



Since 1881

# **The American College**

Re-accredited (2<sup>nd</sup> cycle) by NAAC with Grade “A”, CGPS – 3.46 on a 4 – point scale  
(An Autonomous Institution Affiliated to Madurai Kamaraj University)

**Madurai – 625 002.**

## **MEETING OF THE ACADEMIC COUNCIL**

**Wednesday, June 08, 2016  
10:00 AM**

**Venue  
Main Hall**

**APPENDIX – AK**

## **AGENDA**

1. Prayer
2. Welcome Address – Dr. M. Davamani Christoher, Principal & Secretary
3. Confirmation of the minutes of the meeting of the Academic Council held on Wednesday, June 10, 2015
4. Departmental Resolutions: Undergraduate Programmes (Aided)  
Resolutions 1 to 10
5. Departmental Resolutions: Undergraduate Programmes (SF)  
Resolutions 11 to 19
6. Departmental Resolutions: Postgraduate Programmes (SF)  
Resolutions 20 to 24
7. Community College  
Resolution 25
8. Special resolutions  
Resolution 26 to 29
9. Other Matters, if any
10. Vote of Thanks

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### **Departmental resolutions: Undergraduate programmes (Aided)**

a. BA Tamil	TAM 1 to TAM 14
b. BA English	ENG 1 to ENG 15
c. B.Sc Mathematics	MAT 1 to MAT 11
d. B.Sc Physics	PHY 1 to PHY 13
e. B.Sc Chemistry	CHE 1 to CHE 17
f. B.Sc Botany	BOT 1 to BOT 15
g. B.Sc Zoology	ZOO 1 to ZOO 25
h. BA Economics	ECO 1 to ECO 26
i. BA RPS	RPS 1 to RPS 2

### **Departmental resolutions: Undergraduate programmes (SF)**

j. BA English	ENS 1 to ENS 15
k. B.Sc Mathematics	MAS 1 to MAS 24
l. B.Sc Physics	PHS 1 to PHS 17
m. B.Sc Chemistry	CHS 1 to CHS 13
n. B.Sc BioChemistry	BCH 1 to BCH 9
o. B.Sc Microbiology	MIC 1 to MIC 23
p. B.Sc Visual Communication	BVC 1 to BVC 32
q. B.Sc Information Technology	BIT 1 to BIT 12

### **Departmental resolutions: Postgraduate programmes (SF)**

r. MA English	PSE 1 to PSE 17
s. M.Sc Physics	PSP 1 to PSP 15
t. M.Sc Food Science	PFS 1 to PFS 23
m. MPhil Mathematics	MPM 1 to MPM 11
n. M.Phil Management	MMB 1 to MMB 20

### **Community College**

o. Diploma in Food Processing and Preservation	DFP 1 to DFP 5
p. Advanced Diploma in Food Processing Preservation	AFP 1 to AFP 4

Special Resolutions	SR 1 to SR 4
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## RESOLUTIONS

### Departmental Resolutions: Undergraduate Programmes (Aided)

- R.1: As recommended by the Board of Studies in Tamil, RESOLVED to accept the changes in the programme of studies for BA Tamil as presented on pages from TAM and the syllabi for III and IV Semesters as presented on pages from TAM 2 to TAM 14 with effect from the academic year 2015 – 2016.
- R.2: As recommended by the Board of Studies in English, RESOLVED to accept the changes in the programme of studies for BA English as presented on pages from ENG 1 to ENG 3 and the syllabi for III and IV Semesters as presented on pages from ENG 4 to ENG 15 with effect from the academic year 2015– 2016.
- R.3: As recommended by the Board of Studies in Mathematics, RESOLVED to accept the changes in the programme of studies for B.Sc Mathematics as presented on pages from MAT 1 to MAT 2 and the syllabi for III and IV semesters presented on pages from MAT 3 to MAT 11 with effect from the academic year 2015 – 2016.
- R.4: As recommended by the Board of Studies in Physics, RESOLVED to accept the changes in the programme of studies for B.Sc Physics as presented on pages from PHY 1 to PHY 2 and the syllabi for III and IV semesters as presented on pages from PHY 3 to PHY 13 with effect from the academic year 2015 – 2016.
- R.5: As recommended by the Board of Studies in Chemistry, RESOLVED to accept the changes in the programme of studies for B.Sc Chemistry as presented on pages from CHE 1 and the syllabi for III and IV semesters as presented on pages from CHE 2 to CHE 17 with effect from the academic year 2015 – 2016.
- R.6: As recommended by the Board of Studies in Chemistry, RESOLVED to accept the changes in the courses CHE 1463 Chemistry for Botanists – I and CHE 1464 Chemistry for Botanists – II for I Year Botany as presented on pages from CHE 15 to CHE 17 with effect from the academic year 2016 – 2017.
- R.7: As recommended by the Board of Studies in Botany, RESOLVED to accept the changes in the programme of studies for B.Sc Botany as presented on pages from BOT 1 to BOT 2 and the syllabi for the programme for III and IV semesters as presented on pages from BOT 3 to BOT 15 with effect from the academic year 2015 – 2016.

- R.8: As recommended by the Board of Studies in Zoology, RESOLVED to accept the changes in the programme of studies for B.Sc Zoology as presented on pages from ZOO 1 to ZOO 3 and the syllabi for III, IV, V, and VI semesters as presented on pages from ZOO 4 to ZOO 25 with effect from the academic year 2015 – 2016.
- R.9: As recommended by the Board of Studies in Economics, RESOLVED to accept the changes in the programme of studies for B.A Economics (Tamil and English medium) as presented on pages from ECO 1 to ECO 2 and the syllabi for III and IV semesters as presented on pages from ECO 3 to ECO 26 with effect from the academic year 2015 – 2016.
- R.10: As recommended by the Board of Studies in Religion, Philosophy and Sociology, RESOLVED to accept the changes in the programme of studies for Religion, Philosophy, and Sociology for the course VAL 3230, SOCIAL ISSUES AND VALUE STAND as presented on pages from RPS 1 to RPS 2 with retrospective effect from the academic year 2014 – 2015.

**Departmental Resolutions: Undergraduate Programmes (SF)**

- R.11: As recommended by the Board of Studies in English (Self-financed), RESOLVED to accept the changes in the programme of studies for BA English (Self-financed) as presented on pages from ENS 1 to ENS 3 and the syllabi for III and IV Semesters as presented on pages from ENS 4 to ENS 15 with effect from the academic year 2015 – 2016.
- R.12: As recommended by the Board of Studies in Mathematics (Self-financed), RESOLVED to accept the changes in the programme of studies for B.Sc Mathematics (Self-financed) as presented on pages from MAS 1 to MAS 4 and the syllabi for III and IV Semesters as presented on pages from MAS 4 to MAS 24 with effect from the academic year 2015 – 2016.
- R.13: As recommended by the Board of Studies in Physics (Self-financed), RESOLVED to accept the changes in the programme of studies for B. Sc Physics (Self-financed) as presented on pages from PHS 1 to PHS 2 and the syllabi for III and IV Semesters as presented on pages from PHS 3 to PHS 17 with effect from the academic year 2015 – 2016.
- R.14: As recommended by the Board of Studies in Chemistry (Self-financed), RESOLVED to accept the programme of studies for B. Sc Chemistry (Self-financed) as presented on pages from CHS 1 and the syllabi for III and IV Semesters as presented on pages from CHS 2 to CHS 13 with effect from the academic year 2015 – 2016.

- R.15: As recommended by the Board of Studies in Bio-Chemistry (Self-financed), RESOLVED to accept the changes in the programme of studies for B.Sc Bio-Chemistry (Self-financed) as presented on pages from BCH 1 to BCH 4 and the syllabi for the courses as presented on pages from BCH 5 to BCH 9 with retrospective effect from the academic year 2015 – 2016.
- R.16: As recommended by the Board of Studies in Microbiology (Self-financed), RESOLVED to accept the changes in the programme of studies for B.Sc Microbiology (Self-financed) as presented on pages from MIC 1 to MIC 4 and the syllabi for III, IV, V, and VI Semesters on pages from MIC 5 to MIC 23 with effect from the academic year 2015-2016.
- R.17: As recommended by the Board of Studies in Visual Communication, RESOLVED to accept the changes in the programme of studies for B.Sc Visual Communication (self-financed) presented on pages from BVC 1 to BVC 2 and the syllabi for the programme as presented on pages from BVC 3 to BVC 32 with effect from the academic year 2015-2016.
- R.18: As recommended by the Board of Studies in Information Technology, RESOLVED to accept the programme of studies for B.Sc (Information Technology) as presented on pages from BIT 1 to BIT 2 and the syllabi for the programme for III and IV Semesters as presented on pages from BIT 3 to BIT 11 with effect from the academic year 2015-2016.
- R 19: As recommended by the Board of Studies in Information Technology, RESOLVED to accept the changes for the course BIT 1408, Data Structures using C (TL) instead of BIT 1406, Data Structures using C ++ (TL) and syllabus as presented on page BIT 12 with effect from the academic year 2016 – 2017.

#### **Departmental Resolutions: Postgraduate Programmes (SF)**

- R.20: As recommended by the Board of Studies in English (Self-financed), RESOLVED to accept the programme of studies for MA English (Self-financed) as presented on page PSE 1 and the syllabi for III and IV semesters as presented on pages from PSE 2 to PSE 17 with effect from the academic year 2015-2016.
- R.21: As recommended by the Board of Studies in Physics (Self-financed), RESOLVED to accept the programme of studies for M.Sc Physics as presented on page PSP 1 and the syllabi for III and IV semesters as presented on pages from PSP 2 to PSP 15 with effect from the academic year 2015-2016.

- R 22: As recommended by the Board of Studies in Food Science, RESOLVED to introduce the programme of studies for M.Sc Food Science (self-financed) as presented on page PFS 1 and the syllabi for the programme M.Sc Food Science as presented on pages from PFS 2 to PFS 23 with effect from the academic year 2016 -2017.
- R 23: As recommended by the Board of Studies in Mathematics, RESOLVED to accept the programme of studies for M.Phil Mathematics (Self-financed) as presented on page MPM 1 and the syllabi for the programme M.Phil Mathematics as presented on pages from MPM 2 to MPM 11 with effect from the academic year 2016-2017.
- R 24: As recommended by the Board of Studies in MBA, RESOLVED to accept the programme of studies for M.Phil Management (self-financed) as presented on page MMB 1 and the syllabi for the programme M.Phil Management as presented on pages from MMB 2 to MMB 20 with effect from the academic year 2016-2017.

### **Community College**

- R 25: As recommended by the Board of Studies in Food Processing and Preservation, RESOLVED to accept the programme of studies for Diploma in Food Processing and Preservation (Self-financed) as presented on page DFP 1 and the syllabi for the programme Diploma in Food Processing and Preservation as presented on pages from DFP 2 to DFP 5 with retrospective effect from the academic year 2015 -2016.
- R.26: As recommended by the Board of Studies in Food Processing and Preservation, RESOLVED to accept the programme of studies for Advanced Diploma in Food Processing and Preservation (Self-financed) as presented on page AFP 1 and the syllabi for the programme Advanced Diploma in Food Processing and Preservation as presented on pages from AFP 2 to AFP 4 with effect from the academic year 2016 -2017.

**Special Resolutions**

- R 27: As recommended by the Senatus, RESOLVED to accept the proposal to give attendance concession to NCC cadets/NSS volunteers/SLP students who represent the College at national level and players who represent the college in various sports and games at Zone/Inter-zone/University/District/State/National levels provided NCC, NSS, SLP officers, and Physical Education Directors undertake the responsibility to make such students attend regular classes on other days.
- R 28: As recommended by the Senatus, RESOLVED to accept that NCC cadets/NSS volunteers/SLP students and players representing the college teams shall attend a minimum of one test, one quiz, and one assignment in each course and that the marks secured thereof shall be proportionately doubled for the consolidation of Continuous Internal Assessment.
- R 29: As recommended by the Senatus, RESOLVED to accept the proposal to award a bonus of 10% of the maximum marks in each course in the End-of-Semester Examinations conducted in November, April, and June to NCC cadets, NSS volunteers, SLP students, and Players who represent the College at the University, State, National, and International level tournaments.
- R 30: As recommended by the Senatus, RESOLVED to accept the proposal to conduct a special End-of-Semester Examination for those students who miss regular End-of-Semester Examination conducted in November, April, and June on account of their selection for student exchange programmes abroad with retrospective effect from the academic year 2015-2-16.



Undergraduate Department of Tamil  
Choice Based Credit System 2015 -2016  
Programme for B.A. Degree in Tamil

SEM	PART	COURSE CODE	COURSE TITLE	Hrs\Wk	Cr.	MARKS
III	I	TAM 2201	பொதுத்தமிழ் - III	3	2	60
III	II	ENG 0000	English - III	3	2	60
III	III C	TAM 2521	சங்கம் - அகநெறி	5	5	100
III	III C	TAM 2523	கவிதை-இறைநெறி	5	5	100
III	III C	TAM 2525	நன்னூல் - எழுத்து	5	5	100
III	III C	TAM 2427	புதியஊடகங்களும் தமிழும்	4	4	100
III	III SUP	TAM 2429	பிறமொழி இலக்கியம்	5	4	100

SEM	PART	COURSE CODE	COURSE TITLE	Hrs\Wk	Cr.	MARKS
IV	I	TAM 2202	பொதுத்தமிழ் - IV	3	2	60
IV	II	ENG 0000	English - IV	3	2	60
IV	III C	TAM 2522	சங்கம் - புறநெறி	5	5	100
IV	III C	TAM 2524	இயக்கமும் இலக்கியமும்	5	5	100
IV	III C	TAM 2526	நன்னூல் - சொல்	5	5	100
IV	IIIC	TAM 2428	திரைப்படக்கலை	4	4	100
IV	III SUP	TAM 2430	சித்தர் நெறி	5	4	100

C :Major Core

S : Self Supportive

LS : Life Skill

NME; Non- Major Electives

TAM 2201

பொதுத்தமிழ்-III

2Cr/3 Hrs

**நோக்கம்**

பொதுத்தமிழ் பயிலும் மாணவர்களுக்குப் பகுதி I பிரிவில் அமைகிறது இப்பாடம். முதலிரண்டு பருவங்களில் பயின்ற இலக்கியங்களுக்கு முந்தைய காலகட்ட இலக்கியங்களை அறிமுகப்படுத்துகிறது. அந்தவகையில் காப்பியங்கள் தொடங்கி நவீன இலக்கியம் தொடங்குவதற்கு முன்பு வரையிலான இலக்கியங்கள் இப்பாடத்திற்குள் அடங்கும்.

**கூறு : 1 காப்பியங்கள்**

1. சிலப்பதிகாரம் - கணத்திறம் உரைத்த காதை
2. மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
3. கம்பராமாயணம் - வாலி வதைப்படலம் (10 பாடல்கள்)

**கூறு : 2 பக்தியிலக்கியம்**

4. பன்னிரு திருமுறைகள் - 7ம் திருமுறை திருவெண்ணெய் நல்லூர் பதிகம் (7225-7234)
5. நாலாயிரத் திவ்யபிரபந்தம்- நாச்சியார் திருமொழி (10 பாடல்கள்) (567-576)

**கூறு : 3 சிற்றிலக்கியம்**

6. திருக்குறறாலக்குறவஞ்சி- 1.மலைவளம் - 2 பாடல்கள்  
2.நாட்டுவளம் - 2 பாடல்கள்
7. முக்கூடற்பள்ளு- 1.மழைக்குறி - தேர்ந்தெடுக்கப்பட்ட பாடல்கள்
8. கலிங்கத்துப்பரணி- காடுபாடியது - 5 பாடல்கள்
9. பிள்ளைத்தமிழ்- மீனாட்சியம்மைப்பிள்ளைத்தமிழ் -தாலப்பருவம்

**கூறு : 4 சித்தர் இலக்கியம்**

10. திருமூலர் - சிறப்புப்பாயிரம் - (5 பாடல்கள்)
11. பட்டினத்தார் - 1.திருஞகம்பமாலை- (4 பாடல்கள்)  
2.தகனக்கிரியை - (4 பாடல்கள்)
12. சிவவாக்கியர் - உற்பத்தி நிலை அறிவுநிலை (5 பாடல்கள்)

**கூறு : 5 கட்டுரையிலக்கியம்**

13. பண்பாட்டு அசைவுகள் - தொ.பரமசிவன்
14. சான்றோன் - மயிலை.சீனி.வேங்கடசாமி
15. வரலாறு கூறும் பொற்காலங்கள் - ஆ.சிவசுப்பிரமணியம்
16. மண்ணிலிருந்து கவிதைக்கு (சங்கச்சித்திரங்கள்) - ஜெயமோகன்

**பாடநூல் :** தமிழ்த்துறை வெளியீடு, அமெரிக்கன் கல்லூரி, மதுரை.

**TAM 2521****சங்கம் - அகநெறி****5 Cr/5 Hrs**

**நோக்கம்:**சராயிரமாண்டுத் தமிழ்க் கவிதைப் படைப்புமுயற்சியில் மைய இழையாகத் தொடர்ந்துவருகிற அகநெறிக் கூறுகளை அவ்வவ் காலகட்டங்களில் படைப்பாக்கம் பெற்றுள்ள கவிதைகளின் வாயிலாக இனங்கண்டுபயிலுதல் இப்பாடத்திட்டத்தின் நோக்கமாக அமைகிறது.

**கூறு - 1:**திணைப்பாகுபாடு- அகநிலைக் களன்கள் - தலைவன் - தலைவி -களவு-கற்பு-பாங்கன் - தோழி-செவிலி-திணைக் கூற்றுப் பகுப்பு.ஆகிய அகமரபுகளைச் சித்திரிக்கும் கவிதைகள் - அறநெறிக் காலத்தில் சங்க அக மரபின் தொடர்ச்சியையும் மாற்றத்தையும் சித்திரிக்கும் கவிதைகள். (குறுந்தொகை 10 பாடல்கள், அகநானூறு 1, நற்றிணை 2, ஐந்திணைஐம்பது, (குறிஞ்சி 3), திணைமாலை நூற்றைம்பது (மருதம் 3), திணைமாலைஐம்பது (நெய்தல் 3), கார் நாற்பது 3.)

**கூறு - 2:**பக்திநெறிக் காலத்தில் அகமரபில் எழுந்தமாற்றம் - நாயகநாயகிபாவம் - இறைக் காதல் - பெண் மடலேறுதல் - தோழியின் இடத்தை அ. றிணைப் பொருட்கள் பெறுதல். (சிறியதிருமடல் -2694-2708 வரிகள் திருமங்கையாழ்வார்)-தேவாரம்-4ஆம் திருமுறை(துது -நாவுக்கரசர்)

**கூறு - 3:**தமிழ்க் காப்பியங்களில் அகமரபுமாறியவிதம் - கோவலன் கண்ணகியைநலம் புணந்துரைத்தல் - தொடர்நிலைச் செய்யுள் - சுட்டிஒருவர் பெயர் கூறல் - கண்வழிப் புகுந்தகாதல் நோய் - வால்மீகியிடமிருந்துகம்பன் வேறுபடும் இடங்கள். (கம்பராமாயணம் - மிதிலைக் காட்சிப் படலம் 12 பாடல்கள்,சிலம்பு-மனையறம்படுத்தகாதை 38 - 80)

**கூறு - 4:**சிறுநிலக்கியங்களில் சங்க அக மரபாகிய தூது,மடல் முதலானவைபெற்றவளர்ச்சிநிலைகள் - உலா,கலம்பகம் போன்ற கூறுகள் தனித்துவம் பெற்றமையைச் சுட்டல் - கைக்கிளைக் காதலின் இயல்புகளைக் கூறல் - அகமரபைஒட்டியும் மாறியும் எழுந்த தனிப்பாடல்கள். (குற்றாலக் குறவஞ்சி,நந்திக்கலம்பகம்,முத்தொள்ளாயிரம்,தனிப்பாடல் தேர்வுசெய்யப்பட்டபகுதிகள்)

**கூறு - 5:**சமூகஅமைப்பில் ஏற்பட்டமாற்றத்தின் காரணமாக, அக மரபில் தோன்றியமாற்றம் - தற்காலஅகமரபுகளின் வளர்ச்சி-பழமையும் புதுமையும் இணைதல். (பாரதி-கண்ணம்மாஎன் காதலி,பாரதிதாசன் - முதியோர் காதல்,மீரா,மு.மேத்தா,சுகிர்தராணி,குட்டிரேவதிதேர்வுசெய்யப்பட்டகவிதைகள்)

#### பார்வை நூல்கள்

1. டாக்டர். நா. சுப்புரெட்டியார்,அகத்திணைகொள்கைகள்,பாரிநிலையம்,சென்னை- 1,மு.ப. டிசம்பர் 1981.
2. வ.சு.ப. மாணிக்கம்,தமிழ்க் காதல்,சாரதாபதிப்பகம்,ராயப்பேட்டை,சென்னை- 14, ஜூன் 2007.
3. டாக்டர்.ஆ.வேலுப்பிள்ளை, தமிழ் இலக்கியத்தில் காலமும் கருத்தும், பாரதி புத்தகப் பண்ணை, திருவல்லிக்கேணி,சென்னை- 5,மு.ப. 1985.
4. ம.பெ.சீனிவாசன்,ஆழ்வார்களும் கம்பரும்,மீனாட்சிபுத்தகநிலையம்,மு.ப. 2014.
5. முமணிவேல்,கைக்கிளைக்காதல்,பதிப்புத்துறை,மதுரைகாமராசர் பல்கலைக்கழகம்,மு.ப. 1992
6. டி.எஸ்.முருகேசன் தனிப்பாடலில் நவரசங்கள்,குறிஞ்சிப் பதிப்பகம்,சென்னை- 49 மு.ப. 2003.
7. பா.கொழந்தசாமி தமிழ்ப்புதுக் கவிதைகளில் அகப்பொருள் மரபுக்கூறுகள்,அவ்வைஅச்சுக்கூடம்,சென்னை- 13,மு.

TAM 2523

கவிதை - இறைநெறி

5Hr/5Cr

#### நோக்கம்:

தொல் பழங்காலம் முதல் பாரதியார் காலம் வரை தமிழர்களின் இறை பற்றிய கருத்தாக்கத்தை அந்தந்தக் காலங்களின் கவிதைகள் கொண்டு அணுகுவது இந்தப் பாடத்திட்டத்தின் நோக்கம்.

#### கூறுகள்

1. தொல் பழங்கால இறை வழிபாடு - நிலமும் தெய்வங்களும் - கொடிநிலை, கந்தழி, வள்ளி, நடுகல் வழிபாடு, வேலன் வெறியாட்டு, கொற்றவை வழிபாடு. இறைவனுக்கு என்று தனி இலக்கியம் தோன்றுதல் - திருமுருகாற்றுப்படை - பரிபாடல்.
2. சமண சமயத்தின் தாக்கம் - அதன் செல்வாக்கு, கொள்கைகள் - சிலப்பதிகாரம். பௌத்த சமயத்தின் தாக்கம் - அதன் செல்வாக்கு, கொள்கைகள் - மணிமேகலை.
3. வழிபாட்டில் சிவனும் திருமாலும் முக்கிய இடம் பெறுதல். காரைக்கால் அம்மையார், முதலாழ்வார்கள் மூவர். தலந்தோறும் இறைவனை வழிபடல் (திருமுறைத் தலங்கள் - மங்களாசாசனம் பெற்ற தலங்கள் - வைப்புத் தலங்கள் ஆகியவை). பக்தி இலக்கியத்தில் தமிழ் அகமரபு இடம் பெறல் - நாயகன் நாயகி பாவம். இறைவனை அரசனாகவும் குழந்தையாகவும் பாவித்தல். இசையும் தமிழ்க் கவிதையும் இணையும் பாங்கு - பண்ணொடு பாடுதல். சைவத்தில் சாத்திர நூல்கள் தோன்றுதல்.
4. ஞான வழி இறைவனை அடைதல் - திருமூலர், தாயுமானவர், வள்ளலார். சித்தர்கள் கருத்தாக்கம் - குறியீட்டு மொழிக் கொள்கை, உலக வாழ்வில் வெறுப்பு, பெண்ணாசை வெறுப்பு, இறைவனை அகத்தில் தேடுதல் போன்றவை. கிறித்தவம், இஸ்லாத்தின் வரவு - வீரமாமுனிவர், குணங்குடி மஸ்தான்.
5. நாட்டார் சமய மரபு - அதன் செல்வாக்கு, கொள்கைகள். கதைப்பாடல், கும்மிப்பாடல், அம்மாணை, வர்ணனைப் பாடல்கள் ஆகியன. பாரதியாரின் இறை பாடல்கள் - நாட்டார் மரபின் தாக்கம். சித்தர் இலக்கியத்தின் செல்வாக்கு ஆகியவை.

**பார்வை நூல்கள்**

1. அருணாசலம். ப., பக்தி இலக்கியம், பாரி நிலையம், சென்னை, 1995.
2. கைலாசபதி. க., பண்டைத் தமிழர் வாழ்வும் வழிபாடும், குமரன் புத்தக இல்லம், சென்னை, 1999.
3. சீனிவாசன். ம. பெ., வைணவ இலக்கிய வகைகள். தேவகி பதிப்பகம், சிவகங்கை, 1994.
4. சீனிவாசன். ம. பெ., ஆழ்வார்களும் தமிழ் மரபும், மணிவாசகர் பதிப்பகம், சிதம்பரம். 2010.
5. சீனி வேங்கடசாமி. மயிலை., பௌத்தமும் தமிழும். சைவ சித்தாந்த நூற்பதிப்புக் கழகம், 1940.
6. சீனி வேங்கடசாமி. மயிலை., சமணமும் தமிழும். சைவ சித்தாந்த நூற்பதிப்புக் கழகம், 1957.
7. துரைசாமி பிள்ளை, ஓளவை. சு. சைவ இலக்கிய வரலாறு, அண்ணாமலைப் பல்கலைக்கழகம், 1958.

**பாடல் பகுதிகள்**

1. காரைக்கால் அம்மை - அற்புதத் திருவந்தாதி (முதல் ஐந்து பாடல்கள்).
2. பொய்கையாழ்வார் - முதல் திருமொழி (முதல் ஐந்து பாடல்கள்).
3. திருஞான சம்பந்தர் - திருவெங்குரு பதிகம் (முதல் திருமுறை, 75வது பதிகம்).
4. திருநாவுக்கரசர் - திருக்கருகாவூர் பதிகம் (ஆறாம் திருமுறை, 15வது பதிகம்).
5. சுந்தரர் - திருநாட்டியத்தான்குடி (ஏழாம் திருமுறை, 15வது பதிகம்).
6. மாணிக்கவாசகர் - நீத்தல் விண்ணப்பம் ( முதல் பத்துப் பாடல்கள்).
7. நம்மாழ்வார் - திருவாய்மொழி முதற்பத்து ('அஞ்சிறைய மடநாராய்' பாசரம்).
8. ஆண்டாள் - நாச்சியார் திருமொழி ('கார்கோடல் பூக்காள்' பாசரம்).
9. திருமூலர் - முதல் தந்திரம் (ஐந்து பாடல்கள்)
10. சிவவாக்கியர் - சிவவாக்கியர் பாடல்கள் (தேர்ந்தெடுத்த ஐந்து பாடல்கள்)
10. வள்ளலார் - ஆறாம் திருமுறை (ஐந்து பாடல்கள்)
11. வீரமாமுனிவர் - தேம்பாவணி (தேர்ந்தெடுத்த ஐந்து பாடல்கள்)
12. குணங்குடி மஸ்தான் - மனோன்மணிக்கண்ணி (தேர்ந்தெடுத்த கண்ணிகள்)
13. முத்துப்பட்டன் கதைப்பாடல் - தேர்ந்தெடுத்த பகுதிகள்.
14. முளைப்பாரி கும்மி - தேர்ந்தெடுத்த பகுதிகள்
14. அழகர் வர்ணிப்பு - தேர்ந்தெடுத்த பகுதிகள்
15. பாரத அம்மாணை - தேர்ந்தெடுத்த பகுதிகள்
16. பாரதியார் - தேசமுத்துமாரி பாடல்.

**TAM2525****நன்னூல் - எழுத்ததிகாரம்****5Hrs/ 5 cr.****நோக்கம்:**

தமிழ்எழுத்துக்களின் அடிப்படையானஇலக்கணஇயல்புகளைவிளக்கும் நன்னூல் எழுத்ததிகார இலக்கணத்தினை,சமகாலமொழிப்பயன்பாட்டைமாணவர்கள் பிழையின்றிப் பயன்படுத்துவதற்குஏற்றவகையில்,கற்பித்தல் இப்பாடத்தின் நோக்கமாகும்.

**அலகுகள்**

1. பாயிரவியல்:பாயிரவகை - நூல் வரலாறு-ஆசிரியர்,மாணவர் வரலாறு-கற்றல்,கற்பித்தல் முறைகள். (முதல் 56 நூற்பாக்கள் சிறப்புப் பாயிரம் உட்பட).
2. எழுத்தியல்: எழுத்திலக்கணம் - எண் - பெயர் - முறை-பிறப்பு-உருவம் - மாத்திரை- முதனிலை - இறுதிநிலை-மயக்கம் - போலி. (56 - 127ஆம் நூற்பாமுடிய).
3. பதவியல்: பதம் - பகுபதஉறுப்புக்கள் - பிறமொழிஆக்கம். (128 - 150ஆம் நூற்பாமுடிய).
4. புணரியல்: புணர்ச்சி வகைகள் - உயிரெழுத்துக்களின் பொதுப் புணர்ச்சி,சிறப்புப் புணர்ச்சி. (151 - 203ஆம் நூற்பாமுடிய).
5. புணரியல்: மெய்யெழுத்துக்களின் பொதுப் புணர்ச்சி,சிறப்புப் புணர்ச்சி - உருபுபுணர்ச்சி. (204 - 239: 240 - 257ஆம் நூற்பாமுடிய).

**பாடநூல்:**

நன்னூல் எழுத்ததிகாரம் மூலமும் விருத்தியுரையும்,பொதுப்பதிப்புசோம. இளவரசு,அண்ணாமலைப் பல்கலைக்கழகம், 1990.

## TAM 2427

புதிய ஊடகங்களும் தமிழும்

4HRS/ 4cr

நோக்கம் : 20 ஆம் நூற்றாண்டின் பிற்பகுதியில் கணினி மயப்படுத்தப்பட்ட (Computerized). இணைய வலைப்பின்னல் (Internet) tஅமைப்பிற்குள் செயல்படும். மின்னனுமயமான (Digitalized) ஊடகச் செயல்பாடுகளை அறிமுகப்படுத்தி தமிழில் இப்புதிய ஊடகங்களின் (மின்னஞ்சல், வலைத்தளங்கள், வலைப்பூக்கள், முகநூல், காணொளிக் காட்சிகள் இன்ன பிற) செயல்பாடுகள். அதன் வீச்சு சாதக பாதக அம்சங்கள் ஆகியனவற்றை அறிமுகப்படுத்தியும் விவாதித்தும் மாணவர் அவர்தம் வளர்ச்சிக்கும் வேலைவாய்ப்பிற்கும் இவ்ஊடகங்களைப் பயன்படுத்துவதற்கான வழிமுறைகளுக்கு முக்கியத்துவம் அளிக்கும்.

கூறு 1: தகவல் யுகத்தின் தோற்றம் - கணினி மற்றும் இணைய வெளிச் செயல்பாடுகள் பற்றிய அறிமுகம் - அறிவு, தொழில், அன்றாட வாழ்க்கை என வாழ்வின் எல்லா நிலைகளிலும் இணையம் இந்த நூற்றாண்டின் தவிர்க்க இயலாத அங்கமாக மாறியுள்ளமை விவாதிக்கப்படும்.

கூறு 2: தமிழ் மொழி மற்றும் இலக்கியம் சார்ந்த இணையச் செயல்பாடுகள் அறிமுகப்படுத்தப்படும்- உலகின் மூத்த மொழிகளுள் ஒன்றான தமிழ் கல்விப்புலம் கடந்து இயங்கிவருவதும் அதன் செயல்பாடுகள் நாளுக்குநாள் விரிவடைந்து வருவதும் விவாதிக்கப்படும்.

கூறு 3: மின்னஞ்சல்(Email), வலைத்தளங்கள் (Websites)வலைப்பூக்கள் (Blogs) இணைய இதழ்கள்(Internet Magazines) இணைய நூலகங்கள்(Online Resource Centers) இணைய ஆதாரமையங்கள்( Online Resource Centers) ஆகியனவற்றின் செயல்பாடுகளும் பயன்பாடுகளும் அறிமுகப்படுத்தப்படும்.

கூறு 4: 21ஆம் நூற்றாண்டின் காட்சிக் கலாச்சாரத்தில் மின்னனுமயமான பிம்பங்களைப் (Digitalized Images) புரிந்து கொள்வதன் அவசியம் பேசப்படும் கற்றல் கற்பித்தலுக்கான ஊடகமாக விளங்கும் காணொளிக்காட்சிகளின் (Vidos) பன்முகச் செயல்பாடுகள் விவாதிக்கப்படும்.

கூறு 5: முகநூல் மற்றுமான சமூக ஊடகங்களின் பின்னுள்ள வணிக நோக்கங்களும், அதனால் உருப்பெறும் புதுவகையான இளையோர் உளவியல் மாற்றங்களும் விவாதிக்கப்படும். விழிப்புணர்வோடு புதிய ஊடகங்களை அணுக வேண்டியதன் தேவை முன்னிறுத்தப்படும்.

- இப்பாடத்தின் அக, புற மதிப்பீட்டுத் தேர்வுகள் அனைத்தும் செய்முறைத் தேர்வுகளாக அமையும். தமிழ், ஆங்கிலத் தட்டச்சைத் தேவையான அளவுக்குக் கற்றுக் கொள்ளுதல், மின்னஞ்சல் கணக்குத் தொடங்கி அனுப்புதல், பெறுதல். தேவையான வலைத்தளங்களை கண்டறிதல், தகவல்களைத் தறவிக்கம் செய்தல், வலைப்பூ உருவாக்குதல், படங்கள் காணொளிகளைப் பதிவேற்றம் செய்தல் ஆகியன தனிநபர் மற்றும் குழுப் பணிகளாக (Individual and Group Projects) வழங்கப்பட்டு மதிப்பீடு செய்யப்படும்.

துணை நூல்கள்

1. James Watson., Media Communication, an Introduction to Theory and Process, 2003 Palgrave, Macmillan.
2. Vilanilam. J.V., Mass Communication in India, a Sociological Perspective, 2008. Sage.
3. Tony Schiratio and Jen Webb., Understanding Visual, 2007, Sage.
4. க.பூர்ணசந்திரன், தொடர்பியல் சமூகம் வாழ்க்கை 2011, அடையாளம் பதிப்பகம்
5. ஞாநி.மீடியா உறவுகள் 2000 ம.சா.சுவாமிநாதன் ஆராய்ச்சி நிறுவனம்.

## TAM2429

## பிறமொழி இலக்கியம்

5 Hrs /Cr 4

நோக்கம் : உலகளாவிய அளவில் படைப்பாக்கம் பெற்றுள்ள நவீன இலக்கிய வகைமைகளையும் படைப்புக் கர்த்தாக்களையும் அறிமுகஞ் செய்து, அவற்றின்வழி, பிற மொழிகளில் நிலவிவந்துள்ள இலக்கியப் போக்குகளைத் தமிழ்மொழிவழி அறியச் செய்தல் இப்பாடத்தின் நோக்கமாகும். மேலும், அயல்மொழிப் படைப்புப் பிரதிகளின் பன்முகப்பட்ட பண்புகளை, விதவிதமான கருத்தியற் பொருண்மைகளை அடையாளங்காட்டுதலும், உலக இலக்கியங்கள் மீதான வாசிப்பு ஆர்வத்தை வளரச் செய்தலும் இப்பாடத்தின் பிற நோக்கங்களாகும்.

\* பிறமொழிகளிலிருந்து தமிழில் பெயர்க்கப்பட்டு, தென்னிந்திய, இந்திய - ஆசிய - உலக அளவிலான நவீன இலக்கிய வகைமைகளைப் பிரதிநிதித்துவப்படுத்திடும் குறிப்பிடத்தக்க நாவல்கள், சிறுகதைகள், கவிதைகள், கட்டுரைகள் இப்பாடத்திற்கான பகுதிகளாக அமைவு பெறும்.

**கூறு - 1 :** மொழிபெயர்ப்பிலக்கிய வாசிப்பு : தேவையும் பயன்பாடுகளும் / உலக - ஆசிய - இந்திய இலக்கியம் : விளக்கமும் விவரணைகளும் / தமிழ் மொழிபெயர்ப்பில் உலக - இந்திய இலக்கிய வகைமைகள் / தமிழிலக்கியப் பரப்பில் அயல்மொழி இலக்கியங்களின் தாக்கமும் பரவலும் / பிறமொழி இலக்கியம் மீதான வாசிப்பு முறைமையும் இரசனை மேம்பாடும்.

**கூறு - 2 :** தென்னிந்திய இலக்கியம் : இந்திய இலக்கியச் சூழலில் தென்னிந்திய இலக்கியங்களின் தனித்தன்மைகள் / சமகாலப் படைப்பாளிகள் மற்றும் படைப்புகளின் பொதுமைகள்/

**i.மலையாளம் :** **நாவல்** - வைக்கம் முகமது பஷீர் - என் பால்யகால சகி  
**சிறுகதை** - i. தகழி - மாத்தனின் கதை/  
 ii. எஸ்.கே. பொற்றேகாட் - ஆற்றங்கரையினிலே/  
**கவிதை** குஞ்சுண்ணி - தொழில், மொழி, மரணம் பலவிதம், பீடிதா,  
 சச்சிதானந்தன் - இரிஞ்ஞாலக்குடா,  
 ஏ.அய்யப்பன் - இரவு உணவு,  
 என்.ஜி. ராதாகிருஷ்ணன் - அப்பாவும் நாயும்,  
 கே.ஜி.சங்கரப்பிள்ளை - பல போஸில் புகைப்படங்கள்.

**ii. தெலுங்கு :** **சிறுகதை** - பாலகும்மி பத்மராஜு - தொலைபேசி,  
**கவிதை** - சரபண்ட ராஜு - நான் சாட்சிக் கூண்டில் ஏறுகிறேன்,  
 மகா சுவபன் - பாட்டை நிறுத்துங்கள் பந்தத்தை அணைத்து விடுங்கள்,  
 சிகாமணி - கவனியுங்கள்! உருக்குப் பேனா முனைகள் முளைக்கின்றன,  
 மாத்தாரி நாகேஷ்பாபு - தலித்தாய்.

**iii. கன்னடம் :** **சிறுகதை** - மாஸ்தி வேங்கடேஸய்யங்கார் - ஆன்சேக்ஸ்பியர்,  
**கவிதை** - பி.ஆர்.லக்ஷ்மணராவ் - நடுநிலை,  
 வைதேகி - தெரிந்தவர்களே சொல்லுங்கள், பைக்குள்ளே பார்க்கக் கூடாது,  
 சர்வ மங்களா - அவன் குமரன், பொம்மை.

**கூறு - 3 :** இந்திய இலக்கியம் : தொன்மை, சிறப்பாம்சங்கள் / உலகயிலக்கியப் பரப்பில், இந்திய நவீன இலக்கியத்தின் இடமும் இருப்பும் / இலக்கியத்தினூடான சமூக, வரலாற்று வரைவுகள்/

\* **நாவல்** : **வங்கம்**- மகாசுவேதாதேவி - 1084இன் அம்மா  
 \* **சிறுகதை :** **i. கொங்கணி** - தாமோதர் மௌஜோ - மரணத்தை எதிர்நோக்கி,  
**ii.ராஜஸ்தானி** - நிருஸின்ஹா ராஜ்புரோகித் - காத்திருத்தல்,  
**iii.டோக்ரி** - பி.பி.சாத்தே - அன்பளிப்பு,  
**iv. ஹிந்தி** - அசோக் சக்லா - சைக்கிளைத் திருட்டுக்கொடுத்த சுகம்.  
 \* **கவிதைகள்** : **i. வங்கம்** - தாகூர் - கீதாஞ்சலி  
 குதிராம்போஸ் - பத்து மாதங்கள் பத்து நாட்கள்,  
 கனில் கங்கோபத்யாயா - நீராவுக்கு உடல்நலக்குறைவு,  
**ii.சமஸ்கிருதம்** - ஏ.என். பாண்டே - விருப்பம்,  
**iii. ஹிந்தி** - சுஜாதா - சவுதாரிமாலிகா - I, II, III,  
 - குன்வர் பெச்சைன் - வேறுபாடு,  
**iv. குஜராத்தி** - ஜெயந்த் பார்மர் - தூக்குத்தண்டனை.  
 \* **கட்டுரை :** **வங்கம்** - பக்கிம் சந்திரர் - பூனை.

**கூறு - 4 :** ஆசிய இலக்கியச் செழுமைகள் / ஏனைய புலங்களின் மீது செலுத்திய தாக்கங்கள்/ நிலவியற் வெளிப்பாட்டுத் தன்மைகள்/

* நாவல் : ருஷ்யா	- தாஸ்தியெவ்ஸ்கி	- வெண்ணிற இரவுகள்,
* சிறுகதை :		- எக்ரெட் ஏரியின் துயரங்கள்,
i. சீனா	- துயான் மூ ஹாங் லியாங்	- அமைதி,
ii. ஜப்பான்	- ஹருகி முரகாமி	- பச்சோந்தி,
iii. ருஷ்யா	- ஆண்டன் சேகாவ்	- திற,
iv. பாகிஸ்தான்	- சதத் ஹசன் மண்டோ	- இன்று என் மகன் வீடு வருகிறான்.
v. இலங்கை	- கருணா பெரைரா	- காகிதம் பற்றிய கவிதை
* கவிதைகள்		- ஒரு தாயாக இருப்பது குறித்து,
i. ருஷ்யா	- ரகூல் கம்சதோவ்	- சொத்தைப்பல்,
ii. வியட்நாம்	- செலான் வியென்	- கொடிய விலங்கு,
iii. லெபனான்	- கலில் ஜிப்ரான்	- சிங்கப்பூர் வருபவர்க்கு,
iv. பங்களாதேஷ்	- ரஸியாகான்	- விலங்குகள் பூச்சிகள் கூட்டம் -1984.
v. சிங்கப்பூர்	- கிபோல்சிங்	
vi. மலேசியா	- செசில் ராஜேந்திரா	

**கூறு - 5 :** உலக இலக்கியச் சிறப்பம்சங்கள்/ உலக இலக்கிய முன்னோடிகள்/ பன்முகப் பண்பாட்டுப் பகிர்வுகள்/ அரசியல் நெருக்கடிசார் வரைவுகள்/ சோதனா முயற்சிகள்/

* நாவல்	அமெரிக்கா	- எர்னெஸ்ட் ஹெமிங்வே	- கடலும் கிழவனும்,
* சிறுகதை :	i.அர்ஜென்டினா-	ஜார்ஜ் லூயி பேர்ஹே	- மணல் பிரதி,
	ii.கொலம்பியா	- மார்க்வெஸ்	- மூழ்கிப்போன மனிதன்,
	iii. பிரான்ஸ்	- ஆல்பர்ட் காம்ப்யூ	- விருந்தாளி,
	iv. ஜெர்மனி	- ராபர்ட் நியுமான்	- துறவி,
* கவிதைகள் :	i.அமெரிக்கா	- வால்ட் விட்மன்	- புல்லின் இதழ்கள்,
		- ரேடூரம்	- துயரம் நிறைந்த கண்ணீர்,
		- எட்டர்லிங் ப்ரவீன்	- கிழவன் லெம்,
		- பார்பரா மால்கம்	- தூங்கப்பண்ண அம்மா சொன்ன கதை
	ii.ப்ரெஞ்சு	- ரூமர்கோடன்	- சில அபூர்வமான மௌனப் பிரார்த்தனைகள்
	iii.சிலி	- பாப்லோ நெரூடா	- புத்தகத்திற்கு ஒரு விளிப்பாடல்,
	iv.நியூசிலாந்து	- ஜேம்ஸ் நார்க்னி.ப்	- சோப்பின் உண்மைக் கதை,
	v.இங்கிலாந்து	- எட்வின் ப்ராக்	- மனிதனைக் கொல்ல ஐந்து வழிகள்.
* கட்டுரைகள்	i.மெக்ஸிகோ	- ஆக்டோவியா பாஸ்	- மொழிபெயர்ப்பு என்ற கலை,
	ii.நைஜீரியா	- ச்சினுவா ஆச்சிபி	- நான் குளிக்கப் போவது இல்லை.

\* பாடநூல்கள் : I

\* நாவல்கள் :

- வைக்கம் முகமது பவ்ரீ, பால்ய கால சகி, தமிழில் : குளச்சல் மு.யூசுப், காலச்சுவடு பதிப்பகம், நாகர்கோயில் - 629 001, முதல் பதிப்பு - டிசம்பர். 2009. விலை : 60
  - மகாசுவேதாதேவி, 1084இன் அம்மா, பரிசல் பதிப்பகம், சென்னை, விலை. ரூ60.
  - தாஸ்தியெவ்ஸ்கி, வெண்ணிற இரவுகள், என்.சி.பி.ஹெச்., சென்னை, விலை. ரூ60.
  - எர்னெஸ்ட் ஹெமிங்வே (நா.ஆ.), எம்.எஸ். (மொ.பெ.ஆ.), கிழவனும் கடலும், காலச்சுவடு பதிப்பகம், நாகர்கோயில் - 001, முதல் பதிப்பு - 2003. விலை : 50
- II. பற்பல மொழிபெயர்ப்பு நூல்களுள் இருந்து தேர்ந்து எடுக்கப்பட்டிருக்கும் சிறுகதைகள், கவிதைகள், கட்டுரைகள் ஆகியவற்றின் நகல்கள் அடங்கிய தொகுப்பு.

பார்வை நூல்கள்

- கா.அப்பாதுரைப்பிள்ளை, உலக இலக்கியங்கள், கழக வெளியீடு, சென்னை - 1, முதல் பதிப்பு - 1955.
- க.நா.சுப்பிரமணியம், உலக இலக்கியம், புதுவைப் பல்கலைக்கழகத் தமிழியற்றுறை வெளியீடு, புதுச்சேரி, 605 104, முதல் பதிப்பு - 1989.
- ந.முருகேசபாண்டியன், தமிழ்மொழி பெயர்ப்பில் உலக இலக்கியம், உயிர்எழுத்துப் பதிப்பகம், திருச்சி, 2011.
- இந்திரன், தோட்டத்து மேசையில் பறவைகள், இன்றைய ஐரோப்பிய புது எழுத்து, சந்தியா பதிப்பகம், சென்னை - 83, முதல் பதிப்பு - 2011.
- அமரந்தா, பனியும் நெருப்பும் - லத்தீன் அமெரிக்க இலக்கியம் : ஓர் அறிமுகம், நிழல் வெளியீடு.

6. சிவலிங்கனார், உலகக் கவிதைகள், செல்வி பதிப்பகம், திருச்சி - 23, முதல் பதிப்பு - 2000.
7. வைரமுத்து, எல்லா நதியிலும் என் ஓடம், சூரியா லிட்ரேச்சர் லிமிடெட், சென்னை - 24, ஒன்பதாவது பதிப்பு - நவம். 2004.
8. க.பூரணச்சந்திரன், இந்திய மொழிகள் ஓர் அறிமுகம், நிவேதிதா பதிப்பகம்,
9. பா.ஆனந்தக்குமார், இந்திய ஒப்பிலக்கியம், கியூரி பப்ளிகேசன்ஸ், மதுரை, 1997.
10. எச்.பாலசுப்பிரமணியம், இந்திய மொழி இலக்கியக் கட்டுரைகள், நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை - 98, முதல் பதிப்பு - 2014.
11. க.நா.சுப்பிரமணியம், இந்திய இலக்கியம், கலைஞன் பதிப்பகம், சென்னை.
12. க.நா.சு. 'இந்திய இலக்கியம்', கலைநுட்பங்கள், வேள் பதிப்பகம், சென்னை - 14, முதல் பதிப்பு - 1988.
13. பத்மாவதி விவேகாநந்தன், இலக்கியத்தில் அழகியலும் இலட்சியமும், வள்ளிசுந்தர் பதிப்பகம், சென்னை - 14, முதல் பதிப்பு - 2003.
14. ஏ.ஜி.வேங்கடாச்சாரி, இன்றைய இந்திய இலக்கியம், சாகித்ய அகாடமி, புதுதில்லி - 110 001, இரண்டாம் பதிப்பு - 2003.
15. வசந்த் செந்தில், சாளரம் - எட்கர் ஆலன்போ - ஒரு அறிமுகம், குமரன் பதிப்பகம், சென்னை - 17, முதல் பதிப்பு - 2002.
16. அரவிந்தன், கனவின் யதார்த்தப் புத்தகம், காலச்சுவடு பதிப்பகம், நாகர்கோயில், 629001, முதல் பதிப்பு - 2011.

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## TAM 2202

## பொதுத்தமிழ் - IV

2 Cr \ 3 hrs

நோக்கம் :

மரபார்ந்த இலக்கியங்களின்வழி பழந்தமிழ் மரபினையும் சங்க காலத் தமிழரின் பரந்துபட்ட வாழ்வியல் நெறிமுறைகளையும் மாணவர் அறியச் செய்வது இப்பாடத்தின் நோக்கமாகும்.

கூறு 1

சங்க இலக்கிய வகைகள் அறிமுகம் - அகத்திணை\ புறத்திணை சிறப்பியல்புகள் - சங்கம் மருவிய கால இலக்கியம் குறித்த அறிமுகம் - சங்கப்பாக்களின் பாடுபொருளான அறம் -புறத்திற்கு மாற்றாக அறம் பாடுபொருளான பாங்கினை விளக்குதல்.

கூறு 2

எட்டுத்தொகை நூல்கள்

நற்றிணை - 5 பாடல்கள் (பாடல் எண்கள் 21,61,70,172,202)

குறுந்தொகை - 5 பாடல்கள் (பாடல் எண்கள் 3,8,23,40,58)

கலித்தொகை - பாலைக்கலி \ 2 பாடல்கள் (பாடல் எண்கள் 9,11)

புறநானூறு - 5 பாடல்கள் (பாடல் எண்கள் 12,86,278,279,312)

பரிபாடல் - வையை (15 அடிகள்)

கூறு 3

பத்துப்பாட்டு நூல்கள்

பெரும்பாணாற்றுப்படை (45 அடிகள்)

நெடுநல் வாடை (85 அடிகள்)

கூறு 4

புதினெண் கீழ்க்கணக்கு நூல்கள்

நாலடியார் - கல்வி அதிகாரம் \ 5 பாடல்கள் (பாடல் எண்கள் 131,132,133,135,138)

திருக்குறள் - அறத்துப்பால் - அடக்கமுடைமை

பொருட்பால் - கள்ளுண்ணாமை

இன்பத்துப்பால் - நலம் புனைந்துரைத்தல்

இனியவை நாற்பது - 5 பாடல்கள் (பாடல் எண்கள் 1,4,5,10,13)

பழமொழி நானூறு - 5 பாடல்கள் (பாடல் எண்கள் 5,55,60,61,243)



கூறு 5

கட்டுரைகள்  
வ.சு.ப.மாணிக்கம் - தமிழ்க்காதல்  
ரா.பி.சேதுப்பிள்ளை - ஆறும் ஊரும்  
ஜெயமோகன் - சங்கச் சித்திரங்கள் \ கவிதையிலிருந்து மண்ணுக்கு  
க.பூரணச்சந்திரன் - சங்க இலக்கியம்-மறுவாசிப்பின் தேவை

#### பாட நூல்

செய்யுள் தொகுப்பு  
தமிழ்த்துறை வெளியீடு  
அமெரிக்கன் கல்லூரி,மதுரை-625 002

### TAM 2522

### சங்கம் - புறநெறி

### 5 Cr/5 Hrs

**நோக்கம்:** சங்ககாலம் தொடங்கி தற்காலம் வரை எழுந்துள்ள கவிதைகளை அடிப்படையாகக் கொண்டு, காலந்தோறும் மாறி வருகின்ற மனித வாழ்க்கை, மதிப்பீடுகளுக்கேற்புறப்பொருள் மாறிவந்துள்ளமையைக் கற்றல். முதல் கூறில் தொல்காப்பியப் புறத்திணைகளோடும், ஐயனாரிதனாரின் புறப்பொருள் வெண்பாமாலையோடும் பொருத்திப் பார்த்தல்.

**கூறு - 1:** சங்கக் கவிதையில் வீரம், கொடைசிறப்புடைய பாடுபொருளாதல் - இரவலர் - புரவலர் உறவு- போர்ச்சித்திரிப்பு-நிலைத்தன்மைகருத்துக்கள் - நட்பு, கல்வி, புகழ், குழந்தை. (புறநானூற்றில் 15 பாடல்கள்)

**கூறு -2:** சமண, பௌத்த மதங்களை வைதீகசமயம் வெற்றி கொண்டமை-மனிதநேயத்தின் அவசியத்தைக் கூறும் கவிதைகள். (நாலடியார் 10, திரிகடுகம் 5, ஏலாதி 5, சிறுபஞ்சமூலம், களவழிநாற்பது 5, ஆசாரக்கோவை 5 - திருநாவுக்கரசர், திருவாசகம் (பதிகம் 11) நான்காம் திருமுறை 10 பாடல்கள், தேவாரம் (பதிகம் 98) ஆறாம் திருமுறை 10 பாடல்கள்)

**கூறு - 3:** காப்பியத்தில் அறம் சார்ந்த கருத்துக்கள் பதிவான சூழலைக் குறிப்பிடல். (சிலம்பு-மதுரைக் காண்டம் ஆதிரைபிச்சையிட்டகாதை 11 வரிகள், சீவகசிந்தாமணி முக்தி இலம்பகம் 5 பாடல்கள்)

**கூறு -4:** தொல்காப்பியத் துறைகள் சிலவும் சங்க இலக்கியப் புறத்துறைகளுள் சிலவும் சிற்றிலக்கியங்களில் பரிணமித்துள்ள போக்கினை விளக்கல் - பரணி, கலம்பகம், தனிப்பாடல்களின் புறப்பொருள் - கிறித்துவ இலக்கியத்தில் புறம் விரவியுள்ளவையைக் காணுதல். (பரணி 10, கலம்பகம் 10, தனிப்பாடல் 15, இரட்சண்மனோகரம் 10)

**கூறு -5:** தற்காலக் கவிதைகளில் சூழலுக்கேற்ப உள்ளடக்கத்திலும் வடிவத்திலும் மாறிவரும் புறப்பொருள் கருத்துக்களை எடுத்துக் காட்டல். (கவிதைகள்: சேரன்-வாழ்வும், மரணமும் I, II ஆத்மநாம் - பிச்சை, இத்தநகரத்தை எரிப்பது, அப்பாஸ் - துப்பாக்கி)

#### பார்வை நூல்கள்

1. டாக்டர். ஆ. வேலுப்பிள்ளை, தமிழ் இலக்கியத்தில் காலமும் கருத்தும், பாரதி புத்தகப் பண்ணை, திருவல்லிக்கேணி, சென்னை- 5, மு.ப. 1985.
2. க.ப. அறவாணன், அற்றைநாட் காதலும், வீரமும்,
3. சாமி. சிதம்பரனார், பதினெண்கீழ்க்கணக்கும் தமிழர் வாழ்வும், அறிவுப் பதிப்பகம், ராயப்பேட்டை, சென்னை- 14, மு.ப. அக்டோபர் - 2003.
4. அ. வேலுப்பிள்ளை, தமிழர் சமயவரலாறு, குமரன் பதிப்பகம், சென்னை- 2012.
5. தோ. பரமசிவன், சமயங்களில் அரசியல், கங்கு வெளியீடு, மு.ப. ஆகஸ்ட் - 2005.
6. நாஞ்சில் நான், சிற்றிலக்கியங்கள், தமிழினிபதிப்பகம், சென்னை- 17, மு.ப. 2014.
7. ஞானி, வானம்பாடிகளின் கவிதை இயக்கம்: வரலாறும் படிப்பிணைகளும், காவ்யா, சென்னை- 24, மு.ப. டிசம்பர் -2011.
8. சு.சண்முகசுந்தரம் (தொ.ஆ.), புதுக் கவிதையும், புதுப் பிரக்ஞையும், காவ்யா, பெங்களூரு- 38, மு.ப. 1985.
9. பொன்மணி, புதுக்கவிதையும் புதிய கவிதையும், சிப்பிபுக்ஸ், சென்னை- 17, மு.ப. மார்ச் - 2009

**TAM2418****இயக்கமும் இலக்கியமும்****5 Hrs /5 Credits****நோக்கம் :**

உலகளாவிய அரசியல், சமூக, இலக்கிய இயக்கங்களின் உந்துதல்களால் உருப்பெற்று வளர்ந்துள்ள, வேறுபட்ட இலக்கியப் போக்குகளுள் குறிக்கத்தக்க சிலவற்றை, அவ்வவ் இயக்கங்களின் பின்னணியில் கண்டு விளங்கிக் கொள்வதே இப்பாடத்தின் நோக்கமாகும். பன்முகப்பட்ட இயக்கங்களைப் பிரதிநிதித்துவப்படுத்திடும் நாவல், சிறுகதைகள், கவிதைகள், நாடகம் முதலான இலக்கிய வகைமைகள் இப்பாடத்திட்டத்தினுள் இடம்பெறும்.

**பாடத்திட்டம் :**

**கூறு - 1 :** i.இயக்கம்/இலக்கியம்/கொள்கை/கோட்பாடு/தத்துவம்: விளக்கமும் விவரணைகளும்.  
ii.இயக்கம்சார் இலக்கியங்களும் இலக்கியப் பனுவல்களும் இயக்கங்களின் ஊடாட்டமும்.

**கூறு - 2 :** இந்திய - தமிழக அளவில் அரசியற் களங்களில் முகிழ்த்து, இலக்கியப் பிரதிகளுக்குள் இழைவுற்ற இயக்கங்கள்:

**I.காந்தியம்** - i. பிரார்த்தனை (சி.க.செல்லப்பா)  
ii. பதச்சோறு (பி.எஸ். ராமையா)  
iii. கங்கை இன்னும் வற்றிவிடவில்லை (நா.பார்த்தசாரதி)

**II.பெரியாரியம்** - i. கருப்பணசாமி யோசிக்கிறார், ii. சொர்க்கத்தில் நரகம், iii. செவ்வாழை (அறிஞர் அண்ணா)

**கூறு - 3 :** மேலாதேயக் கோட்பாடுகளின் தாக்கத்தால் இந்திய - தமிழக இலக்கியச் சூழலில் உருப்பெற்ற சிந்தனாவாக்கங்கள்:

**I.தலித்தியம்** - i. மெல்லிய புலால் நாற்றம், ii. செத்துப்போன மாட்டைத் தோலுரிக்கும்போது,  
iii. தீண்டப்படாத முத்தம் (சுகிர்தராணி).  
iv. நாம் என்பது, v. பறை (கரிகாலன்).

**II.பெண்ணியம்** - i. பெண், ii. தீட்டு, iii. யாரும் சொல்லித்தராமல் (அ.வெண்ணிலா),  
iv. காட்ஸில்லா (வைகைச்செல்வி), v. அவர்கள் பார்வையில் (அ.சங்கரி), vi. சுதந்திர அடிமைகள் (வித்யா), vii. புரிதலின் அவலம், viii. உன் தனிமை (ரஞ்சனி). ix. வளையல் விலங்குகள், x. ஆகாசம் பார்த்ததில்லை, xi. கயிறு, xii. கோடிவருட நெருப்பை xiii. சாவி (கந்தர்வன்).

**கூறு - 4 :** தமிழிலக்கியப் பரப்பில், தொடக்ககாலத்தைய மேற்கத்திய இலக்கியக் கோட்பாட்டுப் பரவல்கள்:

**I.புனைவியல்** - i. மழை, ii. பிழைத்த தென்னந்தோப்பு, iii. காற்று,  
iv. விடுதலை (நாடகம்) - (பாரதியார்).

**II.எதார்த்தவாதம்-** i. கெடுக சிந்தை (த.கோவிந்தன்), ii. வெறும் மனைவி (சுப்ரமணியராஜ்), iii. வேளை வரலை (பாலகுமாரன்), iv. நவயுகக் காதல் (மீரா), v. நாய்களே அஜாக்கிரதை அல்லது அஜாக்கிரதை நாய்கள் (ஆதவன் தீட்சண்யா), vi. உன் மகளை உன் மகனே (இரா.மீனாட்சி).

**III. மிகை எதார்த்தவாதம்-** i. தவளைகள் (ஞானக்கூத்தன்), ii. நிலவின் இதயத்தாளம் (பிரம்மராஜன்), iii. ஒரு நம்பிக்கை செத்துக்கிடக்கிறது, iv. ஒருமுறையாவது பூக்கும் (அபி).

- IV. இயற்பண்பியல்வாதம்-** i. கிளிக்குஞ்சு, ii. காட்டு வாத்து (நபிச்சமுர்த்தி), iii. நீலக்கடல், iv. ஜன்னல் (அப்பாஸ்).
- V. குறியீட்டியல்-** i. லெவல் கிராஸிங் (நாரணோ ஜெயராமன்), ii. என்வீட்டுப் பரண்பொருள் (தேவதர்சன்),
- VI. இருத்தலியவாதம்** - i. இல்லாமல் இருப்பது, ii. எல்லைகள், iii. ஸ்டேசன், iv. சுருதி, v. சந்தை, vi. பிரயாண அனுபவம், vii. வேறு (நகுலன்), viii. அனுபவம், ix. சாவு -1, x. காலம் தாழ்ந்த பின் வந்தவன், xi. மரம், xii. சாவு -2, xiii. இல்லாதது (க.நா.சு.).
- VII. மார்க்சியம்** - i. மலரும் சருகும் (டி.செல்வராஜ்).
- கூறு - 5 :** சமகாலத் தமிழிலக்கியச் சூழலில், மேலைதேய நவீன கோட்பாட்டு வரவுகள்:
- I. நவீனத்துவம்** - சீதைமார்ச் சீகைக்காய்த்துள் (சுந்தரராமசாமி).
- II. பின் நவீனத்துவம்** - வாள் உருவப்படும்முன் போர் முடிந்த கதை (மண்பூதம்), வா.மு.கோமு.
- III. சூழலியம்** - முன்பொரு காலத்தில் நூற்று எட்டுக் கிளிகள் இருந்தன (பிரேம்- ரமேஷ்)
- IV. மாந்திரிக எதார்த்தவாதம்** - டார்த்தினியம் (திசைகளின் நடுவே), (ஜெயமோகன்)
- V. பின்காலனித்துவம்** - காக்கா கதை (புலிப்பாணி ஜோதிடர் - கால பைரவன்)

#### பாடநூல்கள்

- i. டி.செல்வராஜ், மலரும் சருகும், சித்திரை நிலவு வெளியீடு, மதுரை - 1, முதற்பதிப்பு - செப்டம்பர் 2013.
- ii. பலவேறுபட்ட நூல்களுள் இருந்து தேர்ந்தெடுக்கப்பட்டிருக்கும் கோட்பாடுகள் குறித்த விளக்கப் பகுதிகள், சிறுகதைகள், கவிதைகள், நாடகம் ஆகியவற்றின் நகல்கள் அடங்கிய தொகுப்பு.

#### பார்வை நூல்கள்

1. நபிச்சமுத்து, இலக்கிய இயக்கங்கள், சக்தி புத்தக நிலையம், சென்னை - 05, மூன்றாம் பதிப்பு, ஏப்ரல் - 2006.
2. கோ.கேசவன், இயக்கமும் இலக்கியப் போக்குகளும், சென்னை புக் ஹவுஸ், சென்னை - 17, முதல் பதிப்பு -1982.
3. இ.எஸ்.டி.(தொ.ஆ.), இலக்கிய இசைங்கள், அன்னம் - அகரம் வெளியீடு, சிவகங்கை, முதற்பதிப்பு - 1994.
4. சிவ.மங்கையாக்கரசி, இலக்கிய இயக்கங்கள், நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை - 98, முதற்பதிப்பு - 2004.
5. அரங்க.சுப்பையா, இலக்கியத் திறனாய்வு - இசங்கள் - கொள்கைகள், பாவை பப்ளிகேசன்ஸ், சென்னை - 14, ஐந்தாம் பதிப்பு - 2007.
6. நபிச்சமுத்து, திறனாய்வும் தமிழிலக்கியக் கொள்கைகளும், சக்தி புத்தக நிலையம், சென்னை - 05, ஐந்தாம் பதிப்பு - 2002.
7. எம்.ஜி.சுரேஷ், இசைங்கள் ஆயிரம், மருதா, சென்னை - 14, முதல் பதிப்பு - 2005.
8. பொன்மணி, விமர்சன சிந்தனைகள், ஸ்ரீ செண்பகா பதிப்பகம், சென்னை - 17, முதல் பதிப்பு - 2002.
9. ஜெயமோகன், நவீன தமிழிலக்கிய அறிமுகம், கிழக்கு பதிப்பகம், சென்னை - 14, முதல் பதிப்பு - 2011.
10. இரா.சம்பத், புதுக்கவிதையில் இலக்கிய இயக்கம், உமா பதிப்பகம், புதுவை - 605004, முதல் பதிப்பு - 1992.
11. நோயல் இருதயராஜ், கோட்பாட்டு விமர்சனயுகம் - விமர்சனக் கோட்பாட்டுயுகம்: கலை - தத்துவம் பற்றிய பின்நவீனத்துவச் சொல்லாடல்கள், அடையாளம், திருச்சி - 621 310, முதல் பதிப்பு - 2013.
12. தமிழவன், தமிழ்க் கவிதையும் மொழிதல் கோட்பாடும், காவ்யா, பெங்களூர் - 560 038, முதல் பதிப்பு - டிசம்பர் 1992.

13. சு.சண்முக சுந்தரம் (தொ.ஆ.), புதுக்கவிதையும் புதுப் பிரக்களுயும், காவ்யா, பெங்களூர் - 38, முதற்பதிப்பு - 1985.
14. சி.செல்லப்பா, படைப்பியல், பீகாக் பதிப்பகம், சென்னை - 86, பதிப்பாண்டு - 1993.
15. நா.சாந்தா ஆப்தே, தமிழ்ச் சிறுகதைகளில் காந்தியத் தாக்கம், செந்தில் முருகன் வெளியீடு, மதுரை - 20, முதல் பதிப்பு - டிசம்பர்.1988.
16. சே.இராசேந்திரன், தமிழ்க் கவிதையில் திராவிட இயக்கத்தின் தாக்கம், பூமணி பப்ளிகேசன்ஸ், சென்னை - 39, முதல் பதிப்பு - 1985.
17. ஆ.ஜீவானந்தம், தமிழில் தலித் இலக்கியம், தி பார்க்கர், சென்னை - 14, முதற்பதிப்பு - 2002.
18. இரா.பிரேமா, பெண்ணியம் - அணுகுமுறைகள், தமிழ்ப் புத்தகாலயம், சென்னை, முதற்பதிப்பு - 1998.
19. ஏ.தீபா (தொ.ஆ.), பெண்மொழி வெளி, பரிசல் பதிப்பகம், சென்னை - 106, முதல் பதிப்பு - 2010.
20. எஸ்.வி.ராஜதுரை, எக்சிஸ்டென்ஸியலிசம், க்ரியா, சென்னை, முதற்பதிப்பு - 1975.
21. கோ.தான்யா, இருபதாம் நூற்றாண்டுத் தமிழ்க்கவிதைகளில் மார்க்சியக் கொள்கைகளின் தாக்கம், ஐந்திணைப் பதிப்பகம், சென்னை - 5, முதற்பதிப்பு - 1988.
22. அ.சஜன், நவீனத்துவம் - சுந்தரராமசாமியை முன்வைத்து..., காலசகம் பதிப்பகம், நாகர்கோவில் - 629002, முதற்பதிப்பு - 2006.
23. அ.மாரக்ஸ், பின் நவீனத்துவம் - இலக்கியம் - அரசியல், விடியல் பதிப்பகம், கோவை, முதற்பதிப்பு - 1996.
24. எம்.டி.முத்துக்குமாரசாமி, பிற்கால அமைப்பியலும் குறியியலும், தமிழ்த்துறை ஆய்வு மையம், தூய சுவேரியர் கல்லூரி, பாலையங்கோட்டை - 02, முதற்பதிப்பு - 1988.
25. பாலா, சார்ரியலிஸம், அன்னம் வெளியீடு, சிவகங்கை - 623 560, முதல்பதிப்பு - 1977.
26. ஜான் லீ ஆண்டர்சன் (நா.ஆ.), வீ.கே.பாலகிருஷ்ணன் (மொ.பெ.ஆ.), மார்க்சேசின் வாழ்க்கையிலிருந்து, நிழல் வெளியீடு, சென்னை - 78, முதல்பதிப்பு - 2002.
27. எம்.ஜி.சுரேஷ், பின்நவீனத்துவம் என்றால் என்ன?, அடையாளம் வெளியீடு, திருச்சி - 10, பதிப்பாண்டு - 2009.

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**TAM2526****நன்னூல் - சொல்லதிகாரம்****5Hrs/ 5 cr.****நோக்கம்:**

தமிழ்மொழியின் சொல்லிலக்கண இயல்புகளை விளக்கும் நன்னூல் சொல்லதிகாரத்தினை மாணவர்கள் பிழையின்றி அறிந்து, சமகால மொழிப்பயன்பாட்டைச் சரிவர செய்து கொள்ளும் வகையில், கற்பித்தல் இப்பாடத்தின் நோக்கமாகும்.

**அலகுகள்**

1. பெயரியல்: சொல்லின் இலக்கணம் - மூவகைமொழி-திணைபால் இடம் -வழக்கு,செய்யுள் - சொல் வகை-பெயர்ச்சொல்லின் இலக்கணம்,வகைகள் - வேற்றுமை,வேற்றுமைவகைகள் - வேற்றுமைமயக்கம். (258- 319ஆம் நூற்பாமுடிய).
2. வினையியல்: வினையின் இலக்கணம் - தெரிநிலை,குறிப்பு-முற்று,எச்சம் - இருதிணைப் பொதுவினை. - (320-351ஆம் நூற்பாமுடிய).
3. பொதுவியல்: ஒன்றொழிபொதுச்சொல் - பெயர்,வினைச் சொற்கள் உருபேற்கும் நிலை-தொகைநிலைத் தொடர்கள் - வழுவழுவுமைதி, வகைகள் - வினா,விடை, வகைகள் - பெயர் வருகைமுறை-பொருள்கோள்.(352 - 419ஆம் நூற்பாமுடிய).
4. இடையியல்: இடைச்சொற்கள் தொடரியல் நிலையில் பொருட் புலப்பாட்டிற்கு உதவும் தன்மை-இடைச்சொற்களின் வகைகள்: வேற்றுமை உருபுகள், வினையுருபுகள், சாரியை உருபுகள், உவம உருபுகள், தத்தம் பொருள் உணர்த்துவன, செய்யுளியை நிறைப்பவை, அசைநிலை, குறிப்புப்பொருள் உணர்த்துபவை.(420-441ஆம் நூற்பாமுடிய).
5. உரியியல்: உரிச்சொற்களின் தன்மை-உயிர்ப்பொருள்,உயிரல் பொருள் - இருவகைப் பொருட்களின் பண்புகள் - ஒருகுணம்,பலகுணம் குறித்தஉரிச்சொற்கள்.(442-462ஆம் நூற்பாமுடிய).

**பாடநூல்**

நன்னூல் சொல்லதிகாரம் மூலமும் விருத்தியுரையும், பொதுப்பதிப்பு சோம.இளவரசு,அண்ணாமலைப் பல்கலைக்கழகம், 1990.

**TAM 2428****திரைப்படக்கலை****4HRS/4CR**

நோக்கம் : 20ஆம்நூற்றாண்டின் இணையற்ற கலையான திரைப்படக்கலையைச் சுவைத்தலும், இலக்கியத்திற்கும் திரைப்படத்துக்குமான உறவைப் புரிந்து கொள்ளலும், இலக்கியத்திப்பிரதிகளைத் திரைப்படங்களாக மாற்றும் நுணுக்கங்களைக் கற்றுக் கொள்ளலும், கற்றுக் கொண்டவைகளை மனதில் கொண்டு ஒரு சிறுகதையைத் திரைக்கதையாக்கிப் பரிசோதித்துப் பார்த்தலும் இப்பாடத்தின் நோக்கங்களாகும்.

கூறு 1: திரைப்படக்கலையில் கலையும் செய்திறனும் தொழில்நுட்பமும் (Art-Craft Technology) இலக்கியத்திற்கும் திரைப்படத்திற்குமான உறவு - இலக்கியப் பிரதியிலிருந்து திரை வடிவத்திற்கான உருமாற்ற முறைமைகளும் நுணுக்கங்களும்.

கூறு 2: சிறுகதையிலிருந்து உருவான குறும்படங்கள் - மன்ட்டோவின் திற அசோகமித்ரனின் 'புலிக்கலைஞன்' பாலுமகேந்திராவின் கதை நேரத்திலிருந்து தேர்ந்தெடுக்கப்பட்ட 5 குறும்படங்கள்.

கூறு3: சிறுகதை மற்றும் நாவல்களை மூலங்களாகக் கொண்ட முழுநீள வணிகத் திரைப்படங்கள் - உமா சந்திரனின் முள்ளும் மலரும் (மகேந்திரனின் முள்ளும் மலரும்). தமிழ்ச்செல்வனின் வெயிலோடு போய் (சசியின் பு)

கூறு4: மாணவர்கள் குழுக்களாகப் பிரித்து அவர்களுக்குப் பிடித்த காட்சிப்படுத்தலுக்கு உகந்த சிறுகதைகளைத் தேர்ந்தெடுத்து திரைக்கதையாக்குவது.

கூறு5: திரைக்கதையாக்கிய பிரதியை குறும்படமாக்கும் முயற்சியில் ஈடுபடுவது.

இப்பாடம் திரைப்படக்கலைக்கு தேவையான திறன்களைக் கற்றுத் தேர்வதாக இருப்பதால் இதன் அகமதிப்பீட்டுத் தேர்வுகள் 50% தேர்வாகவும் 50% செய்முறையாகவும் அமையும். குழுக்களாக மாணவர்கள் தயாரித்து அளிக்கும் குறும்படங்கள் புறமதிப்பீட்டுத் தேர்வுக்கான படைப்புக்களாகக் கொள்ளப்படும் என்பதால் புறமதிப்பீட்டுத் தேர்வு 100%செய்முறைத் தேர்வாக அமையும்.

பரிந்துரை நூல்கள்

1. Sretilak.S., First Edition Fiction in Films, Films in Fiction. 2007 Vinod Vasishtah
2. Katz st., Film Directing Short by shot, 1991 Michel Wiese Productions
3. சிவகுமார், சினிமா ஓர் அற்புத மொழி 1989 சவுத் விஷன் வெளியீடு
4. பிரபாகர் ஆர். சினிமா ஓர் அறிமுகம் 2006, கனவுப்பட்டறை

**TAM2430****சித்தர் நெறி****5 Hrs /4 Credits**

**நோக்கம் :** சித்தர் பாடல்களை வகைப்படுத்தி அறிமுகப்படுத்துதல், அவற்றின்வழி சித்தர்களின் பன்முகப் பல்துறை அறிவை வெளிப்படுத்துதல், அவர்களின் ஒற்றை இலக்கான மெய்ப்பொருளை இனம் காட்டுதல், அதை அடையும் தடைகளைத் தவிர்க்க வேண்டுதல், சமூக இழிநிலைகளைச் சாடுதல், அன்னபிறவும் எடுத்துரைத்தல் இப்பாடத்தின் நோக்கமாகும்.

**கூறு 1:** அடிப்படைத் தத்துவம் : அண்டம் பிண்டம் (ஐம்பூதங்கள்) - மனித உயிர் மேம்பாடு - தன்னையறிதல் - இறைவயமாதல் - சித்தர் சொன்மை, பொருண்மை விளக்கம் - எண்ணிக்கை, வகை - வரலாறு - பாடல்களின் வகைகள் - பல்துறை அறிவு - உறுதிமெய்ப்பொருள்.

**கூறு 2:** பன்முகப் பல்துறை அறிவு : மருத்துவவியல் - அண்டவியல் - வேதியல் - தாவரவியல் - விலங்கியல் - உளவியல் - சமூகவியல் - சோதிடவியல் - இரசவாதவியல், அன்னபிற துறைகளில் ஈடுபட்ட நிலைகள்.

**கூறு 3:** மருத்துவ முறை : உடம்பை வளர்த்து உயிர் வளர்த்தல் - உடலியல் - நோய் எண்ணிக்கை - வகை - நோயறியும் முறை - நோய் தீர்க்கும் அக, புற மருந்து வகை - அதன் அமைவு முறை - மூலிகை முதல் செந்தூரம் வரையிலான மருந்துகள் - அன்ன பிறவும்.

**கூறு 4:** யோகம் - விளக்கம் - எண்வகை யோகங்கள் - பத்துவகைக் காற்றுகள் - பத்துவகை நாடிகள் - ஆறு ஆதாரங்கள் - அவை செயல்படும் முறை - விளக்கம் - குண்டலி யோகம் - ஆதனம் - முத்திரைகள் துணைநிறைவு - உறுதிமெய்ப்பொருள் அறிதல் - எண்வகைக் சித்துக்களைப் பெறுதல் - ஞான நிலையை அடைதல்.

**கூறு 5:** சித்தர் குறித்த பதிவுகளை மதிப்பிடுதல் : தலம் - கோயில் - கடவுள் - உருவ வழிபாடு - புனிதநீர் - வேள்வி - பூசை - சடங்குகள் - புராணம் - சாத்திரம் - சாதி, மத, இன, பால்வேறுபாடுகள் - தீண்டாமை - மூடநம்பிக்கைகள் - பெண் - குறியீட்டு மொழி - உயர்சாதி எதிர்ப்பு - நாத்திகம் அன்னபிறவும் சாடுதலை ஆழ்ந்து அகன்று, நுணுகித் திறனாய்தல்.

**பாடநூல் :**

1. ராமநாதன், அரு.(பதி.), சித்தர் பெரிய ஞானக் கோவை என வழங்கும் சித்தர் பாடல்கள், பிரேமா பிரசுரம், சென்னை, நான்காம் பதிப்பு, 1984.

#### **பார்வை நூல்கள்**

1. கமலக்கண்ணன், பா., சித்தர் தத்துவம், வானதி பதிப்பகம், சென்னை, மூன்றாம் பதிப்பு - 2010.
2. குப்புசாமி முதலியார், க.நா., சித்த மருத்துவம், தொகுதி ஒன்று, அரசு அச்சகம், சென்னை, 1954.
3. கோவேந்தன், த., சித்தர் பாடல்கள், பூம்புகார் பிரசுரம், சென்னை, 1976.
4. சிதம்பரனார், சாமி., சித்தர்கள் கண்ட விஞ்ஞானம் தத்துவம், இலக்கிய நிலையம், சென்னை, நான்காம் பதிப்பு 1974.
5. சோமு, மீ.ப., சித்தர் இலக்கியம், மூன்று தொகுதிகள், அண்ணாமலை நகர், அண்ணாமலைப் பல்கலைக்கழகம், 1988.
6. நாராயணன், க., சித்தர் தத்துவம், தமிழ்ப்புத்தகாலயம், சென்னை, 1985.
7. பசுபதி, K.R., சித்தர்கள், புதுப்புனல் பதிப்பகம், திருச்சி, 1963.
8. மாணிக்கவாசகம், இரா., நம்நாட்டுச் சித்தர்கள், அன்னை அபிராமி அருள், சென்னை, 1982.
9. ராமச்சந்திரன், எஸ்.பி.(பதி.), யோக ஞான சாஸ்திரத்திரட்டு, ஒன்பது தொகுதிகள், தாமரை நூலகம், சென்னை, 1995.
10. Arunachalam, M., The Siddha Culture in Tamilnadu, Bulletin of the Institute of Traditional Cultures, University of Madras, Madras, 1977.
11. Ganapathy, T.N., The Philosophy of the Tamil Siddhas, Indian Council of Philosophical Research, New Delhi, 1993.
12. Zvebil Kamil, V., The Poets of the Powers, Rida & Co, London, 1973.

**Undergraduate Department of English**  
**Programme for BA English from 2015 series**

Sem.	Part		Code	Title	Hr/ Wk	Cr.	Marks
<b>I</b>	Part I		TAM/FRE/HIN		3	2	30
	Part II		ENG 1201	Conversational Skills	3	2	30
	Part III Major	Core	ENG 1461	Prose I:	4	4	60
			ENG 1463	Short Story	4	4	60
			ENG 1565	One Act Play	5	5	75
		Supportive	ENG 1467	Literary Terms and Forms	5	4	60
	Part IV	Non-Maj. Elect.	TAM / ENG 1221	Basic Tamil / Advance Tamil / Film Appreciation	3	2	30
		Life Skill I	ENG 1223 ENG 1225	Word Power/ Pronunciation Skills	3	2	30
				<b>Total</b>	<b>30</b>	<b>25</b>	<b>375</b>
<b>II</b>	<b>Part I</b>		<b>TAM/FRE/HIN</b>		3	2	30
	Part II		ENG 1202	Reading & Writing Skills	3	2	30
	Part III Major	Core	ENG 1562	Poetry I: Chaucer to Arnold	5	5	75
			ENG 1464	Fiction I:	4	4	60
			ENG 1466	Drama I: Elizabethan to Augustan	4	4	60
		Supportive	ENG 1468	History of English Literature	5	4	60
	Part IV	Non-Maj. Elect.	TAM / ENG 1222	Basic Tamil / Advance Tamil / Science Fiction	3	2	30
		Life Skill II	ENG 1224	Spoken English	3	2	30
	Part V	Extension	XXX 0000	Extension Activity (PED/NSS/NCC/SLP)	2	1	
				<b>Total</b>	<b>30+2</b>	<b>25+1</b>	<b>375</b>
<b>III</b>	<b>Part I</b>		<b>TAM/FRE/HIN</b>		3	2	30
	Part II		ENG 2201	Study Skills	3	2	30
	Part III Major	Core	ENG 2561	Indian Literature in English	5	5	75
			ENG 2563	Poetry II: Modern English Poetry	5	5	75
			ENG 2565	Drama II: Modern British Drama	5	5	75
			ENG 2467	Fiction II:	4	4	60
		Supportive	ENG 2469	Critical Reading & Writing	5	4	60
			<b>Total</b>		<b>30</b>	<b>27</b>	<b>405</b>

Sem.	Part		Code	Title	Hr/ Wk	Cr.	Marks
<b>IV</b>	<b>Part I</b>		<b>TAM/FRE/HIN</b>		3	2	30
	Part II		ENG 2202	Career Skills	3	2	30
	Part III Major	Core	ENG 2562	American Literature	5	5	75
			ENG 2564	Translation	5	5	75
			ENG 2566	Prose II:	4	4	60
		Innovative	ENG 2568	21 <sup>st</sup> Century Bookers	5	5	75
		Supportive	ENG 2470	Modern Grammar & Usage	5	4	60
	Part V	Extension		Extension Activity (NSS/NCC/SLP)	2	1	
<b>Total</b>					<b>30+2</b>	<b>27+1</b>	<b>405</b>
<b>V</b>	III	Core	ENG 3671	New Literatures in English	6	6	90
			ENG 3673	Literary Criticism	6	6	90
			ENG 3675	Fiction III:	6	6	90
		Innovative	ENG 3577	English and Media	5	5	75
	IV	Life Skill III	ENG 3279	Creative English	3	2	30
	IV	VAL	XXX xxxx	Value Education	4	2	30
<b>Total</b>					<b>30</b>	<b>27</b>	<b>405</b>
<b>VI</b>	III	Core	ENG 3672	Introduction to Modern Linguistics	6	6	90
			ENG 3674	Contemporary English Literature	6	6	90
			ENG 3676	English Language Education	6	6	90
		Innovative	ENG 3578	Film and Literature	5	5	75
	IV	EVS	ENG 3200	Environmental Studies & Literature	4	2	30
	IV	Life Skill IV	ENG 3280	English for Competitive Exams	3	2	30
<b>Total</b>					<b>30</b>	<b>27</b>	<b>405</b>
<b>Grand Total for semesters I-VI</b>					<b>180+4</b>	<b>158+2</b>	<b>2370</b>



**Life Skills Courses**

SEM	Course No	Course Title	Hrs/Wk	Cr	Marks
I	ENG 1223	Word Power/Pronunciation Skills	3	2	30
II	ENG 1224	Spoken English	3	2	30
V	ENG 3279	Creative English	3	2	30
VI	ENG 3280	English for Competitive Exams	3	2	30
<b>Total</b>			<b>12</b>	<b>8</b>	<b>120</b>

**Non-Major Electives**

SEM	Course No	Course Title	Hrs/Wk	Cr	Marks
I	ENG 1221	Film Appreciation	3	2	30
II	ENG 1222	Science Fiction	3	2	30
<b>Total</b>			<b>6</b>	<b>4</b>	<b>60</b>

**Self-Supportive Courses**

Sem	Code	Title	Hrs	Cr	Marks
I	ENG 1467	Literary Terms & Forms	5	4	60
II	ENG 1468	History of English Literature	5	4	60
III	ENG 2469	Critical Reading & Writing	5	4	60
IV	ENG 2470	Modern Grammar & Usage	5	4	60
			<b>20</b>	<b>16</b>	<b>240</b>

### Internal and External Evaluation Pattern

#### 1. Poetry & Drama

- i. Annotation with three specific questions:  $4/7 \times 5 (1+2+2) = 20$
- ii. Paragraph  $5/7 \times 6 = 30$
- iii. Essay  $5/7 \times 10 = 50$

#### 2. Prose & Fiction, Linguistics, Survey, Literary Forms & Terms, ELE, Criticism

- i. Short Answer Questions  $10 \times 2 = 20$  OR Multiple Choice
- ii. Paragraph  $5/7 \times 6 = 30$
- iii. Essay  $5/7 \times 10 = 50$

#### 3. Three hour courses of two hour exam duration

- i. Short answer questions  $10 \times 2 = 20$
- ii. Paragraph  $2/3 \times 5 = 10$
- iii. Essay  $3/5 \times 10 = 30$

#### 4. Conversational Skills, Spoken English, Pronunciation Skills

100% Oral

#### 5. Word Power & English for Competitive Exams

Different types of objective questions such as match-the-following, mcq, fill-in-the-blanks, rewrite-the-following...

#### 6. Creative Writing

Questions on application and creativity can be asked.

#### 7. National Literatures

- i. Annotations from poetry & drama with three specific questions:  $4/7 \times 5 (1+2+2) = 20$
- ii. Short answer questions from Prose & fiction  $10 \times 2 = 20$
- iii. Paragraph  $4/7 \times 5 = 20$
- iv. Essay  $4/7 \times 10 = 40$

Internal and External Examiners are expected to set both objective and descriptive questions that test students' knowledge, comprehension, application, analysis, evaluation, and creativity.

**ENG 2201****Study Skills**

3 Hrs/2 Crs

The third sequential General English Course aims at empowering second year undergraduate students with study skills necessary to continue their chosen major disciplines. The course assumes importance in the context of students lacking study skills and strategies for academic success.

At the end of the course, students shall be able to

- i. develop healthy study habits and improve homework habits
- ii. fine tune their academic skills
- iii. apply time management skills
- iv. understand psychological traits
- v. use ICT skills

**Unit 1            General**

Definition & scope of study skills, their needs, learning styles, study habits, homework habits, and strategies to improve study skills

**Unit 2            Academic Skills**

Effective, active listening, effective reading strategies & essay writing, note taking & making, summarizing, paraphrasing, information transfer, library skills, and dictionary skills

**Unit 3            Time Management**

Motivation & success, choosing study partners, creation of study space, barrier to time management, strategies to overcome barriers, punctuality & time management, time management during exam

**Unit 4            Psychological Traits**

Concentration skills, memory, remembering, stress management, coping with test anxiety, critical thinking

**Unit 5            ICT**

ICT skills, computer literacy skills at basic, intermediate and advanced levels

**Textbook**

Sekar, J.J. 2015. **Study Skills**. Madurai: Department of English, The American College

**ENG 2561****Indian Literature in English**

5 hrs/5 Cr

The purpose of the course is to provide an awareness of the historical, cultural and literary heritage of India as reflected in Indian Literature in English. This course also aims to throw light on Indian diasporic literature through references to diasporic writings and their works making the study of Indian Literature in English holistic. Through different literary genres, students will have aesthetic appreciation of their literature and a sense of pride of their country. Texts that reflect India's cultural heritage and contemporary social and political situations will be referred to for critical analysis.

At the end of the course students will be able to

1. understand the history of Indian Literature in English.
2. differentiate the characteristics between post and pre-independence Indian Literature.
3. relate instances and reflections in the texts to relevant issues in the society.
4. read and appreciate India's cultural heritage.
5. analyse the prescribed texts and write critical appreciation.

<b>Unit 1</b>	<b>Poetry</b>	
	Toru Dutt	Laxman
	Kamala Das	Introduction
	Nissim Ezekiel	A poem of Dedication
	Jayanta Mahapatra	Hunger
	A. K. Ramanujan	Anxiety
	Keki N Daruwalla	The Unrest of Desire
<b>Unit 2</b>	<b>Short Story</b>	
	Rabindranath Tagore	The Postmaster
	R. K. Narayan	A Horse and Two Goats
	Ruskin Bond	Night Train at Deoli
	Meher Pestonji	Outsider
<b>Unit 3</b>	<b>Novel</b>	
	Easterine Kire	When the River Sleeps
	Manju Kapur	The Immigrant
<b>Unit 4</b>	<b>Drama</b>	
	Girish Karnad	Tughlaq
<b>Unit 5</b>	<b>Essay</b>	
	Amartiya Sen	Poverty, Evil & Crime
	Arundhati Roy	The End of Imagination
<b>Self Study</b>		
	Manju Kapur	The Immigrant

**ENG 2563**

**Poetry II: Modern British Poetry**

**5Hrs / 5 Credits**

The aim of the course is to enhance the level of thinking of students to such a degree that they can interact with poems from Modern Age of English literature, understand and appreciate the different genres of poetry.

At the end of this course, students will be able to

- i. learn the basic themes of the Modern poetry and understand the Modern Literary and social Movements
- ii. read and analyze the high diction, sublime poetry of the premier craftsmen of this period
- iii. explicate the highly intellectualized modern poetry and will appreciate the strange imagery, and the complicated thought
- iv. understand and appreciate a new kind of poetry that introduced new form and style, and

- v. explore more realistic modern poems which focused on the best practices of poets in earlier period and other cultures

**Unit 1**

Thomas Hardy	Man he killed
W.B. Yeats	Among School Children
William Earnest Henley	Black Bird
Dylan Thomas	Do not go gentle into that good night
Ezra Pound	A Pact

**Unit 2**

W H. Auden	In memory of W.B Yeats
D.H. Lawrence	A spiritual woman
Wilfred Owen	Strange Meeting
Edward Thomas	When I first Came Here
Mina Loy	Human Cylinders

**Unit 3**

G.K Chesterton	A Prayer in Darkness
T.S. Eliot	The Love Song of J Alfred Prufrock
Gerard Manly Hopkins	Easter communion
A.E. Houseman	Along the field as we came by
Rudyard Kipling	The Betrothed

**Unit 4**

Wilfred Wilson Gibson	Prelude
James Joyce	I Hear an Army
Robert Graves	The Last Poet
John Drinkwater	A Town Window
Philip Larkin	Church Going

**Unit 5**

John Mansfield	On growing old
Cecil Day-Lewis	In the Heart of Contemplation
Sir John Betjeman	A Subaltern's Love Song
Ted Hughes	Hawk Roosting
Carol Ann Duffy	Valentine

**Self Study**

1. William Earnest Henley	Black Bird
2. Mina Loy	Human Cylinders
3. Gerard Manly Hopkins	Easter communion
4. John Drinkwater	A Town Window
5. Sir John Betjeman	A Subaltern's Love Song

**Sources**

Wain, John. *Anthology of Modern Poetry*. London: Hutchinson, 1963. Print.

Ellmann, Richard, and Robert O'Clair. *The Norton Anthology of Modern Poetry*. New York: Norton, 1973. Print.

<http://www.bartleby.com/40/index1.html>

[www.poetryfoundation.org/](http://www.poetryfoundation.org/)

**ENG 2565****Drama II: Modern British Drama****5 Hrs./5 Cr.**

This course traces the development of modern drama in the context of 20<sup>th</sup> century British literature. Students are exposed to British society, tradition, culture and language. It highlights how modern dramatists integrated in their setting realistic, naturalistic and absurd elements in their attempt at characterising humankind. The course will emphasize the significant themes, dialogues and the theatre forms by prominent playwrights of the modern era.

At the end of the course, students shall be able to

- i. develop a multilayered understanding of the society, culture, political and artistic milieu of the play and playwright
- ii. understand how exposition, conflicts, climax and denouement or the lack of them are effectively used by the playwright
- iii. analyze how comedy, absurd and farce are treated to comment on the society
- iv. understand how the settings and stage directions are crucial in the plot development
- v. appreciate the concept of vision and performance

**Unit 1 Satire**

George Bernard Shaw

Pygmalion**Unit 2 Absurd Drama**

Samuel Beckett

Waiting for Godot**Unit 3 Realistic Drama**

John Osborne

Look Back in Anger**Unit 4 Comedy of Menace**

Harold Pinter

The Birthday Party**Unit 5 Farce**

Joe Orton

Loot**Self Study**

George Bernard Shaw

Pygmalion**References**

Griffiths, Stuart. *How Plays Are Made*. Oxford: Heinemann Educational Books, 1982.

Esslin, Martin. *The Theatre of the Absurd*. London: Penguin Books, 1976.

Watson, G.J. *Drama: An Introduction*. London: Macmillan, 1983.

Esslin, Martin. *The Field of Drama*. London: Methuen, 1987.

**ENG 2467****Fiction II: 19<sup>th</sup> Century British Fiction****4 Hrs/4 Cr**

Second, in a sequence of three courses on British Fiction, this course will explore the way novel as a genre, in England developed during the 19<sup>th</sup> century British context. Women writers writing with male pseudonyms played a vital role in the popularity and the development of fiction in the 19<sup>th</sup> century. This was also a period that witnessed serialization of fiction. Though the realist mode was predominant, other narrative modes were adopted by writers of this period. This course will attempt to highlight the important thematic and formal traditions of fiction writing during this century.

At the end of the course, students shall be able to

- i. understand the various narrative styles adopted by a range of authors– omniscient narrator, multiple plot, round and flat characters, description and exposition.
- ii. compare different narrative modes and to learn different types of novels– historical, Romance, social, realist, domestic, provincial, gothic, bildungsroman and the fluctuating borderline among them.
- iii. analyse the thematic concerns such as male-female gender roles, history and politics, class and industrialisation, religion and sexuality
- iv. develop the technique of close reading.

**Unit 1: Domestic**

Jane Austen                      **Mansfield Park** (1814)

**Unit 2: Historical**

Sir Walter Scott              **Ivanhoe** (1819)

**Unit 3: Social**

Charles Dickens              **Oliver Twist** (1838)

**Unit 4: Gothic**

Charlotte Bronte              **Jane Eyre** (1847)

**Unit 5: Didactic**

George Eliot                      **Silas Marner** (1861)

**Self Study**

Charles Dickens              **Oliver Twist**

**References**

Watt, Ian. **The Victorian Novel: Modern Essays in Criticism**. New York: OUP, 1976.

Wheeler, Michael. **English Fiction of the Victorian Period: 1830-1890**. London and New York: Longman, 1985.

**ENG 2469**

**Critical reading And Writing**

Crs. 5 Hrs. 5

Critical reading does not mean being critical about some idea or argument or some writing. On the other hand, it means engaging oneself in what they are reading by asking themselves questions like “What is the author trying to say?” or “What is the main argument being presented?” It therefore involves presenting a reasoned argument that evaluates and analyses what they have read. The course aims at enabling students to advance their own understanding of literary texts and articulating their responses orally and in writing, not dismissing and therefore closing off learning.

Students shall be able to

- i. understand the links between ideas, determining the importance & relevance of arguments & ideas
- ii. recognize, build, and apprise arguments, identify inconsistencies & errors in reasoning
- iii. approach problems in a consistent & systematic way, reflect on justification of their own assumptions, beliefs, and values,

- iv. achieve fluency (generating ideas), flexibility (shifting perspectives easily), originality (conceiving of something new), and elaboration (building on other ideas).
- v. to reflect on interpretations of the text by scrutinizing the style and structure of the text, the language, and the content

**Unit 1**

Ernst Hemingway	Hills Like White elephants A Clean Well-Lighted Place
Guy de Maupassant	The Necklace
O. Henry	The Cop and the Anthem

**Unit 2**

James Joyce	Araby
Stephen Crane	The Open Boat
Jamaica Kincaid	What I have been Doing Lately
N.S. Madhavan	When the Big Tree Falls
Jhumpa Lahiri	Interpreter of Maladies

**Unit 3**

James Baldwin	Sonny's Blues
Ambai	My Mother, Her Crime
D.H. Lawrence	Horse Dealer's Daughter
Kate Chopin	Story of an Hour

**Unit 4**

Anton Chekov	The Bear: A Joke in One Act, or The Boor
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**Unit 5**

H.G. Wells	The Invisible man
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**Self study**

H.G. Wells	The Invisible Man
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**ENG 2202****Career Skills****3 Hrs. / 2 Cr.**

The fourth sequential General English Course aims at empowering second year undergraduate students with communication & cognitive skills and personality traits necessary to empower their career skills. The course assumes importance in the context of students lacking career skills and strategies for successful profession.

At the end of the course students will be able to

- i. develop communication skills
- ii. acquire the interview skills
- iii. improve cognitive skills
- iv. enhance thinking skills
- v. master personal traits

**Unit 1****Communication Skills**

Active Listening & speaking, written & oral communication



**Unit 2 Interview Skills**

Interview questions, job application, CV preparation, self-introduction, presentation skills, negotiation skills, conducting a meeting, agenda setting, recording minutes

**Unit 3 Cognitive Skills**

Self motivation, setting personal goals, problem solving, decision making, delegation

**Unit 4 Thinking Skills**

Strategic thinking, organization, innovation, leadership skills

**Unit 5 Personal Traits Skills**

Personal development & empowerment, confidence & rapport building, tact & diplomacy, emotional intelligence, self-esteem, humour and persuasion skills

**Textbook**

Sekar, J.J. 2015. **Career Skills**. Madurai: Department of English, The American College.

**ENG 2562****American Literature****5 Hrs. / 5 Cr**

This course intends to introduce students to the various literary genres of American Literature from both 19 and 20 Centuries. The text chosen for study will reflect the changing dimensions of American society from the days of American Dream through Transcendentalism to the post World War development era.

On completion of the course, students shall be able to

- i. appreciate the social, cultural, and historical development of both 19 and 20 centuries
- ii. critically appreciate American poetry
- iii. analyze thematic organization of the prose works
- iv. explore salient features of American fiction
- v. develop a critical perspective towards drama

**Unit 1 History of American Literature**

Colonization, Revolution, Transcendentalism, Naturalism, and Modernism

**Unit 2 Poetry**

Ralph Waldo Emerson	“Brahma”
Edgar Allan Poe	“The Raven”
Walt Whitman	“When Lilacs Last in the Dooryard Bloom’d”
Emily Dickinson	“Because I Could not Stop for Death”
Robert Frost	“Stopping by Woods on a Snowy Evening”
Carl Sandburg	“Chicago”
e.e. cummings	“Buffalo Bills”
William Carlos Williams	“Red Wheel Barrow”

**Unit 3 Prose**

Henry David Thoreau	“Where I Lived and What I Lived For”
William Faulkner	“Nobel Prize Acceptance Speech”

**Unit 4 Fiction**

Nathaniel Hawthorne	“Young Goodman Brown”
Ernest Hemingway	“Sun Also Rises”

<b>Unit 5</b>	<b>Drama</b>	
	Tennessee Williams	<i>The Glass Menagerie</i>
	Eugene O’Neil	<i>The Hairy Ape</i>

**Self Study**

Robert Frost	“Stopping by Woods on a Snowy Evening”
William Faulkner	“Nobel Prize Acceptance Speech”
Ernest Hemingway	“Sun Also Rises”

**Reference**

Cunliffe, Marcus. *The Literature of the United States*. Suffolk: Penguin, 1970.  
 Fisher, William J. *American Literature of Ninetieth Century: An Anthology*. New Delhi: Eurasia Publisher, 1984  
 Hart, James D. *The Oxford Companion to American Literature*. New York: OUP, 1995.  
 Oliver, Egbert S. *American Literature 1890 – 1965: An Anthology*. New Delhi: Eurasia Publisher, 1986.

**ENG 2564****Translation**

5Hrs./5Cr.

The course will trace the history of translation and its significance. A basic knowledge on theories of translation will be given focusing more on practice. It will also enable students to analyse different problems of translation and find solution to the problems by applying different translation theories, techniques and methods. The course will train students to become skilled translators.

At the end of the course students will able to

1. understand the significance and the importance of translation as an art and craft
2. acquire a knowledge on theories of translation
3. acquire a knowledge of different translation techniques and methods
4. learn to identify the problems of translation and solve them, and
5. develop the skill of a professional translator in the fields like Journalism & Mass Communication, Public Administration and Science & Technology.

**Unit 1** Translation- Definition and Significance

**Unit 2** Theories on Translation-Early Theories by theorists like Homer, Cicero, Dryden, Shelley, Matthew Arnold and Alexander Pope -Modern Theories of Edward Fitzgerald, Eugene Nida, George Steiner, and Theodore Savory

**Unit 3** Methods of Translation- Various methods of translation like metaphrase, paraphrase, transliteration, transcreation, and transference

**Unit 4** Practice of Translation -students will be trained to translate passages from English to Tamil and vice-versa.

**Unit 5** Problems in Translation- Cultural and Linguistic untranslatability, problems encountered in translating different literary genres and solutions found.

**Self Study** The students shall practise translating literary and non literary texts and other articles.

### Reference

Bassnet, Susan Mcguire. **Translation Studies**. London: Routledge,1998.

Bassnet,Susan Mcguire and Harish Trivedi. **Post-Colonial Translation: Theory and Practice**. London: Routledge,2000

## ENG2566

## Prose II

4Hrs./4 Cr.

This course aims to introduce students to the various modes of prose writing with a view to enabling them to distinguish and identify the characteristics specific to each mode.

At the end of the course, student shall be able to

- i. read and analyse a variety of prose writings using appropriate literary strategies
- ii. comprehend and appreciate different prose styles and different forms of prose- descriptive, narrative, epistolary etc .
- iii. develop their critical thinking ability and respond in relation to their socio- historic and cultural contexts.
- iv. identify the specificities of prose writing and to write prose in as many different modes as possible
- v. apply the acquired prose styles to their academic writing

### Unit 1

E.V. Lucas	A funeral Bores
A.G. Gardiner	On Superstitions On Shaking Hands

### Unit 2

G.K. Chesterton	On the Pleasures of No Longer Being Young The Worship of the Wealthy
E.M. Forster	My Wood What I believe

### Unit 3

Aldous Huxley	Pleasures The Beauty Industry
Hillaire Bellock	The Idea of Pilgrimage On Spellings

### Unit 4

Robert Lynd	On Good Resolutions A Disappointed Man In Praise of Mistakes
J.B. Priestly	On Getting off to Sleep On Doing Nothing

**Unit 5**

Stephen Leacock  
Harold Pinter

The Ideal College  
Art, Truth & Politics (excerpts from the  
Nobel lecture)

**Self Study**

Bores, My Wood, Pleasures, A Disappointed Man, Art, Truth & Politics (excerpts from the Nobel lecture)

**References**

Muthiah, V.S. *Modern Prose Selections*. Madras: B.I. Publications, 1976

Susanta, K. Sinha ed. *English Essayists*. Oxford: Oxford University Press, 1987.

Boulton, Majorie. *The Anatomy of Prose*. New Delhi: Kalyani Publishers, 1993.

**ENG 2568****21<sup>st</sup> Century Bookers**

5 Hrs./5 Cr.

The course introduces novels from commonwealth countries that have won Booker Prize in the present century. It exposes students to the nature of fiction that originates from different geographical locations and from authors who are shaped by the history, culture and the tradition of the particular locale. The novels and the politics of the prize further showcase how these transcend boundaries and become a commentary on the politics of such prizes.

On completion of the course, students will be able to

- i. understand the history of booker prize and the underlying politics in awarding the prize
- ii. inculcate love for creative writers/their writings
- iii. analyse the contemporary society in the globalised world and the depiction of the same by authors from various commonwealth countries
- iv. differentiate novels on the basis of crime, fantasy, humour, tragedy and history
- v. appreciate how emotional, physical and contemporary issues that affect humankind are treated effectively by the novelists

**Unit 1****Booker Discourse**

Traces the history of the prize, selection criteria, reception of the prize winner, and politics of Booker prize and the subsequent change in the nomenclature of the prize to Man Booker

**Unit 2****Crime**

Peter Carey True History of the Kelly Gang

**Unit 3****Fantasy/Adventure**

Yann Martel Life of Pi

**Unit 4****Dark Humour**

Aravind Adiga The White Tiger

**Unit 5****Reviews**

Analysis of critical reviews and student responses

**Self Study**

Yann Martel Life of Pi

## References

- Boulton, Marjorie. *The Anatomy of the Novel*. London: Routledge and Kegan, 1984.  
 Forster, E.M. *Aspects of the Novel*. London: Edward Arnold, 1927.  
 Narasimhaiah, C.D. (ed.). *Commonwealth Literature*. Delhi: Oxford University Press. 1976.  
 Booth, C. Wayne. *The Rhetoric of Fiction*. Chicago: University of Chicago Press, 1961.

## ENG 2470

## Modern Grammar and Usage

5 Hrs./4 Cr

The course is designed to provide students an understanding of the structure, pattern and usage of modern English grammar. The course would focus on motivating students to express themselves in correct English. It would aim at strengthening students' ability to express and write clearly and concisely. Further, it intends to motivate students in expressing their ideas and experiences in various forms of literature.

At the end of the course students will be able to

- i. develop a strong theoretical understanding on Modern Grammar
- ii. internalize an understanding of Modern English grammar and usage.
- iii. demonstrate free use of expressions in writing
- iv. try advanced forms of writing.

### Unit 1

#### Basics—Parts of Speech

Nouns, Articles, Pronouns, Adjectives, Adverbs, prepositions, Conjunctions, interjections, Forms of Be, Tenses, Reported speech, and their usage.

### Unit 2

#### Syntax

Sentence, phrase, clauses - structure, coordination and subordination

### Unit 3

#### Usage Issues in Modern English Grammar

Punctuation, verb forms, Subject-verb agreement, Pronoun-Antecedent agreement, Auxiliaries, Adjective-Adverb Confusions

### Unit 4

#### Common Errors in English

Dangling construction, Parallel construction, American vs. British, Errors in common expressions, Errors by Non-Native students

### Unit 5

#### Style and composition

Emphasis, Clarity, Concision and Consistency, Forms of writing

## Textbook

- Green, David.. 2014. **Contemporary English Grammar—Structures and Composition**. Hyderabad: Macmillan  
 Narayanaswamy, K. R. 2003. **Success with Grammar and Composition**. Hyderabad: Orient Longman

## Undergraduate Department of Mathematics

## Program for B.Sc. Degree in Mathematics - CBCS -2015-16

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	I	XXX xxxx	TAM/FRE/HIN	3	2	30
1	II	ENG xxxx	Conversational Skills	3	2	30
1	III M	MAT 1511	Classical Algebra	5	5	75
1	III M	MAT 1411	Analytical Geometry -3D	4	4	60
1	III M	MAT 1413	Differential Calculus	4	4	60
1	III S	MAT 1421	Programming in C	5	4	60
1	IV LS	XXX xxxx	Life Skill - I	3	2	30
1	IV NME	XXX xxxx	Non-major Elective - I	3	2	30
<b>Total</b>				<b>30</b>	<b>25</b>	<b>375</b>
2	I	XXX xxxx	TAM/FRE/HIN	3	2	30
2	II	ENG xxxx	Reading & Writing Skills	3	2	30
2	III M	MAT 1512	Algebra- I	5	5	75
2	III M	MAT 1412	Analysis -I	4	4	60
2	III M	MAT 1414	Integral Calculus	4	4	60
2	III S	MAT 1422	Object Oriented Programming in C++	5	4	60
2	IV LS	XXX xxxx	Life Skill - II	3	2	30
2	IV NME	XXX xxxx	Non-major Elective - II	3	2	30
2	V	XXX xxxx	Ext. Activity NCA/NCN/ NSS/PED/SLP		1	15
<b>Total</b>				<b>30</b>	<b>26</b>	<b>390</b>
3	I	XXX xxxx	TAM/FRE/HIN	3	2	30
3	II	ENG xxxx	Study Skills	3	2	30
3	III M	MAT 2511	Algebra -II	5	5	75
3	III M	MAT 2513	Analysis -II	5	5	75
3	III M	MAT 2515	Differential Equations	5	5	75
3	III M	MAT 2411	Statistics- I	4	4	60
3	III S	PHY xxxx	Physics for Mathematics -I	5	4	60
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
4	I	XXX xxxx	TAM/FRE/HIN	3	2	30
4	II	ENG xxxx	Career Skills	3	2	30
4	III M	MAT 2512	Algebra- III	5	5	75
4	III M	MAT 2514	Analysis- III	5	5	75
4	III M	MAT 2516	Vector Calculus & Trigonometry	5	5	75
4	III M	MAT 2412	Statistics- II	4	4	60
4	III S	PHY xxxx	Physics for Mathematics - II	5	4	60
4	V	XXX xxxx	Ext. Activity NCA/NCN NSS/PED/SLP		1	15
<b>Total</b>				<b>30</b>	<b>28</b>	<b>420</b>

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
5	III M	MAT 3611	Mechanics	6	6	90
5	III M	MAT 3613	Graph Theory	6	6	90
5	III M	MAT 3615	Operations Research- I	6	6	90
5	III M	MAT 3511	Combinatorics	5	5	75
5	IV LS	XXX xxxx	Life Skill- III	3	2	30
5	IV	MAT 3200	Environmental Studies	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
6	III M	MAT 3612	Number Theory	6	6	90
6	III M	MAT 3614	Complex Analysis	6	6	90
6	III M	MAT 3616	Fuzzy Mathematics	6	6	90
6	III M	MAT 3512	Operations Research- II	5	5	75
6	IV LS	XXX xxxx	Life Skill - IV	3	2	30
6	IV	VAL xxxx	Value Education	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

Courses offered to Non-major Students by the Department of Mathematics (UG)

#### Supportive

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	IIIS	MAT 1431	Maths for Physics-I	5	4	60
2	IIIS	MAT 1433	Maths for Economics (ECE & ECO)	5	4	60
2	IIIS	MAT 1432	Maths for Physics-II	5	4	60
2	IIIS	MAT 1434	Fundamentals of Computer Applications (ECE & ECO)	5	4	60
3	III	MAT 2431	Maths for Chemistry - I	5	4	60
3	III	MAT 2433	Business Statistics (COM)	5	4	60
4	III	MAT 2432	Maths for Chemistry - II	5	4	60
4	III	MAT 2434	Business Mathematics (COM)	5	4	60

#### Non-Major Elective

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	IV	MAT 1221	Arithmetic & Mathematical Logic	3	2	30
2	IV	MAT 1222	Recreational Mathematics	3	2	30

#### Life Skill Courses

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	IV	MAT 1231	Mathematics for Life	3	2	30
2	IV	MAT 1232	Mathematical Reasoning	3	2	30
5	IV	MAT 3231	Mathematics for Competitive Exam.	3	2	30
6	IV	MAT 3232	Developing Quantitative Aptitude	3	2	30

**MAT 2511****ALGEBRA - II****5hr/ 5cr****Objective:**

The objective of this course is to create awareness on the existing structures such as rings, fields, lattices and their relevance in the contemporary world.

This course deals with basic ideas in Ring theory, Fields and Lattices.

- Unit I:** Introduction to Rings – Types of rings – Sub rings – Examples.  
**Unit II:** Ideals – Integral domain – Quotient rings – Maximal ideal – Prime ideal – Homomorphism of rings.  
**Unit III:** Introduction to Fields – Field of quotients – Ordered integral domain – Unique Factorization Domain – Euclidean Domain – Principal ideal domain.  
**Unit IV:** Polynomial rings - Eisenstein Criterion.  
**Unit V:** Lattices – Modular Lattice, Distributive lattice– Boolean algebra - Boolean ring – Boolean functions – Canonical form.

**References:**

1. S.Arumugam and A.Thangapandian Isaac, 2006. **Modern Algebra**, SCITECH Publications Private. Limited.
2. J.N.Sharma and A.R.Vashishtha, 1981. **Linear Algebra**, Krishna Prakasha Mandir.

**MAT 2513****ANALYSIS - II****5hr/ 5cr****Objective:**

The course deals with metric spaces which is a classical extension of the real line and its properties in terms of the distance.

The course introduces to the students, metric spaces and its properties. The properties like connectedness, completeness and compactness which are inherent in nature in the real line are extended to the metric spaces. Also properties like continuity and uniform continuity are exploited.

- Unit I:** Introduction to limits - Limit and continuity - Continuous Functions- Discontinuity - Types of discontinuity - Intermediate value theorem and its consequences.
- Unit II:** Metric spaces- Open sets- Limit point- Closed sets- Closure of a set- Properties of closure of a set- Interior of a set- Properties of interior of a set- Dense sets- Nowhere dense sets - Limits in metric spaces- Reformulation of definition of continuous functions- Baire's theorem- Uniform continuity.
- Unit III:** Connected metric spaces- Separated sets- Connected and Disconnected sets- Connectedness of product of connected metric spaces- Continuity and Connectedness.
- Unit IV:** Completeness - Totally Boundedness.
- Unit V:** Compact metric spaces- Continuous functions on compact metric spaces- Continuity of the inverse function - Bolzano-Weierstrass theorem.



**References:**

1. Arumugam Issac, 2006. **Modern Analysis**, New Gamma Publishing House.
2. Richard R.Goldberg, 2002. **Methods of Real Analysis**, New Delhi: Oxford & IBH Publishing Company Private Limited.
3. J.N.Sharma and A.R.Vasistha, 1997. **Real Analysis**, Krishna Prakashan Media (P) Limited.
4. Shanthi Narayan and M.D.Raisinghania, 2010. **Elements of Real Analysis**, Sultan Chand & Company Limited.
5. R.G.Bartle and D.R.Sherbert, 2002. **Introduction to Real Analysis**, Singapore: John Wiley and Sons(Asia) Private Limited.
6. K.A.Ross, 2004. **Elementary Analysis: The Theory of Calculus**, Undergraduate Texts in Mathematics, Springer (SIE), Indian Reprint.
7. J.M. Howie, 2007. **Real Analysis**, Springer.
8. Shirali, S. and H.L.Vasudeva, 2001. **Metric Spaces**, Springer.
9. Malik, S.C. and Savita Arora, 2001. **Mathematical Analysis**, New Age International Publishers.

**MAT 2515****DIFFERENTIAL EQUATIONS****5hr/ 5cr****Objective:**

The objective of this course is to enable the students to solve various types of differential equations and to apply them in various fields.

The topics covered includes formation of differential equations, solving various types of ordinary and partial differential equations, Laplace transforms and Laplace transforms as tool for solving differential equations.

- Unit I:** Ordinary differential equation – Non-Homogeneous equations of the first degree in x and y – First order and first degree exact equation – Integrating factors – Equations of the first order but of higher degree – Equations solvable for p, y and x and Clairaut's form.
- Unit II:** Linear differential equations with constant coefficients – Particular integrals – second order homogeneous equations with variable coefficients – Equations reducible to the linear homogeneous equations – Variation of parameters – Simultaneous differential equations of the form  $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$  -n<sup>th</sup> order exact differential equations – Orthogonal trajectory.
- Unit III:** Partial differential equations of the first order – Derivation of partial differential equations – Classification of integrals – Lagrange's method of solving linear Partial differential equations – Standard forms – Equations reducible to the standard forms.
- Unit IV:** Laplace transforms – Developing the theory to use it as a tool - Laplace transforms of periodic functions – Some general theorems – Evaluation of integrals – Inverse Laplace transform.
- Unit V:** Solving ordinary differential equation with constant coefficients - variable coefficients and simultaneous linear equation using Laplace transform.

**References:**

1. S.Narayanan and T.K.Manickavachagom Pillay, 1996. **Calculus III**, S.Viswanathan Private Limited.
2. S.Narayanan and T.K.Manickavachagom Pillay, 1996. **Differential Equations**, S.Viswanathan Private Limited.
3. S.Arumugam and A.Thangapandian Isaac, 2002. **Differential Equations**, New Gamma Publishing House.

**MAT 2411****STATISTICS - I****4hr/ 4cr****Objective:**

The objective of the course is to enable the students to understand the theoretical background of statistics as a student of Mathematics.

The course essentially deals with the probability distribution theory which is the basis of statistics. The topics covered includes Correlation and Regression and curve fitting.

**Unit I:** Sample space – Random Variable-Discrete and continuous Distribution function- Probability density function, joint probability function.

**Unit II:** Mathematical expectation and generating functions – Moment generating function- Chebyche's inequality- Law of large numbers.

**Unit III:** Theoretical Discrete and continuous distributions- Binomial, Poisson, Normal, Gamma, Exponential, Rectangular, Uniform distributions- Standard properties- Central limit theorem.

**Unit IV:** Correlation and Regression.

**Unit V:** Method of least squares – Curve fitting- linear, polynomial, exponential and logarithmic.

**References:**

1. S.C.Gupta and V.K.Kapoor, 2001. **Mathematical Statistics**, Sultan Chand and Sons.
2. S.Arumugam and A.Thangapandian.Isaac, 2003. **Statistics**, New Gamma Publications Private Limited.
3. Manmohan Gupta, 2001. **Statistics**, Sultan Chand and Sons.

**MAT 2512****ALGEBRA - III****5hr/ 5cr****Objective:**

The objective of this course is to enable the students to understand the basic ideas of vector spaces as algebraic structure, linear transformations and their relations to matrices are also dealt with.

The topics covered in this course are vector spaces, inner product space, linear transformations, matrix of linear transformation.

**Unit I:** Vector space – Subspace – Quotient space.

**Unit II:** Spanning set – Linear independent set- Basis – Dimension.

- Unit III:** Linear transformations - Rank and Nullity of a linear transformation – Matrices - linear transformations – Vector space of linear transformations.
- Unit IV:** Inner product space –Properties – norm and distance- Schwartz inequality, triangle inequality.
- Unit V:** Orthogonal elements – Orthonormal set – Gram-Schmidt orthogonalization process – orthogonal complement

**References:**

1. J.N.Sharma and A.R.Vashishtha, 2002. **Linear Algebra**, Krishna Prakasha Mandir.
2. S.Arumugam and A.Thangapandian Isaac, 2006. **Modern Algebra**, SCITECH Publications Private Limited.

**MAT 2514**

**ANALYSIS - III**

**5hr/ 5cr**

**Objective:**

The first two semesters of the degree programme introduced calculus which includes differentiation and integration where integration was treated as the reverse process of differentiation. However, the Riemannian definition of integration gave a twist to the way it is looked at. Students are introduced to integration as a limit of summation by Riemann integration. The Riemann integrability of a function is looked at in detail. The necessary and sufficient condition for Riemann integrability is the central theme of this course.

Sequence of functions and their limits are introduced (pointwise limit and uniform limit). The ramifications of uniform convergence and their ramifications on integrability, differentiability and continuity are dealt in depth.

- Unit I:** Riemann Integration - Riemann Integrable Functions - properties of the Riemann integral- Characterization theorem on Riemann integrable functions .
- Unit II:** Derivatives - chain rule - Darboux's theorem - Rolle's Theorem - Law of the mean – The Fundamental theorem of calculus -Substitution theorem and application - improper integrals.
- Unit III:** Taylor's theorem with Lagrange and Cauchy form of remainders- Taylor series- Maclaurin series - convex functions.
- Unit IV:** Pointwise and uniform convergence of sequence of functions - uniform convergence and Continuity - uniform convergence and differentiation - uniform convergence and integration -Cauchy criterion for uniform convergence.
- Unit V:** Series of functions - convergence and uniform convergence of series of functions – Weierstrass M-Test - Dini's theorem for series - differentiation and integration of series of functions- power series - radius of convergence.

**References:**

1. Richard R. Goldberg, 2002. **Methods of Real Analysis**, New Delhi: Oxford & IBH Publishing Company Private Limited.
2. J.N.Sharma and A.R.Vasistha, 1997. **Real Analysis**, Krishna Prakashan Media (P) Ltd.
3. R.G.Bartle and D.R.Sherbert, 2002. **Introduction to Real Analysis**, Singapore: John Wiley and Sons (Asia) Private. Limited.
4. K.A.Ross, 2004. **Elementary Analysis: The Theory of Calculus**, Undergraduate Texts in Mathematics, Springer (SIE), Indian Reprint.
5. J.M. Howie, 2007. **Real Analysis**, Springer.
6. J.V. Deshpande, 1999. **Mathematical Analysis and Applications**, Narosa Publishing House.
7. Torence Tao, 2000. **Analysis I**, TRIM 37, Hindustan Book Agency.

**MAT 2516****VECTOR CALCULUS & TRIGONOMETRY****5hr/ 5cr****Objective:**

This is a foundational course for any student aspiring to complete B.Sc degree in mathematics. The applicability of the subject is enormous in nature. The first unit is primarily devoted for the basics on vectors. Trigonometry is an inevitable part of any branch of science, Demovire's theorem and its applications are exploited..

- Unit I:** Introduction to vectors- dot product and cross product of vectors- product of three and four vectors- geometrical interpretation of dot and cross product and their related aspects- volume of parallelopiped- tetrahedron-vector equation(lines, circles etc.,) algebraic equations and geometrical interpretations- problems related to aforesaid aspects on vectors.
- Unit II:** Limit of a vector function- continuity- differentiation of vectors- Taylor's theorem for vector functions- Partial derivatives- differentiability of vector functions- related problems- Definition of gradient, divergent and curl with physical interpretation- curvilinear coordinates- cylindrical and spherical.
- Unit III:** Vector integration- indefinite integrals- definite integral- line, surface and volume integrals- Green's theorem in plane – Green's theorem in space- Stoke's and Gauss theorems- problems related to the verification of these theorems- vector integrations.
- Unit IV:** Demovire's theorem- geometrical interpretation- simplification of trigonometric function- expansion of trigonometric functions.
- Unit V:** Hyperbolic functions- logarithmic functions- trigonometric summation of series.

**References:**

1. M. D. Raisinghania, 1998. **Vector Calculus**, S.Chand Company Limited.
2. Narayanan and Manichavasagam Pillai, 2002. **Vector algebra and analysis**, M. S. Viswanathan Private Limited.
3. Dipak chatterjee, 2003. **Vector Analysis**, New Delhi: Prentice Hall of India.
4. Narayanan and Manichavasagam Pillai, 2002. **Trigonometry**, M. S. Viswanathan Private Limited.
5. Arumugam and Thangapandi Issac, 2003. **Trigonometry**, New Gamma Publication.
6. A.Chandra Babu and C.R. Seshan, 2006. **New Engineering Mathematics, Volume – II**, Chennai: Narosa Publishing House.

**MAT 2412****STATISTICS - II****4hr/ 4cr****Objective:**

This is the second segment of a sequential course as a tool for solving problems in real life.

The aim of this course is to enable the students to understand statistics. The course deals with analysis of variance- analysis of time series and statistical quality control.

**Unit I:** Sampling and Large sample tests.

**Unit II:** Small sampling tests using t- F- and Chi-square distributions.

**Unit III:** Index numbers – fixed and chain base indices – cost of living index – consumer price index – ideal index number

**Unit IV:** Analysis of time series – components of time series – measurement of trend – seasonal variations.

**Unit V:** Analysis of variance – one way- two way classification -Latin square design.

**References:**

1. SC. Gupta and V.K. Kapoor, 2001. **Mathematical Statistics**, Sultan Chand & Sons.
2. S. Arumugam and A. Thangapandian Isaac, 2003. **Statistics**, New Gamma Publications Private Limited.
3. S.P. Gupta, 2001. **Statistical Methods**, Sultan Chand and Sons.
4. Manmohan Gupta, 2001. **Statistics**, Sultan Chand & Sons.

**Supportive:****MAT 2431****MATHS FOR CHEMISTRY - I****5hr/4cr****Objective:**

To introduce the basic concepts of various areas in Mathematics required to study chemistry.

This course deals with matrices, eigen values, eigen vectors, sets, functions, groups, rings, fields, sampling, and numerical methods.

- Unit I:** Matrices – elementary transformations – diagonalization – inverse – rank
- Unit II:** Solving homogeneous and non-homogeneous equations – Cayley-Hamilton theorem - Eigen values and Eigen vectors.
- Unit III:** Sets – relations – functions – types of functions – groups – examples and simple problems, rings & fields with examples.
- Unit IV:** Sampling theory – Large and small sample tests for mean – normal, t-test, chi-square test.
- Unit V:** Numerical methods – solution of algebraic equations – Interpolation - Newton's and Lagrange's methods – Numerical differentiation & integration.

**References:**

1. M.L. Khanna, 2001. **Matrices**, Meerut: Jai Prakash Nath & Company.
2. S. Arumugam & A. Thangapandian Issac, 1998. **Modern Algebra**, SCITECH Publications.
3. S.C.Gupta & V.K. Kapoor, 1995. **Elements of Mathematical Statistics**, Sultan Chand & Sons.
4. S.S.Sastry, 2000. **Introductory methods of Numerical Analysis**, Prentice Hall of India.

**MAT 2433**

**BUSINESS STATISTICS**

**5hr/4cr**

**Objective:**

To enable the students to use the tools in statistic solve the problems in business studies and commerce.

This course deals with measures of central tendency, correlation, regression, probability theory, and sampling theory.

- Unit I:** Measures of central tendency – measures of dispersion.
- Unit II:** Correlation – correlation coefficients – rank correlation – regression – regression coefficients.
- Unit III:** Probability function – addition and multiplication theorems on probability – conditional probability – Baye's formula and theorem.
- Unit IV:** Type of sampling- parameters & statistic – statistical hypothesis – null and alternative hypothesis – types of errors- large samples based on normal area table – test of significance of small samples – t-test and, F-test and Chi-square test for population variance and goodness of fit.
- Unit V:** Analysis of variance – one way and two way classification – Latin square design.

**References:**

1. S.C Gupta & V.K. Kapoor, 1995. **Elements of Mathematical Statistics**, Sultan Chand Company.
2. S.Arumugam & A.Thangapandian Issac, 2004. **Statistics**, New Gamma publishing House.

**MAT 2432****MATHS FOR CHEMISTRY -II****5hr/4cr****Objective:**

To reinforce and enhance the mathematical tools introduced in MAT2431. Differential equations as a mathematical model for solving problems in chemistry is the central theme of the course.

This course deals with differentiation, integration, differential equations and Laplace transform.

- Unit I:** Differentiation – successive differentiation – meaning of derivative- maxima and minima.
- Unit II:** Partial differentiation – errors and approximation- maxima and minima.
- Unit III:** Integration – Methods of integration – Some standard formulae-Integration by parts – definite integral – reduction formula.
- Unit IV:** Formation of differential equations –growth, decay and chemical reactions-Solving first and second order differential equations.
- Unit V:** Laplace transforms – Inverse transforms-solving linear differential equations – variation of parameters.

**References:**

1. D.N. Hirst, 1993. **Mathematics for Chemistry**, Macmillan Press Limited.
2. Sankaranarayanan & J.A. Mangaladoss, 1980. **Differential Equations and its Applications**, Palayamkottai: Suja Publishing House.
3. S.Narayanan & T.K.ManickavachagomPillay, 2002. **Calculus, Volume I & II**, S.Viswanathan Private Limited.
4. S.Narayanan & T.K.ManickavachagomPillay, 1996. **Differential Equations**, S.Viswanathan Private Limited.

**MAT 2434****BUSINESS MATHEMATICS****5hr/4cr****Objective:**

To introduce various concepts of mathematics required for commerce.

This course deals with differentiation, integration, matrices, transportation and assignment problem.

- Unit I :** Differential calculus: idea of limit- continuity- average concept and marginal concept- differential coefficient- standard forms rules for differentiation- higher order derivatives – increasing and decreasing functions- criteria for maxima and minima applications.
- Unit II:** Integral calculus: standard forms rules for integration- definite integral- integration by substitution – integration by parts- applications.
- Unit III:** Matrices – types of matrix – consistency of a matrix – rank of matrix-solving system of Homogeneous and non- homogeneous equation.
- Unit IV:** Transportation problems: methods of finding IBFS-u-v method-unbalanced problems - Assignment problems.
- Unit V:** Game theory– pure and mixed strategies –solution of 2x2 games- dominance rule- graphical solution of 2xn and mx2 games.

**References:**

1. Jeyaram & Arumugam, 1986. **Mathematics: An Introduction.**
2. V.Sundaresan and SD Jeyaseelan, 2003. **An introduction to Business Mathematics**, Sultan Chand & Company.
3. M.L. Khanna, 2001. **Matrices**, Meerut: Jai Prakash Nath & Company.
4. S. Narayanan & T.K. Manickavachagom Pillay, 2002. **Calculus, Volume I & II**, S.Viswanathan Private Limited.
5. S. Arumugam & A. Thangapandian Isaac, 2002. **Differential Equations with Applications**, New Gamma Publishing House.



**UNDER GRADUATE DEPARTMENT OF PHYSICS**  
**B. Sc. – Physics Programme**  
(w. e. f. 2015-16 batch onwards)

Semester	Part	Course No.	Course Title	Hours	Credits	Marks
I	I	TAM / HIN / FRE 12XX		3	2	30
	II	ENG12XX		3	2	30
	IIIC	PHY1371	Physics Lab - I	3	3	45
	IIIC	PHY1551	Physics of Motion	5	5	75
	IIIC	PHY1553	Energy Physics	5	5	75
	IIIS	MAT14XX		5	4	60
	IVE	TAM12XX / NME12XX	Basic Tamil / Advance Tamil / Non-Major	3	2	30
	IVLS	LSC12XX	Life Skill Course - I	3	2	30
	V	NCA / NCN / NSS / PED / SLP 11XX				
			<b>Total</b>	<b>30</b>	<b>25</b>	
II	I	TAM / HIN / FRE 12XX		3	2	30
	II	ENG12XX		3	2	30
	IIIC	PHY1372	Physics Lab - II	3	3	45
	IIIC	PHY1552	Geometrical & Physical Optics	5	5	75
	IIIC	PHY1554	Electrodynamics	5	5	75
	IIIS	MAT14XX		5	4	60
	IVE	TAM12XX / NME12XX	Basic Tamil / Advance Tamil / Non-Major	3	2	30
	IVLS	LSC12XX	Life Skill Course - II	3	2	30
	V	NCA / NCN / NSS / PED / SLP 11XX			1	
			<b>Total</b>	<b>30</b>	<b>25+1</b>	
III	I	TAM / HIN / FRE 22XX		3	2	30
	II	ENG22XX		3	2	30
	IIIC	PHY2671	Physics Lab - III	6	6	90
	IIIC	PHY2573	Analog Electronics	5	5	75
	IIIC	PHY2475	Mathematical Physics	4	4	60
	IIIC	PHY2477	Modern Optics	4	4	60
	IIIS	CHE24XX		5	4	60
	V	NCA / NCN / NSS / PED / SLP 21XX				
			<b>Total</b>	<b>30</b>	<b>27</b>	
IV	I	TAM / HIN / FRE 22XX		3	2	30
	II	ENG22XX		3	2	30
	IIIC	PHY2672	Physics Lab - IV	6	6	90
	IIIC	PHY2574	Digital Electronics	5	5	75
	IIIC	PHY2476	Classical Mechanics	4	4	60
	IIIC	PHY2478	Quantum Mechanics & Relativity	4	4	60
	IIIS	CHE24XX		5	4	60
	V	NCA / NCN / NSS / PED / SLP 21XX			1	
			<b>Total</b>	<b>30</b>	<b>27+1</b>	

Semester	Part	Course No.	Course Title	Hours	Credits	Marks
V	IIIC	PHY3671	Physics Lab - V	6	6	90
	IIIC	PHY3673	Thermodynamics & Statistical Physics	6	6	90
	IIIC	PHY3575	Solid State Physics	5	5	75
	IIIC	PHY3677	Microprocessor & Communication Systems	6	6	90
	IVLS	LSC32XX	Life Skill Course - III	3	2	30
	IV	EVS32XX	Environment and Physics	4	2	30
			<b>Total</b>	<b>30</b>	<b>27</b>	
VI	IIIC	PHY3672	Physics Project	6	6	90
	IIIC	PHY3674	Atomic Physics & Spectroscopy	6	6	90
	IIIC	PHY3576	Nuclear Physics	5	5	75
	IIIC	PHY3680	Astronomy & Astrophysics	6	6	90
	IVLS	LSC32XX	Life Skill Course - IV	3	2	30
	IV	VAL32XX	Value Education	4	2	30
			<b>Total</b>	<b>30</b>	<b>27</b>	

**Part III Supportive Courses offered to Non-Major Students:**

Semester	Course No.	Course Title (Theory Cum Lab Courses)	Hours	Credits	Marks
I	PHY1481	Physics for Chemists – I	3+2	3+1	45+15
II	PHY1482	Physics for Chemists - II	3+2	3+1	45+15
III	PHY2481	Physics for Mathematics - I	3+2	3+1	45+15
IV	PHY2482	Physics for Mathematics – II	3+2	3+1	45+15
		<b>Total</b>	<b>20</b>	<b>16</b>	

**Part IVLS Life-Skill Courses:**

Semester	Course No.	Course Title	Hours	Credits	Marks
I	PHY1291	Handling of Tools & Machines	3	2	30
II	PHY1292 / PHY1294	Physics of Music / Photography & Digital Editing	3	2	30
V	PHY3291 / PHY3293	PC Management & Maintenance / Medical Instrumentation	3	2	30
VI	PHY3292 / PHY3294	Alternate Energy Resources / Consumer Electronics	3	2	30
		<b>Total</b>	<b>12</b>	<b>8</b>	

**Part IVE Non-Major Elective Courses:**

Semester	Course No.	Course Title	Hours	Credits	Marks
I	PHY1201	Basic Electricity & Electronics	3	2	30
II	PHY1202	Wonders of Sky	3	2	30
		<b>Total</b>	<b>6</b>	<b>4</b>	

**PHY 2573****Analog Electronics****5 hr/5 cr****Course Objective:** *Enable the Students*

- *To understand the characteristics and applications of semiconductor devices and circuits.*
- *To analyze, select and bias the devices and study their applications.*
- *To construct, analyze, verify, and troubleshoot analog circuits using appropriate techniques and test equipment.*

**Unit 1:** Kirchhoff's Voltage Law, Kirchhoff's Current Law. Constant voltage source and current source and their conversion. Superposition Theorem. Thevenin's Theorem, Norton's Theorem and their conversion. Intrinsic and Extrinsic semiconductors, Energy Band diagram. Fermi level- Forward and reverse bias. Diode equation (no derivation) - regulated power supply and ripple factor - Clippers, clampers. Biased clipper and clamper, voltage multipliers, half wave & full wave rectification- bridge rectifier. Zener diode-voltage regulator, light emitting diodes, Laser diodes.

**Unit 2:** Bipolar Junction Transistors (BJT): Transistor fundamentals -configurations, DC operating point and load line. BJT characteristics - fixed bias, emitter bias potential divider bias. Analysis of above circuits and their design, variation of operating point and its stability. Two-port network. Hybrid Parameters.

**Unit 3:** Transistors Amplifier: Small Signal common base and common emitter amplifiers : AC equivalent circuit, hybrid model and their use in amplifier design. Multistage amplifiers, frequency response of basic & compound configuration, Power amplifiers: Class A, B, AB, C.

**Unit 4:** Feedback & Oscillator Circuits: Feed back- effect of positive and negative feedback, basic feedback topologies & their properties. Phase shift and Wien's bridge, RC oscillators with theory. Colpitt's and Hartley LC oscillators. Crystal Oscillators.

**Unit 5:** Operational Amplifier & FET: Characteristics of Op-Amp - Pin out of IC 741. Differential and Common mode operation. Inverting & Non Inverting Amplifier, Differential amplifier- Summing and difference amplifier. Integrator - differentiator - Comparator. Field-Effect Transistors (FET)-JFET- current-voltage characteristics. FET types only. FET amplifier.

**Text Book(s)**

1. Albert Malvino, David Bates , **Electronic Principles**. 8<sup>th</sup> Edition,, McGraw-Hill Education. 2015.
2. Floyd, **Electronic devices**, 5<sup>th</sup> Edition,, Pearson Education, 2001.

**References**

1. B.L.Theraja, **Basic electronics solid state**, S. Chand Publications, 2006.
2. V.K.Metha & Rohit Metha, **Principles of Electronics**, S Chand Publications, 2005.

**PHY 2475****Mathematical Physics****4 hr/4 cr****Course Objective:** *Enable the Students*

- *To gain knowledge in differential equations which are essential to solve advanced problems in physics.*
- *To understand special functions in mathematical methods.*
- *To learn the essentials of matrices.*

**Unit 1: Differential Equations**

Partial differential equations in Physics – method of separation of variables - separation of Helmholtz equation in Cartesian, spherical polar coordinates – Laplace's equation in various coordinate systems

**Unit 2: Special Functions – I**

Bessel functions – spherical Bessel function – Legendre polynomials – Hermite polynomials – Laguerre polynomials – recurrence relations – orthonormality relations.

**Unit 3: Special Functions – II**

Beta, gamma, Dirac Delta, Green's, Airy Functions – Green function for one dimensional problem - Eigen function expansion of Green's function

**Unit 4: Matrices**

Orthogonal, Unitary and Hermitian matrices and its properties – Eigen value and Eigen vector of a matrix – Matrix Diagonalization – Matrix representation of Linear operators – Special matrices in Physics

**Unit 5: Integral Transforms**

Fourier Integral – Fourier Transform – Convolution theorem – Applications of Fourier Transform – Laplace Transform – Laplace Transform of Derivatives - Convolution theorem – Applications of Laplace transforms

**Text Book**

1. K. Chattopadhyay, **Mathematical Physics**, New Age International, 2013.  
Unit 1: Chapter 2.1 – 2.3 ; Unit 2: Chapter 5.1 - 5.7; Unit 3: Chapter 5.8- 5.9, 6.1 -6.3;  
Unit 4: Chapter 7.8 - 7.10; Unit 5: Appendix B1 – B 9.

**References**

1. Charlie Harper, **Introduction to Mathematical Physics**, PHI Learning Pvt. Ltd., 2012.
2. Arfken, Weber, and Harris, **Mathematical Methods for Physicists**, Elsevier India Pvt. Ltd., 2013.

**PHY 2477****Modern Optics****4 hr/4 cr****Course Objective:** *Enable the Students*

- *To understand the fundamentals of propagation of light waves*
- *To understand the working principles of LASERS*
- *To gain knowledge about Fourier Optics*
- *To learn the fundamentals of Fiber optics*
- *To understand the concepts of Crystal Optics*

**Unit 1: Light Wave**

Reflection from Dielectrics – Intensities of the Transmitted Light - Internal Reflection – Phase Change on Reflection – Metallic Reflection – Optical Constants of Metals

**Unit 2: Laser**

Einstein Coefficients – Light Amplification – Threshold Condition – Laser Rate equation (Three Level Only) – Variation of Laser Power around Threshold – Line Broadening Mechanisms (no derivation) – types Lasers.

**Unit 3: Fourier Optics**

Fresnel and Fraunhofer Diffraction: Fraunhofer Diffraction – Diffraction Formula – Rectangular Aperture - Fresnel Diffraction – Diffraction Integral – Diffraction of a Gaussian Beam - Fourier Transform and Some of its Important Properties – holography.

**Unit 4: Crystal Optics**

Double Refraction – Wave Surface of Uniaxial Crystals – Propagation of Plane Wave in Uniaxial crystals – Elliptically and Circularly Polarized Light – Quarter and Half Wave Plates – Babinet Compensator.

**Unit 5: Fiber Optics**

Optical Fiber – Numerical Aperture – Multimode Graded Index Fibers – Single Mode Fibers – Pulse Dispersion in Step Index Fiber - Fiber Optic Communication Systems.

**Text Book(s)**

1. Jenkins and White, **Fundamentals of Optics**, 4<sup>th</sup> Edition, McGraw Hill, International Editions, New Delhi (2011).  
Unit 1: Chapter 25.1-25.4, 25.8, 25.9; Unit 4: Chapter 26.1, 26.2, 26.9, 27.1, 27.2, 27.4.
2. Ghatak A and K Thyagarajan, **Optical Electronics**, Cambridge University Press, Cambridge (1988).  
Unit 2: Chapter 8; Unit 3: Chapter 4.1-4.3, 5.1, 5.2, 5.4, 6.1, 6.2; Unit 5: Chapter 13.

**References**

1. Ajoy Ghatak, **Optics**, 3<sup>rd</sup> Edition, Tata McGraw Hill Limited, New Delhi (2005).

**PHY 2574****Digital Electronics****5 hr/5 cr****Course Objective: Enable the Students**

- To understand the fundamentals of Digital Electronics
- To know the different number systems and codes used in digital electronics
- To gain knowledge about logic gates and Boolean algebra
- To learn about the combinational and sequential logic systems
- To understand the function of D/A and A/D converters
- To be exposed to various memory devices

**Unit 1:** Digital Signals and Logic, Storing and transferring digital information, Basic Gates and universal logic Gates, Positive and Negative logic, Combinational Logic Circuits: Boolean laws and basic theorems, Sum-of-Products method, Karnaugh map (up to 4 variables), Karnaugh simplification (with don't care conditions), Product-of-Sum method, POS simplification.

**Unit 2:** Binary number system, Decimal-Binary-Octal and Hexadecimal-their representation, Inter-conversion, BCD, Weighted binary codes, ASCII character code, excess-3 code, Gray code and Error detecting and correcting code, Binary to Gray code conversion and vice-versa, Binary addition and subtraction, Unsigned and Sign-magnitude numbers, 2's complement representation, 2's complement arithmetic, Half adder, Full adder, Half subtractor, Full subtractor.

**Unit 3:** Data Processing Circuits: Multiplexers, Demultiplexers, Decoders: 1-of-16 Decoder, BCD-to-decimal Decoders, Seven-segment Decoders, Encoders: Decimal to binary, Decimal to BCD, Octal to binary and Priority Encoders, Exclusive -OR Gates, Parity checker, Parity generator, Magnitude comparator, Read-only Memory, Programmable Array Logic, Programmable Logic Arrays.

**Unit 4:** Flip-flops: RS Flip-flops, Gated Flip-flops, Edge-triggered RS, D and JK Flip-flops, Flip-flop Timing, JK Master/slave Flip-flops. Shift Registers, Serial in-Serial out, Serial in-Parallel out, Parallel in-Serial out and Parallel in-Parallel out shift registers, Ring Counters, Synchronous and Asynchronous Counters, Mod-3 and mod-6 counters, Decade Counters, Cascaded counters, Synchronous up/down counter.

**Unit 5:** Schmitt Trigger, Astable, Monostable and Bistable multivibrators, Basics of digital signal processing, A/D conversion, Simultaneous type A/D converter - Successive approximation type A/D converter, Specifications of D/A converter, Binary-Weighted-input D/A converter, Memory: Basic terms and ideas, Memory addressing, RAMs, ROMs, PROMs and EPROMs.

#### **Text Book(s)**

1. Donald P Leach, Albert Paul Malvino and Goutam Saha, **Digital Principles and Applications**, 6<sup>th</sup> Edition, The McGraw-Hill Companies 2006.  
Unit 1: Chapter 1.1, 1.3, 1.4, 2.1, 2.2, 2.4, 3.1-3.8; Unit 2: Chapter 5.1-5.8, 6.1-6.8; Unit 3: Chapter 4.1-4.7, 4.8-4.12; Unit 4: Chapter 8.1-8.7, 9.1-9.6, 10.1, 10.3-10.6; Unit 5: Chapter 7.3- 7.5, 13.1-13.7.
2. Thomas L Floyd, **Digital Fundamentals**, 8<sup>th</sup> Edition, Pearson Education 2003.  
Unit 2: Chapter 2.10, 2.11; Unit 4: Chapter 9.5; Unit 5: Chapter 14.1, 14.3, 14.5.

#### **References**

1. Morris M Mano and Michael D Ciletti, **Digital Design**, 4<sup>th</sup> Edition, Pearson Prentice Hall 2006.
2. S Salivahanan and S Arivazhagan, **Digital Circuits and Design**, 4<sup>th</sup> Edition, Vikas Publishing House Pvt Ltd 2013.

**PHY 2476****Classical Mechanics****4 hr/4 cr****Course Objectives:** *Enable the Students*

- *To review Newtonian mechanics and constraints.*
- *To introduce the concepts of generalized coordinates and Lagrangian formulation.*
- *To impart the applications of central force motion and Hamiltonian formulations.*
- *To inculcate a strong emphasis on the foundations of rigid body dynamics and small oscillations.*

**Unit 1: Review of Newtonian Mechanics and Constrained Motion**

Frames of reference - inertial and non-inertial frames - Mechanics of a particle - Motion under constant, time- dependent, velocity dependent forces. Motion of charged particle in Magnetic field - System of particles: centre of mass –conservation of linear and angular momentum - kinetic energy for a system of particles - Energy conservation of system of particles. Constraints - Holonomic – Non-holonomic constraints – Scleronomous and Rheonomous constraints

**Unit 2: Lagrangian Formulation and Variational Principle**

Generalized coordinates - degrees of freedom - configuration of space - Lagrange's equations - Kinetic energy in generalized co-ordinates - generalized momentum - first integrals of motion - and cyclic coordinates - velocity dependent potential - dissipative force - Newtonian and Lagrangian formalisms. Variational Principle: Hamilton's principle-deduction of Hamilton's principle-Lagrange's equation from Hamilton's principle .

**Unit 3: Central force Motion and Hamiltonian Formalism**

Reduction to one-body problem-general properties of central force motion-effective potential-classification of orbits-Motion in a central force field- inverse square law of force-Kepler's laws- laws of gravitation from Kepler-Scattering in a central force field. Hamiltonian formalism: The Hamiltonian of system- Hamilton's equations of motion-Hamilton's equations from variational principle-Integrals of Hamilton's equations.

**Unit 4: Canonical Transformations, Poisson Brackets and Rotational motion**

Canonical transformations-Poisson brackets-Poisson bracket and integrals of motion-the canonical invariance of Poisson bracket-Lagrange's brackets  
Motion of rigid bodies: Angular momentum-kinetic energy-Inertia tensor-principal axes- Euler's angles-Infinitesimal rotations- rate of change of a vector - Coriolis forces- Euler's Equations of motion-Force free motion of a symmetrical top.

**Unit 5: Small oscillations**

Theory of small oscillations: Equilibrium and potential energy-Theory of small oscillations- normal modes-two coupled pendulum-longitudinal vibrations of CO<sub>2</sub> molecule.

**Text Book**

1. G.Aruldas, **Classical Mechanics**, PHI Learning Private Limited, 2013.  
Unit1: Chapter 1, 2 & 3 1.1-1.8, 2.1-2.6, 3.1,3.3-3.4; Unit 2 : Chapter 3 & 4 3.2,3.5-3.8, 3.10-3.12,4.1-4.4; Unit 3: Chapter 5 & 6 5.1-5.8, 5.12, 6.1-6.4; Unit 4: Chapter 6 6.6-6.12; Unit 5: Chapter 8 & 9 8.1-8.12, 9.1-9.5.

**References**

1. J. C. Upadhyaya, **Classical Mechanics**, HimalayaPublishing House.
2. K. Sankara Rao, **Classical Mechanics**, PHI Learning Private Limited,2011
3. H. Goldstein, **Classical Mechanics**, Narosa Publishing Home, New Delhi.

**PHY 2478****Quantum Mechanics and Relativity****4 hr/4 cr***Course Objective: Enable the Students*

- *To understand the inadequacies of classical physics*
- *To understand the fundamentals of quantum mechanics*
- *To learn the skills of quantum mechanics and its applications to free state and bound states*
- *To understand the concepts of Special theory of relativity.*

**Unit 1: Dual nature of matter**

Electromagnetic waves - blackbody radiation- photoelectric effect - X-ray diffraction - Compton effect - pair production - photons and gravity - De-Broglie waves - Davisson and Germer experiment-uncertainty principle.

**Unit 2: Elements of quantum mechanics**

Wave function- linearity and superposition-normalization- probability density- probability current density-expectation value-Schrodinger wave equation- statistical interpretation- time dependent and independent form- operators: Hermitian operators- commuting and non-commuting observables- Eigen values and Eigen functions- momentum.

**Unit 3: Free State problems**

Particle in field free space- Wave packet- phase and group velocities- step potential- barrier potential-particle flux: incident- penetrated and reflected- transmission probability- finite square well-free states- delta function potential.

**Unit 4: Bound state problems**

Infinite potential well- particle in a box- degeneracy- quantized states- normalized wave functions- expectation values- harmonic oscillator- energy Eigen values and Eigen functions- zero point energy-. Schrodinger equation for one electron atom- separation of variables- radial and angular part of Schrodinger equation- quantum numbers- spherical harmonics (qualitative discussion only)



**Unit 5: Theory of relativity**

Galilean and Newtonian relativity- Michelson-Morley experiment- Einstein's relativity- postulates- Lorentz transformation- length contraction- time dilation- mass variation- mass-energy equivalence-- Lorentz transformation- velocity transformation-relativistic momentum, force and kinetic energy- Minkowski space

**Text Book(s)**

1. Arthur Beiser, **Concepts of modern physics**, 4<sup>th</sup> Edition. - Tata McGraw-Hill (2003).  
Unit 1: Chapter 2.1-2.9, 3.1-3.5, 3.7-3.9; Unit 2: Chapter 5.1-5.7; Unit 4: Chapter 5.8, 5.11, 6.1-6.7; Unit 5: Chapter 1.1-1.9.
2. D.J. Griffiths, **Introduction to Quantum Mechanics**  
Unit 2: Chapter 2-1.1-1.5; Unit 3: Chapter 2-2.4-2.6, Text-1-5.9, 5.10.

**References**

1. F.K.Ritchmeyer, E. H. Kennard and John N. Kooper, **Introduction to Modern Physics**.
2. Cohen Tannoudji, Bernard Diu and F.Lalou, **Quantum mechanics** ( vol.1& vol.2).

**PHY 2671****Physics Lab – III****6 hr/6 cr****Course Objective: Enable the Students**

- To have hands-on experience in the measurements
- To record and process the measurements
- To correlate with the respective theoretical concepts and
- To draw non-trivial conclusions of the significance of the experiments

S. No.	Experiment
1	Solar Constant – using Lee's Disc
2	Spectrometer – Cauchy's Constants
3	Spectrometer – (i-i') Curve
4	Spectrometer – Dispersive Power
5	Newton's Rings
6	Fresnel's biprism
7	Field along the axis of a circular coil – Determination of $M$ & $B_H$
8	LCR circuits - Series
9	Constant Deviation Spectrograph – Calibration and Wavelength measurement
10	Potentiometer – Calibration of Voltmeter / Ammeter
11	Joule's Calorimeter
12	De Sauty Bridge – Capacitance of a Capacitor
13	Temperature Coefficient - Thermistor
14	Measurement of $e/m$ ratio of electron – using CRT
15	Bandgap measurement - Semiconductors
16	Charge of electron – Milliken's oil drop method
17	Measurement of Hall Coefficient
18	Michelson Interferometer – Wavelength separation
19	Measurement Planck's constant – Photoelectric Effect
20	Spectral Analysis

**PHY 2672****Physics Lab – IV****6 hr/6 cr****Course Objective:** *Enable the Students*

- *To have hands-on experience in the measurements*
- *To record and process the measurements*
- *To correlate with the respective theoretical concepts and*
- *To draw non-trivial conclusions of the significance of the experiments*

S. No.	Experiment
1	Dual Power Supply – PCB Making
2	Dual Power Supply – Construction & Characterization
3	Phase, frequency and voltage measurements - using CRO
4	Full Wave Rectifier
5	Bridge Rectifier
6	Network Theorems
7	Zener diode Characterization – Voltage regulation
8	Wave Shaping – Clipping & Clamping
9	Transistor Characteristics
10	Single stage amplifier
11	Transistor multivibrators – Monostable & Astable
12	Square wave generation Using 555 & 741
13	Colpitt's Oscillator
14	Phase shift Oscillator
15	Hartley Oscillator
16	FET Characteristics
17	FET Amplifier
18	Op-amp – Characteristics
19	Op-amp – applications
20	Op-amp – Filters

**PHY 2481****Physics for Mathematics-I****5(3+2) hr / 4(3+1) cr****Course Objective:** *Enable the Students*

- *To understand the fundamental of Mechanics and wave motion*
- *To know the motion of a particle in one, two and three dimensions*
- *To gain knowledge about the properties of gravitation which is one of the fundamental and universal forces of nature*
- *To develop a mathematical description of waves.*
- *To import skills in measurements by doing experiments*

**Unit 1:** Position, Velocity and Acceleration, One dimensional kinematics, Motion with constant acceleration, Free falling bodies, Projectile motion, Linear momentum, Impulse, Force, Conservation of momentum, Two-body collision, Rotational variable, Rotation with constant acceleration, Relationship between linear and angular variables, Angular momentum of a particle, System of particles, Torque, Conservation of angular momentum.

**Unit 2:** Work done on a system by external forces, Internal energy in a system of particle, Frictional work, Conservation of energy in a system of particles

**Unit 3:** Newton's law of universal gravitation, Gravitational constant, Gravitation near the earth's surface, The two shell theorem, Gravitational potential energy, Motions of planets and satellites,

**Unit 4:** Simple harmonic oscillator, Simple harmonic motion, Energy in simple harmonic motion, Applications of simple harmonic motion, Damped harmonic motion, Forced oscillations.

**Unit 5:** Mechanical waves, Types of waves, Travelling waves, Sinusoidal waves, The wave equation, Interference of waves, Standing waves and resonance, Properties of sound waves, Travelling sound waves, Speed, power and intensity of sound waves, Interference of sound waves, Standing longitudinal waves, Vibrating systems and sources of sound, Beats, The Doppler effect.

### Text Book

- David Halliday, Robert Resnick and Kenneth S Krane, **Physics-Vol I**, 5<sup>th</sup> Edition, John Wiley & Sons, Inc 2007.  
Unit 1: Chapter 2.3- 2.6, 4.3, 6.2- 6.5, 8.2, 8.4, 8.5, 10.1, 10.2, 10.4; Unit 2: Chapter 13.1-13.4; Unit 3: Chapter 14.2- 14.7; Unit 4: Chapter 17.2- 17.5, 17.7, 17.8; Unit 5: Chapter 18.1- 1.3, 18.5, 18.8, 18.10, 19.1- 19.9.

### References

- D.S.Mathur, **Elements of Properties of Matter**, 11<sup>th</sup> Edition, S.Chand Publications, 2014.
- Brij Lal and N. Subrahmanyam, **Properties of Matter**, 4<sup>th</sup> Edition, Eurasia Publishing House (Pvt) Ltd., 2003

### List of Experiments:

#### *Objective: Enable the Students*

- To have hands-on experience in the measurements*
- To record and process the measurements*
- To correlate with the respective theoretical concepts and*
- To draw non-trivial conclusions of the significance of the experiments*

S. No.	Experiment
1	Error Analysis (Simple pendulum / UV method)
2	Precise Linear Measurements (Screw Gauge & Vernier Calipers)
3	Usage of Travelling Microscope – Radius of the Capillary tube
4	Spectrometer – Refractive Index
5	Spectrometer – grating
6	Thermal Expansion ( Light & Telescope) – Coefficient of thermal expansion
7	Compound Pendulum – ‘g’ and Radius of Gyration
8	Sonometer – Verification of Laws
9	Newton's Law of Cooling – Specific heat capacity of Liquid
10	Plane grating – using CD

**PHY 2482****Physics for Mathematics-II****5(3+2) hr / 4(3+1) cr****Course Objective:** *Enable the Students*

- *To understand the basics of Electricity and Magnetism*
- *To know the fundamental laws of electricity and the behavior of a capacitor*
- *To gain knowledge about magnetic field and inductance coil*
- *To understand the operation of electronic devices*
- *To import skills in measurements by doing experiments*

**Unit 1:** Electric charge, Coulomb's law, Continuous charge distribution, Electric field, Electric field of point charges and of continuous charge distributions, Gauss' law, Applications of Gauss' law,

**Unit 2:** Electric potential energy, Potential due to point charges, collection of point charges and an electric dipole, Electric potential of continuous charge distributions, Calculating the field from the potential, Potential of a charged conductor, Capacitance, Capacitors in series and parallel, Energy stored in an electric field, Capacitor with a dielectric.

**Unit 3:** Magnetic force on a moving charge and a current-carrying wire, Torque on a current loop, Magnetic field due to a moving charge, Magnetic field of a current and a solenoid, Ampere's law, Faraday's law of induction, Lenz's law, induction and energy transfers, Self inductance, LR circuit, LCR circuit.

**Unit 4:** Intrinsic and Extrinsic semiconductor, Formation and V-I characteristics of PN junction diode, Zener diode and LED, Transistors, Various configurations of transistor, CE transistor amplifier, Operational amplifier and its characteristics, inverting and non inverting amplifier, adder, subtractor, differentiator, integrator.

**Unit 5:** Logic gate – Universal logic gates - Half adder, Full adder, Half subtractor, Full subtractor - Decoders: 1-of-16 Decoder, BCD-to-decimal Decoders, Seven-segment Decoders - Flip-flops: RS Flip-flops, D and JK Flip-flops, Shift Registers - Synchronous and Asynchronous Counters.

**Text Book(s)**

1. David Halliday, Robert Resnick and Kenneth S Krane, **Physics-Vol II**, 5<sup>th</sup> Edition, John Wiley & Sons, Inc 2002.  
Unit 1: Chapter 25.2, 25.4, 25.5, 26.2- 26.4, 27.4, 27.5; Unit 2: Chapter 28.2, 28.5-28.7, 28.9, 30.1- 30.6; Unit 3: 32.2, 32.5, 32.6, 33.1, 33.2, 33.4, 33.5, 34.2, 34.3, 36.1-36.4, 37.3.
2. B.L. Theraja, **Basic Electronics-Solid State**, 5<sup>th</sup> Edition, S.Chand & Company Ltd, 2005.  
Unit 4: Chapter 12.24, 12.25, 13.1- 13.7, 14.1, 15.1, 16.3, 17.9-17.11, 17.13, 17.14;  
Unit 5: Chapter 18.1, 18.6, 22.5- 22.7, 31.18- 31.21, 31.24-31.25, 31.27- 31.30.

**References**

1. Thomas L Floyd, **Digital Fundamentals**, 8<sup>th</sup> Edition, Pearson Education 2003.
2. A. Ambrose and T. Vincent Devaraj, **Elements of Solid State Electronics**, 4<sup>th</sup> Edition, Meera Publications 1993.

**List of Experiments:****Objective:** *Enable the Students*

- *To have hands-on experience in the measurements*
- *To record and process the measurements*
- *To correlate with the respective theoretical concepts and*
- *To draw non-trivial conclusions of the significance of the experiments*

S. No.	Experiment
1	Coefficient of Viscosity – Burette Method
2	Surface Tension – Capillary Rise
3	Young's Modulus - Uniform bending
4	Rigidity Modulus – Torsion Pendulum
5	Melde's Apparatus
6	Specific heat Capacity – Method of mixtures
7	Junction Diode Characteristics
8	Logic gates – universal gates
9	OP-AMP – Inverting & Non-inverting
10	Lee's Disc – Thermal conductivity

**Undergraduate Department of Chemistry**  
**Programme for B.Sc. Chemistry from 2015 batch**

SEM	Part	Course No.	Course Title	Hours	Credits	Marks
3	I	<b>TAM/FRE/HIN</b>		3	2	30
3	II	<b>ENG 2201</b>	Study Skills	3	2	30
3	IIIC	<b>CHE 2511</b>	Organic Chemistry - II	5	5	75
3	IIIC	<b>CHE 2513</b>	Inorganic Chemistry - III	5	5	75
3	IIIC	<b>CHE 2515</b>	Physical Chemistry - II	5	5	75
3	IIIC	<b>CHE 2431</b>	Inorganic Qualitative Analysis	4	4	60
3	IIIS	<b>MAT/BOT</b>	Mathematics / Botany	5	4	60
3	V		NSS/NCN/NCC/PED/SLP			
			<b>Total</b>	30	29	435
4	I	<b>TAM/FRE/HIN</b>		3	2	30
4	II	<b>ENG 2202</b>	Career Skills	3	2	30
4	IIIC	<b>CHE 2512</b>	Organic Chemistry - III	5	5	75
4	IIIC	<b>CHE 2514</b>	Inorganic Chemistry - IV	5	5	75
4	IIIC	<b>CHE 2516</b>	Physical Chemistry - III	5	5	75
4	IIIC	<b>CHE 2432</b>	Organic Estimation & Gravimetric Analysis	4	4	60
4	IIIS	<b>MAT/BOT</b>	Mathematics / Botany	5	4	60
4	V		NSS/NCN/NCC/PED/SLP			
			<b>Total</b>	30	29	435

Third Semester Supportive courses for Chemistry students

**MAT 2431** Maths for Chemistry – I

**BOT 2439** Botany for Chemists – I

Fourth Semester Supportive courses for Chemistry students

**MAT 2432** Maths for Chemistry – II

**BOT 2440** Botany for Chemists – II

**CHE 2511****Organic Chemistry–II****5 hr/5 cr**

This course will enable the students to learn and understand the concepts of aromaticity and basic nature of arenes, polynuclear hydrocarbons and halogen containing compounds. They will be able to comprehend the reactivity and physical nature of functional groups like alcohols, ethers, thiols, thioethers, epoxides and phenols.

**UNIT I: Aromaticity and Arenes**

Structure of benzene–Resonance model–MO picture–concept of aromaticity–Huckel’s rule, non-aromatic, antiaromatic

Arenes–Nomenclature of benzene derivatives–General methods of preparation–physical properties–chemical properties–orientation effect of substitution on electrophilic aromatic substitution–activating group, deactivating group, orientation and o/p ratio, energy profile diagram–free radical substitution–addition reaction–oxidation reaction–Birch reduction. Biphenyl–preparation and reactions.

**UNIT II: Polynuclear hydrocarbons**

Naphthalene–isomerism–orbital picture–synthesis–physical properties–chemical properties–electrophilic aromatic substitution–orientation of disubstitution–addition reaction–uses–naphthol and naphthylamine.

Anthracene–nomenclature and isomerism–synthesis–physical properties–chemical properties–reduction, electrophilic substitution reaction, oxidation, electrophilic addition reaction–anthraquinone.

Phenanthrene–synthesis–structure–properties.

**UNIT III: Haloalkanes and Haloarenes**

Classification and nomenclature of alkyl halides–Physical properties–Preparation and reactions of alkyl halides–Nucleophilic aliphatic substitution– $S_N^1$  and  $S_N^2$  mechanism and kinetics with energy profile– $E_1$  and  $E_2$  elimination–orientation–vinyl and allyl halide–preparation and property–Poly halogen compounds (chloroform, carbon tetrachloride, freons)–Preparation and reactions of aryl halides–nuclear and side chain reactions–Reactivity and orientation in aromatic substitution reactions–Benzyne mechanism–Relative reactivity of alkyl vs allyl, vinyl and aryl halides–Synthesis and uses of DDT, BHC

**UNIT IV: Alcohols, Thiols, Ethers, Thioethers and Epoxide**

Classification and Nomenclature–Monohydric alcohol–physical properties–synthesis of alcohols from alkenes via oxymercuration and demercuration, hydroboration, oxidation, reduction–Reactions of alcohols–distinction between  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols–hydrogen bonding–acidic nature of alcohols

Dihydric alcohol–physical properties–method of formation–chemical reaction–oxidative cleavage via lead tetraacetate and periodic acid–pinacol–pinacolone rearrangement.

Trihydric alcohol–method of formation–chemical reaction–glycerol, dynamite, cordite–Estimation of number of hydroxyl groups

Thiols–Preparation and chemical reactions of thiols–comparison with alcohols–mustard gas.

Ethers–Structure and nomenclature of ethers–physical properties–preparation–Williamson’s synthesis–Alkoxymercuration and demercuration–chemical reactions–cleavage and auto oxidation–analysis of ether–Ziesel’s method–crown ethers (brief introduction).

Thioethers–Preparation and chemical reactions.

Epoxides–synthesis–reactions–acid and base catalyzed ring opening of epoxides–orientation of cleavage of epoxide–reaction with Grignard and organolithium reagents.

**UNIT V: Phenols**

Classification and nomenclature of monohydric, dihydric and trihydric phenols–preparation of phenol–physical properties of phenol–acidic nature–comparison with alcohols–resonance stabilization of phenoxide ion–reactions of phenol as acid, reaction pertaining to -OH group and benzene ring of phenol–electrophilic aromatic substitution–Mechanism of Fries, Claisen rearrangement, Gattermann synthesis, Houben-Hoesch reaction, Lederer-Manasse reaction, Libermann Nitroso reaction, Kolbe reaction, Reimer-Tiemann reaction, phthalein reaction–Analysis of phenol.

**Textbook:**

1. Jain. M.K. and Sharma. S.C., Textbook of Organic Chemistry, Vishal publishing Co, 4<sup>th</sup> edition, 2014.

**References:**

1. Morrison and Boyd., Organic Chemistry, Pearson publication, 7<sup>th</sup> edition, 2003.
2. Mehta. B. and Mehta.M., Organic Chemistry, Prentice–Hall of India Private limited, 2007.
3. Soni. P.L. and Chawla. H.M., Textbook of Organic Chemistry, Sultan Chand and Sons, 28<sup>th</sup> edition, 2007.

**CHE 2513****Inorganic Chemistry-III****5 hr/5 cr**

This is a course intended to impart knowledge about the solid state, metallic bond and chemistry of nitrogen, chalcogen and halogen groups. This course also deals with the theory behind the laboratory course and aims at enriching student's analytical learning and skill.

**UNIT I: Solid state**

Crystalline and amorphous solids–characteristics of solid–symmetry in crystals–laws of crystallography–unit cell–space lattice–basic crystal systems–Bravais lattices–number of atoms per unit cell–interplanar spacing in a crystal system–Miller indices–X ray diffraction–Bragg equation, experimental methods  
Metallic Bond–Free electron and band theory–electrical properties of solids–super conductivity (elementary ideas only)

**UNIT II: Group V**

General characteristics–unique features of nitrogen–a comparative study of hydrides–preparations, properties and uses of  $N_2H_4$ ,  $NH_2OH$ ,  $HN_3$ –oxo acids of nitrogen–nitric acid–oxidising properties–structures of oxides and oxoacids of phosphorus and nitrogen–halides of phosphorus–phosphazines.

**UNIT III: Group VI**

Gradient in properties–oxidation state–differences between oxygen and other elements–chemistry of ozone and  $H_2O_2$ –oxides of sulphur–thionyl and sulphuryl chlorides–oxoacids of sulphur–sulphuric, permono, perdisulphuric acid– $SF_6$ ,  $SCl_2$ ,  $S_2Cl_2$ –preparation, properties and structures.



**UNIT IV: Group VII**

General characteristics–bond energies in  $X_2$  molecules–oxidising power–reaction with water–reactivity of elements–peculiarities of fluorine–hydrogen halides–properties–energy cycle showing their acid strength–oxides of halogens–structures–oxyacids of chlorine– strength of oxyacids of halogen–interhalogen compounds–poly halides–basic properties of halogens–pseudohalogens and pseudohalides.

**UNIT V: Analytical Chemistry-II**

Gravimetric method of analysis–principle–mechanism and desirable properties of precipitates–common ion effect–solubility and ionic product–gravimetric factor–particle size, purity of precipitate–types of precipitate–surface adsorption–occlusion–coprecipitation–post precipitation–precipitation from homogeneous solution–digestion–filtration–washing– drying and incineration–organic and inorganic precipitants–applications.

Evaluation of analytical data–Significant figures–types of error–sources and minimisation of errors–precision and accuracy– methods of expression–confidence limits– rejection of a result–Q test.

**Textbook:**

1. Puri. B.R., Sharma. L.R. and Kalia. K.C., Principles of Inorganic Chemistry, Milestone Publishers, 2012.

**References:**

1. Lee. J.D., Concise Inorganic Chemistry, Chapman & Hall, 5<sup>th</sup> edition, 2000.
2. Soni. P.L., Mohan Katyal, A Textbook of Inorganic Chemistry, Sultan Chand & Sons, 12<sup>th</sup> edition, 2006.
3. Day. R.A. Jr, Underwood. A.L., Quantitative analysis, Prentice Hall of India, New Delhi, 6<sup>th</sup> edition, 2006.
4. Mendham. J., Denney. R.C., Barnes. J. D., Thomas. M.J.K., Vogel's Textbook of Quantitative Chemical Analysis, Pearson Edu. Ltd, Singapore, 6<sup>th</sup> edition, 2000.

**CHE 2515****Physical Chemistry–II****5 hr/5 cr**

This course deals with the concepts and applications of thermodynamics. Properties of non-electrolytes along with colligative properties will be discussed.

**UNIT I: First law of Thermodynamics and Thermochemistry**

Terminologies–thermodynamic equilibria–extensive and intensive properties–heat and work–first law–internal energy–state functions–cyclic rules–reciprocal relation–enthalpy–heat capacity– $C_p$  and  $C_v$ –expansion of an ideal gas–isothermal expansion–adiabatic expansion–reversible and irreversible expansion–Joule Thomson effect– $\mu_{JT}$ –ideal gas coefficient–real gas coefficient–Zeroth law of thermodynamics–absolute temperature scale.

Change of internal energy in a reaction–heat of reaction– $q_p$  and  $q_v$ –standard enthalpy change–Kirchoff's equation–flame and explosion temperature–Hess's law and its applications–Bomb calorimeter–bond energies.

**UNIT II: Second law of Thermodynamics**

Limitations of I law–spontaneous process–cyclic process–Carnot cycle–entropy–second law of thermodynamics–entropy change in isothermal expansion of an ideal gas–entropy change in reversible and irreversible processes–phase change–calculation of entropy changes of an

ideal gas with change in P, V and T—entropy of mixing—standard entropy—physical significance of entropy—work and free energy functions—variation of T and P—Maxwell's relationship—criteria for reversible and irreversible process, Gibbs-Helmholtz equation, Open system—partial molar properties, Gibbs-Duhem equation, Clapeyron–Clausius equation, Fugacity and activity—activity coefficient, standard states.

### **UNIT III: Third law of Thermodynamics and Chemical equilibrium**

Nernst heat theorem—third law of thermodynamics—determination of absolute entropy—experimental verification of III law—entropies of real gases—entropy change in a chemical reaction—Boltzmann equation—residual entropy.

Spontaneous reactions—standard free energy changes—Chemical equilibrium—law of mass action—van't Hoff reaction isotherm— $K_p$  and  $K_c$ —Homogeneous equilibria—temperature dependence—van't Hoff equation—Heterogeneous equilibria—Le-Chatelier principle.

### **UNIT IV: Solutions of Non-Electrolytes**

Solutions of liquids in liquids—Raoult's law—vapour pressure of ideal solution—temperature-dependence of vapour pressure of a solution—volume change of mixing for an ideal solution—entropy change of mixing—vapour pressure of real (non-ideal) solution—binary solutions—fractional distillation—Azeotropic mixture—Lever rule and fractional distillation—immiscible liquids—steam distillation—partially miscible liquids—critical solution temperature—phenol-water system—aniline-hexane system—Nicotine-water system—Solutions of gases in liquids—factors influencing solubility of a gas—Henry's law.

### **UNIT V: Colligative property and Nernst Distribution law**

Colligative properties—vapour pressure lowering—osmotic pressure—theories of semi permeability—elevation of boiling point—depression of freezing point—abnormal results and van't Hoff factor—Nernst distribution law—application of Nernst distribution law—solvent extraction.

#### **Textbook:**

1. Puri. B.R., Sharma. L.R. and Pathania. M.S., Principles of Physical Chemistry, Vishal Publishing Co., 2014.

#### **References:**

1. Castellan. G.W., Physical Chemistry, Addison-Wesley, 3<sup>rd</sup> edition, 1983.
2. Atkins. P.W. and De Paula. J., Physical Chemistry, Oxford University press, 8<sup>th</sup> edition, 2008.
3. Glasstone. S., A Textbook of Physical Chemistry, Macmillan(India) Ltd, 1976.
4. McQuarrie. D.A., Simon. J.D., Physical Chemistry, University Science Books, 1996.

### **CHE 2431**

### **Inorganic Qualitative Analysis**

**4 hr/4 cr**

This is a laboratory course designed to improve the analytical skill of the students in the identification of the cations and anions in the mixture of inorganic salts.

A mixture of inorganic salts which contains two cations and two anions will be given. Among them, one of the anion must be an interfering ion.

**CHE 2411****Chemistry For Physicists–I****5(3+2) hr/4(3+1)cr**

There will be two components in this course. Theory component deals with atomic structure, properties, chemical bonding, elementary aspects of organic chemistry, basics of energetic, chemistry of solutions and fundamentals of titrimetry and chromatography. Lab component is to train the students to estimate volumetrically metal ions like iron, Manganese, magnesium, zinc.

**THEORY COMPONENT****(3hrs / week)****UNIT I: Atomic structure, Periodic properties and Chemical bonding**

Shapes of s, p and d orbitals–electronic configuration up to 30 elements–periodic properties–atomic size, ionization energy, electron affinity and electro negativity–Ionic bond–lattice energy–Born-Haber cycle–covalent bond–VSEPR model– $\text{BCl}_3$ ,  $\text{CH}_4$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ –atomic orbit overlap concept–hybridization– $\text{sp}^3$ ,  $\text{sp}^2$ ,  $\text{sp}$ –MO theory–MO diagram for  $\text{H}_2$ ,  $\text{He}_2$ ,  $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{F}_2$ .

**UNIT II: Basics of Organic Chemistry**

Tetravalent carbon–aliphatic and aromatic compounds–structure–functional groups–nomenclature–types of organic reactions–substitution, addition, elimination, oxidation, reduction, rearrangement reactions–reactive intermediates–carbocations, carbanions, free radicals–generations and their stability–hydrogen bond–types–consequences of hydrogen bonding.

**UNIT III: Energetics**

Spontaneous and non-spontaneous changes–criterion for spontaneity–Entropy–Second law of thermodynamics–measurement of entropy–free energy and chemical equilibrium–law of mass action–entropy change in phase transformation–Le-Chatelier principle–application of thermodynamics to biological systems.

**UNIT IV: Solution Chemistry**

Aqueous solution–acid-base equilibria– $\text{pK}_a$ ,  $\text{pK}_b$  and pH–Buffer solutions– Henderson equation–Solubility and  $K_{sp}$ –Types of solutions based on nature and amount of solvent/solute–determination of concentration of solutions expressed in various scales–percentage–molarity–molality and normality–diffusion in solutions–osmosis and osmotic pressure–measurement of osmotic pressure–isotonic solutions–reverse osmosis–significance of osmosis in biological systems.

**UNIT V: Analytical Chemistry**

Titrimetry–basic requirement for a titration–acid-base titrations–theory of acid-base indicators–redox titrations–complex metric titrations involving EDTA–metallochromic indicators.

Chromatography–introduction–classification of chromatographic techniques–paper chromatography–thin layer chromatography–column chromatography–principle and applications.

**LAB COMPONENT:****(2 hours / week)**

This course is intended for students to quantitatively estimate metal ions like iron, manganese, calcium, zinc etc.

1. Preparation of solutions
2. Estimation of Sodium Carbonate
3. Estimation of acetic acid in vinegar
4. Estimation of Manganese dioxide in pyrolusite
5. Estimation of Fe(II)-Permanganometry
6. Estimation of Fe(II)-Dichrometry/Internal indicator
7. Estimation of Fe(II)-Dichrometry/External indicator
8. Estimation of Zn (II)-Complexometry
9. Estimation of Ca (II)-Complexometry
10. Estimation of Hardness of water

**References:**

1. Chang. R., Chemistry, Tata-McGraw Hill, 1<sup>st</sup> Indian Edition, 2007.
2. Gopalan. R., and Sundaram. S., Fundamentals of Chemistry, Sultan Chand and Sons, 1988
3. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Inorganic Chemistry, Shobanlal Nagin Chand and Co, 1995.
4. Gopalan. R., and Sundaram. S., Allied Chemistry, Sultan Chand and Sons, 1993.
5. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Physical Chemistry, Vishal Publications, 1998.
6. Soni. P. L., Textbook of Organic Chemistry, Sultan Chand & Sons, 1998.

**CHE 2413****Chemistry For Zoologists-I****5(3+2) hr/4(3+1)cr**

There will be two components in this course. Theory component deals with atomic structure, chemical bonding, thermodynamics and solutions. It also deals the stereochemistry of organic compounds and photo chemistry. The objective of the lab component is to train the students to estimate volumetrically metal ions like iron, manganese, calcium, zinc.

**THEORY COMPONENT****(3hrs / week)****UNIT I: Atomic structure, Periodic properties and Chemical bonding**

Shapes of s, p and d orbitals, electronic configuration for elements up to atomic number 30– Periodic properties–atomic size, Ionization energy, electron affinity and electro negativity– ionic bond–covalent bond–coordinate covalent bond–weak interactions–vander Waals, hydrophobic, London, dipole-dipole, ion-dipole and hydrogen bond–Metallic bond–electron sea model.

**UNIT II: Nomenclature and Stereochemistry of Organic Compounds**

Classification of organic compounds–nomenclature of hydrocarbons–substituted hydrocarbons–Functional groups and their priority–isomerism–geometrical and optical–chirality–enantiomers and diastereoisomers–absolute and relative configuration–D/L, d/l, R/S, E/Z notations–examples–racemic mixture–mesocompound.

**UNIT III: Photochemistry**

Comparison between thermal and photochemical reactions, laws of photochemistry–quantum yield–fluorescence–phosphorescence–chemiluminescence–bioluminescence, common photochemical reactions–photosensitization and its application to biological systems–photosynthesis.

**UNIT IV: Thermodynamics**

First, Second, third laws of thermodynamics–spontaneous and non spontaneous changes, criterion for spontaneity, entropy–entropy change in phase transformation–free energy and chemical equilibrium–Le-Chatelier principle–application of thermodynamics to biological systems.

**UNIT V: Solution Chemistry**

Aqueous solution–acid-base equilibria– $pK_a$ ,  $pK_b$  and pH–Buffer solutions, Henderson equation–Solubility and  $K_{sp}$ –Types of solutions based on nature and amount of solute/solvent–determination of concentration of solutions expressed in various scales–percentage, molarity, molality and normality–diffusion in solutions–osmosis and osmotic pressure– isotonic solutions, reverse osmosis–significance of osmosis in biological systems.

**LAB COMPONENT****(2hrs / week)**

This course is intended for students to quantitatively estimate metal ions like iron, manganese, calcium, zinc.

1. Preparation of solutions
2. Estimation of Sodium carbonate
3. Estimation of Manganese Dioxide in Pyrolusite
4. Estimation of Fe(II)–Permanganometry
5. Estimation of Fe(II)–Dichrometry/Internal Indicator
6. Estimation of Fe(II)–Dichrometry/External Indicator
7. Estimation of Zn(II)–Complexometry
8. Estimation of Ca(II)–Complexometry
9. Estimation of Hardness of Water

**Textbook:**

1. Fisher. J. and Arnold. J.R.P., Instant notes in chemistry for biologists, Viva Books Private Ltd., Series editor B.D.Hames- Bio Scientific Publishers Ltd., 2002.

**References:**

1. Gopalan. R., Inorganic Chemistry for Undergraduates, Universities Press, 2009.
2. Jain. M.K. and Sharma. S.C., Modern Organic Chemistry–Vishal publishers, 2014.
3. Chang. R., Chemistry, Tata Mcgraw Hill Publishing Ltd, 2005.

**CHE 2512****Organic Chemistry–III****5 hr/5 cr**

This course is aimed at giving ample information on structure, reactivity, and properties of aldehydes, ketones, carboxylic acids, amines, nitro compounds and heterocyclic compounds. After the completion of this course, the students will be able to appreciate the mechanism and reactivity of these functional groups.

**UNIT I: Aldehydes and Ketones**

Structure and nomenclature (aliphatic and aromatic)–synthesis–aldehydes and ketones–with particular reference to the synthesis from acid chloride, nitriles, ozone, Grignard reagent, alkyne, carboxylic acids–relative reactivities of aldehyde and ketone–Reactions–mechanism of nucleophilic addition to carbonyl group with particular emphasis on condensation reactions–Benzoin, Aldol, Crossed Aldol (with special reference to acetaldehyde, crotonaldehyde, cinnamaldehyde), Perkin, Claisen-Schmidt, Knoevenagel reaction–condensation with ammonia and its derivatives, nitriles, nitroalkanes, alcohols–Wittig and Mannich reaction.

Oxidation of aldehyde–Baeyer-Villiger oxidation of ketones, Cannizzaro reaction–Reduction–Meerwein-Ponndorf-Verley, Clemmensen, Wolff-Kishner,  $\text{LiAlH}_4$ ,  $\text{NaBH}_4$ –Halogenation of enolizable ketones–Haloform reactions–introduction to  $\alpha,\beta$ -unsaturated aldehyde and ketones–Distinction between aldehyde/ketone and aliphatic/aromatic aldehyde (*mechanism not required for all the reactions*)

**UNIT II: Carboxylic acids and derivatives**

Structure, bonding and nomenclature (aliphatic and aromatic) –physical properties–acid strength and effect of substitution on acid strength–preparation and reactions of carboxylic acids–Hell-Volhard-Zelinsky reaction–reduction and decarboxylation–nucleophilic substitution at acyl carbon.

Preparation and chemical reactions of hydroxy acids–malic acid, tartaric acid, citric acid.

Acid derivatives–structure and nomenclature of acid chloride, ester, amides, acid anhydrides–relative strength of acyl derivatives–physical properties–Interconversion of acid derivatives by nucleophilic acyl substitution–preparation and chemical reactions of acid derivatives–Mechanism of esterification and hydrolysis(acid and base catalyzed).

**UNIT III: Amines and diazonium compounds**

Structure and nomenclature of amines–physical properties–separation of 1°, 2° and 3° amines–basicity of amines–preparation of alkyl and aryl amines–reduction of nitro, nitrile, reductive amination of aldehyde and ketonic compounds, Hofmann, Curtius, Lossen, Schmidt, Wolff rearrangement, Gabriel phthalimide reaction, Hofmann-bromamide reaction–Reactions of amines–alkylation, Schiff's reaction, electrophilic aromatic substitution in aryl amines, Schotten-Bauman reaction, reactions of amines with nitrous acid.

Synthesis and chemical reaction of aryl diazonium salts–Sandmeyer reaction, Gattermann reaction, Balz-Schiemann reaction, Gomberg reaction, azo coupling.

**UNIT IV: Nitro compounds and nitriles**

Nomenclature–acidity of nitroalkanes–preparation of nitroalkanes and nitroarenes–chemical reactions of nitroalkanes, nitroarenes and their reduction in acid, neutral and alkaline media–Picric acid.

Nomenclature- Preparation of alkane nitriles and iso-nitriles–chemical properties.

**UNIT V: Heterocyclic compounds**

Nomenclature–aromaticity of five and six membered heterocyclics–furan, pyrrole, thiophene, pyridine, piperidine–methods of synthesis- chemical reactions with special emphasis on mechanism of electrophilic and nucleophilic substitutions–comparison of basicity of pyridine, piperidine and pyrrole–condensed five and six membered heterocyclics- indole, quinoline, isoquinoline–synthesis with special reference to Fischer-indole, Skraup, Beilstein-Napieralski synthesis–mechanism of electrophilic substitution reaction of the above.

**Textbook:**

1. Jain. M.K. and Sharma. S.C., Textbook of Organic Chemistry, Vishal publishing Co, 4<sup>th</sup> edition, 2014.

**References:**

1. Morrison and Boyd., Organic Chemistry, Pearson publication, 7<sup>th</sup> edition, 2003.
2. Mehta. B. and Mehta.M., Organic Chemistry, Prentice–Hall of India Private limited, 2007.
3. Soni. P.L. and Chawla. H.M., Textbook of Organic Chemistry , Sultan Chand and Sons, 28<sup>th</sup> edition, 2007.
4. Finar. I.L., Organic Chemistry, ELBS publication, 7<sup>th</sup> edition, 1998.

**CHE 2514****Inorganic Chemistry- IV****5 hr/5 cr**

The objective of the course is to provide an in-depth knowledge of transition elements. This will enable the students to understand the details of bonding, reactivity, applications of coordination compounds and inorganic polymers.

**UNIT I: d-Block elements**

An introduction to the transition elements–electronic configuration–metallic character–variable valency–oxidation states–size of atoms–density–melting point–boiling point–reactivity–ionization energy–magnetic properties–color–catalytic properties–differences between first, second and third row transition elements–metallurgy of Cr, Fe, Ni and Au.

**UNIT II: Coordination chemistry-I**

Double salts–coordination compounds–coordination number and geometries–nomenclature–Werner’s theory–physical methods in the study of complexes–stability of complex ions–step-wise and overall stability constants–chelate effect–isomerism in coordination compounds–application of complexes.

**UNIT III: Coordination chemistry-II**

Bonding in complexes–Valence bond theory–shortcomings–Crystal field theory as applied to octahedral and tetrahedral complexes–CFT and magnetic properties–factors affecting CFSE–spectrochemical series–application of CFT- drawbacks–Jahn-Teller effect–term symbols–Orgel diagrams and electronic spectra of  $d^1$  and  $d^9$  ions.

**UNIT IV: Chemistry of transition metal compounds**

Titanium tetrachloride- vanadium pentoxide–chromous acetate–peroxo compounds of chromium–potassium dichromate–tungsten bronzes–tungsten blues–potassium permanganate–potassium ferrocyanide–Prussian blue–sodium nitroprusside–nickel-dmg complex–halides of silver–forms of Pt and Au–verdigris–mercurous compounds–Nessler’s reagent–alloys of Cu and Ni.

**UNIT V: Inorganic polymers**

Definition–special characteristics–glass transition temperature–solubility–classification–preparation, properties and uses of–boron nitride–silicones– polymeric sulphur nitride, chalcogenic glasses–polyphosphazene–borophosphate glass–coordination polymers– volan, quilon, metallophthalocyanine–factors affecting the formation of coordination polymers.

**Textbook:**

1. Puri. B.R., Sharma. L.R. and Kalia. K.C., Principles of Inorganic Chemistry, Milestone Publishers, 2012.

**References:**

1. Lee. J.D., Concise Inorganic Chemistry, Chapman & Hall, 5<sup>th</sup> edition, 2000.
2. Cotton. F.A., Wilkinson. G. and Paul. L.G., Basic Inorganic Chemistry, John Wiley and Sons, Singapore, 3<sup>rd</sup> edition, 2004.
3. James. E. Huheey, Keiter. E.A., Keiter. R.L., Inorganic Chemistry, Pearson Education (Singapore), Delhi, 4<sup>th</sup> edition, 2005.
4. Gopalan. R. and Ramalingam. V., Concise Coordination Chemistry, Vikas Publishing House, 2010.
5. Bhagi. A.K. and Chatwal. G.R., Inorganic Polymers, Himalaya Publishing House, Mumbai, 1<sup>st</sup> edition, 2001.

**CHE 2516****Physical Chemistry–III****5 hr/5 cr**

This course deals with electro chemistry, chemical kinetics, catalysis and ionic equilibrium. It also provides the student an overview of fuel cells.

**UNIT I: Electro Chemistry-I**

Electronic and electrical conductance–Faraday’s laws of electrolysis–conductance–cell constant– specific conductance–equivalent conductance–ionic mobility–Hittorf’s theory–transport number–and its determination–Kohlrausch’s law and its application–applications of conductance measurements–Debye-Huckel theory of strong electrolytes–Onsager equation(no derivation)–Debye-Falkenhagen effect and Wein effect–Activity and activity coefficient– ionic strength–Debye-Huckel Limiting Law (no derivation).

**UNIT II: Electro Chemistry–II**

Reversible and irreversible cells–EMF measurements–change in free energy and EMF–other thermodynamic parameters from EMF data–standard electrode potential–electrochemical series–various types of electrodes–metal, metal insoluble salts, gas and redox electrodes–chemical and concentration cells with and without transference–liquid junction potential and its determination–applications of EMF measurements–fuel cells and its construction and applications–overvoltage–determination of overvoltage–corrosion and passivity of metals–commercial cells and their principles.

**UNIT III: Chemical Kinetics–I**

Order and molecularity of a reaction–rate constant–factors influencing rate of a reaction–experimental determination of reaction rates–first order, second order, third order and zero order reactions–half-life periods–methods of determining order of a reaction– equilibrium and steady state approximation– effect of temperature on reaction rates–activation energy and its determinations–Arrhenius equation–theories of reaction rates–collision theory and its importance– evaluation of thermodynamic parameters.



**UNIT IV: Chemical Kinetics–II and Catalysis**

Lindemann theory of unimolecular reaction–consecutive and opposing reactions–chain reactions–Bronsted-Bjerrum equation–fast reactions–stop flow method–catalysis–types of catalysis–homogeneous and heterogeneous catalysis–characteristics of catalytic reactions–promoters–catalytic poisoning–negative catalysis–auto catalysis–activation energy and catalysis–theories of catalysis–generalized acid–base catalysis–enzyme catalysis–characteristics of enzyme catalysis.

**UNIT V: Ionic Equilibrium**

Various concepts of acid and bases–dissociation of polybasic acids–pH scale– common ion effect–buffer solution–buffer capacity–Henderson's equation–hydrolysis of salts–relationship between  $K_b$ ,  $K_a$  and  $K_w$ –degree of hydrolysis–acid-base indicators–theory of indicators–solubility–solubility product and its applications.

**Textbook:**

1. Puri. B.R., Sharma. L.R. and Pathania. M.S., Principles of Physical Chemistry, Vishal Publishing Co., 2014.

**References:**

1. Castellan. G.W., Physical Chemistry, Addison-Wesley, 3<sup>rd</sup> edition, 1983.
2. Atkins. P.W. and De Paula. J., Physical Chemistry, Oxford University press, 8<sup>th</sup> edition, 2008.
3. Glasstone. S., A Textbook of Physical Chemistry, Macmillan(India) Ltd, 1976.
4. McQuarrie. D.A., Simon. J.D., Physical Chemistry, University Science Books, 1996.
5. Laidler. K.J., Chemical Kinetics, Harper and Row, 3<sup>rd</sup> edn, 1987.
6. Bockris. J.O.M. and Reddy. A.K.N., Modern Electrochemistry, Plenum, 2<sup>nd</sup> edn, 1998.

**CHE 2432****Organic Estimation And Gravimetric Analysis****4 hr/4 cr**

In this course students will be trained in the quantitative estimation of organic compounds like glucose, phenol, aniline, amino acids and formaldehyde and the gravimetric estimation of cations. This course also includes purification techniques of organic compounds.

**I–ESTIMATION OF ORGANIC COMPOUNDS**

- Aniline/ Phenol
- Glucose
- Glycine
- Formaldehyde

**II–PREPARATION OF ORGANIC COMPOUNDS**

- Benzoic Acid
- Oxime

**III–GRAVIMETRIC ESTIMATION OF CATIONS**

- $Ba^{2+}$  as barium chromate
- $Pb^{2+}$  as lead chromate
- $Ca^{2+}$  as calcium oxalate
- $Ni^{2+}$  as Ni-DMG
- $Cu^{2+}$  as copper thiocyanate

**CHE 2412****Chemistry For Physicists–II****5(3+2) hr/4(3+1)cr**

There will be two components in this course. Theory component deals with chemical kinetics, thermo-chemistry, basic concepts of coordination chemistry, stereochemistry and elementary ideas on carbohydrates, amino acids and proteins. Lab component is to train the students in the qualitative analysis of inorganic salts.

**THEORY COMPONENT****(3hrs / week)****UNIT I: Chemical Kinetics and Catalysis**

Rate, order and molecularity of a reaction–rate constant–rate equations–First, second and zero order reactions–half life time of a reaction–methods of determining order of a reaction–effect of temperature on reaction rate–activation energy–Arrhenius equation–Catalysis–enzyme catalysis–Michaelis-Menten hypothesis and its applications.

**UNIT II: Thermochemistry**

Internal energy changes in a chemical reaction–Changes of enthalpy in a chemical reaction–enthalpy of reaction at constant volume and at constant pressure–enthalpy of combustion, neutralization, dissociation, formation–Kirchoff's equation–Hess's law and its applications–Bomb Calorimeter.

**UNIT III: Co-ordination Chemistry**

Coordination compounds–shapes of d-orbitals–Werner's theory–coordination number–important ligands–nomenclature–concept of EAN–Pauling's theory–CFT–CFSE–crystal field splitting in Octahedral field–spectrochemical series–chelation–application of complexes in qualitative–volumetric and gravimetric analysis.

**UNIT IV: Stereochemistry**

Stereochemistry and stereoisomerism–tetrahedral carbon–optical activity–plane polarized light–polarimeter–specific rotation–chiral centres–enantiomers and optical activity–specification of R and S configurations–diastereomers–meso structures–racemic modification–resolution–Geometrical isomers–E/Z nomenclature.

**UNIT V: Carbohydrates, Amino acids and Proteins**

Classification of carbohydrates–Monosaccharide–Glucose, fructose–preparation, properties and structure (no structure elucidation)–mutarotation–Disaccharide–sucrose–properties, preparation and structure–General study of polysaccharides–Starch and cellulose. Classification and preparation of amino acids–general reactions–Dipeptides–synthesis–structure and types of proteins.

**LAB COMPONENT****(2 hours / week)**

This course is intended for students to qualitatively analyze the simple salts containing the following cations and anions.

Cations: Pb(II), Cu(II), Cd(II), Bi(III), Fe(II), Mn(II), Ni(II), Co(II), Zn(II), Mg(II) and  $\text{NH}_4^+$   
Interfering Anions: Oxalate, tartrate, borate, fluoride, and phosphate.

**References:**

1. Chang. R., Chemistry, Tata-McGraw Hill, 1<sup>st</sup> Indian Edition, 2007.
2. Gopalan. R., and Sundaram. S., Fundamentals of Chemistry, Sultan Chand and Sons, 1988
3. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Inorganic Chemistry, Shobanlal Nagin Chand and Co, 1995.
4. Gopalan. R., and Sundaram. S., Allied Chemistry, Sultan Chand and Sons, 1993.
5. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Physical Chemistry, Vishal Publications, 1998.
6. Soni. P. L., Textbook of Organic Chemistry, Sultan Chand & Sons, 1998.

**CHE 2414****Chemistry For Zoologists–II****5(3+2) hr/4(3+1)cr**

There will be two components in this course. Theory component deals with chemical kinetics, catalysis, spectral techniques, and metals in biology. It also deals with basic organic reactions and purification methods. Lab component is to train the students in the qualitative analysis of inorganic salts.

**THEORY COMPONENT****(3hrs / week)****UNIT I: Basic Organic Chemistry**

Types of bond fission–Reagents–electrophile, nucleophile, free radical–Reactive intermediates and their stability–carbocations, carbanions, free radicals–Types of organic reactions–substitution, addition, elimination, oxidation, reduction and rearrangement reactions.

**UNIT II: Chemical Kinetics and Catalysis**

Reaction rate–Order and Molecularity–determination of order, half-life period and its application in biology–Enzyme catalysis–Michaelis-Menton kinetics–Inhibition–Bio-chemical applications–Catalysis and Activation energy–thermodynamic and kinetic control.

**UNIT III: Metals in Biology**

Essential and Non-essential elements–Biological role–Hemoglobin, Vitamin B<sub>12</sub>. Chlorophyll, Ion pump–Medicinal role–Calcium, Platinum, Lithium, Silver, Gold–Metal toxicity–Mercury, Lead, Chromium.

**UNIT IV: Purification of Organic Compounds**

Criteria for purity–Effect of impurity on physical properties and their application in biology–Methods of purification and their basis–Crystallization, Sublimation, Extraction with solvent, Soxhlet, Distillation–Simple, Steam, Fractional and Reduced pressure–Chromatography–Column, TLC and Paper.

**UNIT V: Basic Spectral Techniques**

Electromagnetic Spectrum–quantization of energy–regions of the spectrum–UV-Vis, spectrophotometry–Beer-Lambert law, electronic transition, spectral representation, chromophore and uses in biology–Infra red spectrophotometer–molecular vibrations, infrared spectrum and uses in biology–NMR–nuclear spin, nuclei with spin, NMR spectrum, chemical shifts, coupling constants, relaxation and applications in biology–Mass spectrometry–basic experiment, ion analysis, mass spectrum and ionization techniques.

**LAB COMPONENT****(2hrs / week)**

This course is intended for students to qualitatively analyze the simple salts containing the following cations and anions.

Cations—Pb(II), Cu(II), Fe(II), Mn(II), Ni(II), Co(II), Zn(II), Ca(II), Mg(II) and  $\text{NH}_4^+$

Interfering Anions—oxalate, tartrate, borate, fluoride, phosphate.

**Textbook:**

1. Fisher. J. and Arnold. J.R.P., Instant notes in chemistry for biologists, Viva Books Private Ltd., Series editor B.D.Hames- Bio Scientific Publishers Ltd., 2002.

**References:**

1. Jain. M.K. and Sharma. S.C., Modern Organic Chemistry—Vishal publishers, 2014.
2. Bhattacharya. P.K., Metal Ions in Biochemistry, Narosa Publishing House Pvt.Ltd., 2005.

**CHE 1463****Chemistry For Botanists–I****5(3+2) hr/4(3+1)cr**

There will be two components in this course. The objective of the lab component is to train students to estimate the metal ions volumetrically.

**THEORY COMPONENT****(3 hours / week)****UNIT I: Atomic Structure and Periodic properties**

Atom-Atomic number–Build-up of elements–Hunds' rule–sequence of energy levels–Arrangement of elements in periodic table–Electronic configuration (upto  $Z=30$ )–Definition–atomic size, Ionization energy, electro affinity, electronegativity.

**UNIT II: Chemical bonding**

Octet rule–Ionic bond-examples and properties–Covalent bond–Shapes of s, p and d orbitals–A.O overlap concept of  $\sigma$  and  $\pi$  bond–Coordinate bond–Weak interactions–vander Waal's, hydrophobic, London, dipole-dipole and ion-dipole–Hydrogen bond-types–importance–metallic bond–electron sea model.

**UNIT III: Basics of Organic Chemistry**

Tetravalent Carbon–Aliphatic and Aromatic compounds–Hybridization– $sp^3$ ,  $sp^2$ ,  $sp$ –Functional groups–nomenclature–types of organic reactions–oxidation, reduction, substitution, addition, elimination–rearrangement.

**UNIT IV: Solution Chemistry**

Aqueous solution–Acid-Base equilibria– $pK_a$ ,  $pK_b$  and pH–Buffer solutions–Types of solutions–based on nature and amount of solute/solvent–Determination of concentration of solutions expressed in various scales–percentage, molarity, molality, normality and ppm.

**UNIT V: Chemistry of Biomolecules**

Introduction, classification, synthesis, chemical properties and biological interests of amino acids–Structure and applications of protein–nucleic acids–Introduction and classification of carbohydrates–D/L configuration–Manufacture of Glucose and Sucrose.

**LAB COMPONENT****(2 hours / week)**

This course is intended for students to quantitatively estimate metal ions like iron, manganese, calcium, zinc etc.

1. Preparation of solutions
2. Estimation of  $\text{Na}_2\text{CO}_3$
3. Estimation of Fe(II)-Permanganometry
4. Estimation of Fe(II)-Dichrometry/Internal indicator
5. Estimation of Fe(II)-Dichrometry/External indicator
6. Determination of Acetic acid in Vinegar
7. Determination of percentage purity of pyrolusite
8. Estimation of Zn (II)-Complexometry
9. Estimation of Ca (II)-Complexometry
10. Estimation of Hardness of water

**Textbook:**

1. Fisher. J. and Arnold. J.R.P., Instant notes in chemistry for biologists, Viva Books Private Ltd., Series editor B.D.Hames- Bio Scientific Publishers Ltd., 2002.

**References:**

1. Gopalan. R., and Sundaram. S., Fundamentals of Chemistry, Sultan Chand and Sons, 1988
2. Gopalan. R., and Sundaram. S., Allied Chemistry, Sultan Chand and Sons, 1993.
3. Gopalan. R., Inorganic Chemistry for Undergraduates, Universities Press, 2009.
4. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Inorganic Chemistry, Shobanlal Nagin Chand and Co, 1995.
5. Bahl. B. S. and Arun Bahl, A textbook of Organic Chemistry, S. Chand and Co., 1989.
6. Soni. P. L., Textbook of Organic Chemistry, Sultan Chand & Sons, 1998.
7. Bahl. B. S. and Arun Bahl, A textbook of Physical Chemistry, S. Chand and Co., 1989.
8. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Physical Chemistry, Vishal Publications, 1998.

**CHE 1464****Chemistry For Botanists–II****5(3+2) hr/4(3+1)cr**

There will be two components in this course. Theory part deals with atmosphere, water, soil, food, phyto and photo-chemistry. The objective of the lab component is to train the students for qualitative analysis of inorganic salts.

**THEORY COMPONENT:****(3 hours / week)****UNIT I: Atmospheric Chemistry**

Atmosphere structure–composition of atmosphere–particulates–types and formation–Chemical and photochemical reactions in atmosphere–Oxygen and ozone chemistry–Greenhouse effect and global warming–Acid rain–Photochemical smog.

**UNIT II: Water Chemistry**

Water Pollution–Control of pollution–DO–OD–COD–BOD–Reverse Osmosis–Deioniser–Hard water–water in crystals–Hygroscopy and deliquescence–efflorescence–Soft water–permanent and temporary hardness–removal of hardness–potable water–standards of drinking water (WHO)–algal bloom.

**UNIT III: Soil Chemistry**

Importance of soil–composition and types of soil–pH of soil–Acidity & alkalinity and their causes (6 causes)–Emphasis towards industrial waste–Radioactive pollutants– Agricultural pesticides–Soil pollution by soluble salts.

**UNIT IV: Food Chemistry**

Physical and Chemical properties of natural fats and oils–scope of food and vegetables preservation–additives–flavours–synthetic and natural colorants–Principles and methods of preservation.

Milk–Types, composition, chemical analysis, adulteration and checks for purity–pasteurization–value added milk products (cheese, paneer and ghee).

**UNIT V: Photochemistry**

Laws of photochemistry–quantum yield–Fluorescence–Phosphorescence–Chemiluminescence–Bioluminescence–Photosensitization and its application to biological systems–photosynthesis.

**LAB COMPONENT:****(2 hours / week)**

This course is intended for students to qualitatively analyse the simple salts containing the following cations and anions.

Cations: Pb(II), Cu(II), Cd(II), Bi(III), Fe(II), Mn(II), Ni(II), Co(II), Zn(II), Mg(II) and  $\text{NH}_4^+$

Interfering Anions: Oxalate, tartrate, borate, fluoride, and phosphate.

**Textbooks:**

1. Anil Kumar De, Environmental Chemistry, Wiley Eastern Ltd., Second Edition, 1992.
2. Kaur. H., Environmental Studies, Pragati Praksahan, First edition, 2005.

**References:**

1. Gopalan. R., and Sundaram. S., Fundamentals of Chemistry, Sultan Chand and Sons, 1988
2. Sodhi. G. S., Fundamental concepts of Environmental Chemistry, Narosa Publications House, New Delhi, 2002.
3. Bahl. B. S. and Arun Bahl, A textbook of Organic Chemistry, S. Chand and Co., 1989.
4. Soni. P. L., Textbook of Organic Chemistry, Sultan Chand & Sons, 1998.
5. Sharma. B. K., Industrial Chemistry, Goel Publishing and Co., 1995.
6. Chang. R., Chemistry, Tata McGraw Hill Publishing Ltd., 2005.

**Department of Undergraduate Botany**  
**B.Sc. – Botany Programme (CBCS)**  
 (With effect from June 2015)

Sem.	Part	Course No.	Course Title	Hr.	Cr.	Marks
1	I	***12XX	TAM/HIN/FRE	3	2	30
	II	ENG1201	Conversational Skills	3	2	30
	IIIC	BOT1531	Ecology	5	5	75
	IIIC	BOT1433	Learning Basic Skills In Biology(LBSB)	4	4	60
	IIIC	BOT1435	LAB I (Ecology and LBSB)	4	4	60
	IIIS	CHE14XX	Chemistry for Botanist -1	3+2L	3+1	45+15
	IVE	***12XX	Basic Tamil/Adv.Tamil/Non-Major	3	2	30
	IVLS	***12XX	Life Skill -1	3	2	30
	V	***11XX	NCA/NCN/NSS/PED/SLP		-	
			<b>Total</b>	<b>30</b>	<b>25</b>	
2	I	***12XX	TAM/HIN/FRE	3	2	30
	II	ENG1202	Reading and Writing Skills	3	2	30
	IIIC	BOT1532	Economic Botany	5	5	75
	IIIC	BOT1434	Horticulture Practices and Post-Harvest Technology (HPPHT)	4	4	60
	IIIC	BOT1436	LAB II (Economic Botany and HPPHT)	4	4	60
	IIIS	CHE14XX	Chemistry for Botanist - 2	3+2L	3+1	45+15
	IVE	***12XX	Basic Tamil/Adv.Tamil/Non-Major	3	2	30
	IVLS	***12XX	Life Skill -2	3	2	30
	V	***11XX	NCA/NCN/NSS/PED/SLP		1	
			<b>Total</b>	<b>30</b>	<b>25+1</b>	
3	I	***22XX	TAM/HIN/FRE	3	2	30
	II	ENG2201	Study Skills	3	2	30
	IIIC	BOT2531	Microbiology and Phycology	5	5	75
	IIIC	BOT2533	Archegoniatae	5	5	75
	IIIC	BOT2335	Genetics and Plant Breeding	3	3	45
	IIIC	BOT2637	LAB III (Micro+Arche +Genetics)	2+2+2	6	90
	IIIS	ZOO24XX	General Zoology-I	3+2L	3+1	45+15
	V	***21XX	NCA/NCN/NSS/PED/SLP			
			<b>Total</b>	<b>30</b>	<b>27</b>	
4	I	***22XX	TAM/HIN/FRE	3	2	30
	II	ENG2202	Career Skills	3	2	30
	IIIC	BOT2532	Mycology and Pathology	5	5	75
	IIIC	BOT2434	Cell Biology	4	4	60
	IIIC	BOT2436	Anatomy and Reproductive Biology of Angiosperms (ARBA)	4	4	60
	IIIC	BOT2638	LAB IV (Myco+Cellbio+ARBA)	6	6	90
	IIIS	ZOO24XX	General Zoology II	3+2L	3+1	45+15
	V	***21XX	NCA/NCN/NSS/PED/SLP		1	
			<b>Total</b>	<b>30</b>	<b>27+1</b>	

Sem.	Part	Course No.	Course Title	Hr.	Cr.	Marks
5	IIIC	BOT 3631	Plant Systematics	6	6	90
	IIIC	BOT3633	Biochemistry	6	6	90
	IIIC	BOT3535	Analytical Techniques and Research Methodology	5	5	75
	IIIC	BOT3637	LAB – V (Systematics + Biochem)	3+3	6	90
	IVLS	***32XX	Life Skill - 3	3	2	30
	IVEVS	BOT 3241	Environment Studies	4	2	30
				<b>30</b>	<b>27</b>	
6	IIIC	BOT3832	Plant Biotechnology (Lab cum Theory)	5+3L	8	75+45
	IIIC	BOT3434	Entrepreneurial Botany	4	4	60
	IIIC	BOT3536	Bioresource Management	5	5	75
		BOT3538	Botany Project			
	IIIC	BOT3642	Plant Physiology (Lab cum Theory)	4+2L	6	60+30
	IVLS	***32XX	Life Skill IV	3	2	30
	IVVE	VAL32XX	Value Education	4	2	30
			<b>Total</b>	<b>30</b>	<b>27</b>	

### Supportive Courses (Lab Cum Theory Courses)

Semester	Part	Course No.	Course Title	Hr.	Cr.	Marks
1	IIIS	BOT1437	Plant Biology I	3+2L	4	45+15
2	IIIS	BOT1438	Plant Biology II	3+2L	4	45+15
3	IIIS	BOT 2439	Botany for Chemists– I (Theory cum Lab	3+2L	4	45+15
4	IIIS	BOT2440	Botany for Chemists II (Theory cum Lab)	3+2L	4	45+15

### Life Skill Courses

Semester	Part	Course No.	Course Title	Hr.	Cr.	Marks
1	IVLS	BOT1231	Mushroom Culture Technology	3	2	30
2	IVLS	BOT1236	Nursery and Gardening	3	2	30
5	IVLS	BOT3239	Medicinal Botany	3	2	30
6	IVLS	BOT3240	Biofertilizer and Bio-Pesticide	3	2	30

### Non Major Courses

Semester	Part	Course No.	Course Title	Hr.	Cr.	Marks
1	IVE	BOT1233	Food and Nutrition	3	2	30
2	IVE	BOT1238	Plant Wonders	3	2	30



BOT 2531

Microbiology and Phycology

5hr/5cr

**Preamble:**

This course provides an overview of the diversity of microbial life forms to the students. Structure and functions of selected prokaryotic organisms and algae will be dealt in detail. The course introduces students to monera and protista of the five kingdoms, and proceeds with the milestones in the history of microbiology and phycology and contributions of eminent scientists. Viruses will be dealt separately with emphasis on the diseases caused by them to plants and animals. The unit on bacteria will have methods to isolate and study them in the lab and their patterns of growth and nutrition. The variations and pigmentation characteristics of prokaryotic, photosynthetic cyanobacteria will be dealt. Pitching discussions on selected forms in the cyanobacterial link between the heterotrophs and autotrophs will be explored.

**Objectives:**

1. Students will be able to comprehend the life and processes of prokaryotic organisms from viruses to algae which are the earliest photosynthetic forms.
2. Besides evolution and conservation aspects, commercial aspects of members will add the utility value for the course.

**Unit 1: Introduction**

Classification of life forms: Five kingdom and 3 domain- the advent of microbiology, (A. V. Leeuwenhoek, L. Pasteur and Robert Koch) and phycology (F E Fritsch and MOP Iyengar) - diversity based on habitat - isolation techniques for microbes (serial dilution and pour plate).

**Unit 2: Viruses**

Viruses: Discovery, DNA virus (T-phage), lytic and lysogenic cycle- RNA virus (HIV)- comparison of plant and animal viruses – common human viral diseases.

**Unit 3: Bacteria and Cyanobacterium**

Prokaryotic organisation: morphotypes, structure; nutritional types. A brief Introduction to Bergeys system of classification. Growth curve and measurements, Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction).

Cyanobacteria - Exomorphic variations, pigmentation, biological nitrogen fixers, Reproduction and adaptations.

**Unit 4: Algae**

General characteristics, major groups of algae - life-cycles of Caulerpa (Chlorophyta), Sargassum (Phaeophyta) and Gelidium (Rhodophyta).

**Unit 5: Economic Importance**

Harmful and beneficial microbes: microbial products – antibiotics (Streptomycin), vaccines (Rabies) and fermentation products - food spoilage. Biofertilizers & biopesticides, Agar, Carrageenan - Diatomite – Biofuel - large scale cultivation of algae.

**References:**

1. Pelczar, H.J. E.C.S. Chan and N.R. Kreig. (1993). Microbiology concepts and applications. Tata McGraw Hill Inc. ISBN 0-07-049234-4
2. Prescott, L.M., Harley J.P., Klein D. A. (2008). Microbiology. McGraw Hill, India. 6th edition. ISBN 0071267271
3. Bold, H.C and Wynne. M.J. (1978). Introduction to the algae: Structure and reproduction. Prentice-Hall. ISBN 0134777867
4. Kumar, H.D. (1988). Introductory Phycology. East West press. ISBN: 81-859-3896-2
5. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition. ISBN: 978-0-521-14144-4
6. Ion Morris. (1971). An Introduction to the Algae. Hutchinson University Library. London. ISBN: 0-090-80713-8
7. Dubey, R.C. and Maheswari, D.K. (2013) A Textbook of Microbiology, S. Chand & Comp. ISBN 81-219-2620-3
8. Sharma, O.P. (2007). Textbook of algae. Tata McGraw Hill, India ISBN 0-07-451928.

**BOT 2533****ARCHEGONIATAE****5hr/5cr****Preamble:**

This course will help the student to understand the evolutionary process in plant kingdoms which will commence from algal form. It seeks to give an account of plants of plant adaptations from aquatic condition to a colonized terrestrial habitat. The changes in morphological, anatomical and reproductive structures that propel plant evolution will be investigated. In nutshell the course will trace evidences of plant evolution from extinct and extant plants.

**Objectives:**

1. To trace the evolutionary trend of land plants.
2. To guide students to travel across geological time scale and appreciate the prehistoric evidences of life forms.

**Unit 1: Morphological and life-cycle changes of typical land plants:**

General adaptations to terrestrial habitats (morphological and anatomical characters for heterotrichous habit) - evolution of plant sex organs:- (Antheridium, Oogonium with respect to sterile protective covering, archegonium, ovule).

**Unit 2: Bryophytes:**

Classification and Salient features; Introduction to Hepaticopsida, Anthocertopsida and Bryopsida, Morphology, anatomy and reproduction of Riccia, Anthoceros and Funaria. Ecological importance.

**Unit 3: Pteridophytes:**

Classification and Salient features; Introduction to Lycopsidea, Sphenopsida and Filicopsida, Heterospory and seed habit. Morphology, anatomy and reproduction of Lycopodium

**Unit 4: Gymnosperms:**

Classification and Salient features; Introduction to Cycadopsida, Coniferopsida, Gnetopsida, Morphology, anatomy and reproduction of *Pinus*. Economic importance.

**Unit 5: Evolution of land plants:**

Paleoclimatic changes across the Geological time zones. Fossilization and fossil types ( Impression, compression, Petrifaction, cast, coal ball) - mega extinction - Origin of angiosperm.

**References:**

1. Muller,W,H. (1979). Botany: A functional approach, Collier Mac Millan ISBN 0-02-979440-4
2. Rashid,A.( 1998). An Introduction to Bryophytes, Vikas Publishers Co. New Delhi. ISBN: 81-259-0569-3
3. Rashid,A.(1982). An Introduction to Pteridophyta, Vikas Publishers Co. New Delhi. ISBN: 81-259-0709-2
4. Vasishtha, P. C. (2006). Gymnosperms. S. Chand & Company New Delhi. ISBN 81-219-2618-1
5. Willis,K.J and McElwain.J.C (2002). The Evolution of Plants. Oxford University Press. ISBN 0-19-850065-3
6. Pandey, B. P. (2005). College Botany, Vol I. 5<sup>th</sup> Edn., S. Chand & Company New Delhi. ISBN 81-219-0593-1
7. Pandey, B. P. (2009). College Botany, Vol II. 7<sup>th</sup> Edn., S. Chand & Company New Delhi. ISBN 81-219-0601-6

**BOT 2335****Genetics and Plant breeding****3hr/3cr****Preamble:**

The course introduces the basics of genetics dealing with inheritance of characters, about principles pertaining to plant breeding and crop improvement.

Starting from the basic rules drawn from Mendels experiments, the idea of chromosomal theory of inheritance will be introduced that with this foundations students will be able to study applied studies, with real time examples. It will help them to understand DNA as the genetic material. The unit on population genetics will brief about the mutations, genetic drift and chances for speciation. Basics of plant breeding and traditional methods in crop improvement will be discussed citing regional examples. Discussion on plant breeding and crop improvement will not be exhaustive, but the content would suffice the learner to apprentice the need for breeding, conservation and management of genomes of useful plant stocks.

**Objectives:**

1. Students should be able to understand the science of inheritance of characters and reasons behind the variations noticed in the population.
2. They should be able to appreciate the importance of plant resources, need to develop hybrid varieties and to conserve them for the future generation.

**Unit 1: Fundamentals of genetics**

Mendel's experiment, laws of inheritance. Gene interactions- dominant epistasis, complementary gene, multiple allele inheritance ( human blood group), and polygenic interactions (ear length in Maize). Sex linked inheritance (color blindness).

**Unit 2: Chromosomal structure and inheritance**

Chromosome organization – types of chromosomes, sex chromosome, Sex determination in human and plants (*Melandrium*), chromosomal aberrations, linkage and mechanism of crossing over.

**Unit 3: Population genetics**

Hardy-Weinberg Law, penetrance and expressivity, spontaneous and induced mutation, mutagens, genetic drift and erosion. Introduction to speciation, Pedigree and family tree.

**Unit 4: Plant breeding**

Objectives - Qualitative and quantitative characters. Conventional methods of selection and hybridization. Traditional breeding programmes in Rice and Brinjal.

**Unit 5: Crop improvement issues**

Farmer's and breeder's rights. Crop improvement for resistant, tolerant and high yielding varieties. Plant genetic resources of India- Germplasm centres.

**References:**

1. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition. ISBN 0470388250
2. Klug, W.S., Cummings, M.R., Spencer, C.A. (2007). Concepts of Genetics. Pearson Education. 7th edition. ISBN 813170811X
3. Sinnott, E.W., Dunn, L.C. and Dobzhansky, T. (2004). Principles of Genetics. Tata Mc Graw Hill. ISBN : 0-07-099-413-7.
4. Singh, B.D. (2014). Plant Breeding- Principles and methods. Kalyani Publishers.
5. Ahluwalia, K.B. (2009). Genetics, 2edn. New Age International Publishers. ISBN 978-81-224-2390-7
6. Chahal, G.C and Gosal, S.S (2002) Principles and Procedures of Plant Breeding. Narosa Publishing House. ISBN 81-7319-374-6

**BOT 2637****Lab III****6 hr/ 6cr****A -- Microbiology and Phycology****2hrs/wk****I - Microbiology**

1. Good laboratory practices and observation of ubiquitous presence of microbes
2. Microscope and Simple Staining techniques
3. Gram staining
4. Media preparation & sterilization techniques
5. Microbial isolation from natural habitat – Serial Dilution
6. Smear, spread and pour plate & streaking techniques
7. Microbial analysis of legume root nodules

**II - Phycology**

1. Observation of common Cyanobacteria and algae from field
2. Microscopic green algae - Volvox and Spirogyra
3. Macro Green algae - Caulerpa and Chara
4. Brown algae – Sargassum
5. Red algae : Batrachospermum and Gracilaria
6. Mass Cultivation of Algae – Spirulina

**Outstation study:**

1. Visit to Aavin dairy – food microbiology & industrial unit
2. Field trip to Rameswaram (CMFRI) – marine algal collection

**References:**

1. Gunasekaran, P. (2000). Laboratory manual in microbiology, New Delhi
2. Cappuccino, J.G. and Sherman, N.(2002). Microbiology: a laboratory manual 6<sup>th</sup> ed. Pearson Education Ltd. Singapore.

**B - Archegoniatae****2hr/wk**

1. Panoramic view of archegoniates : whole mount and charts
2. Liver worts and thalloid bryophytes: vegetative and reproductive features of Riccia
3. A study on mosses based on Funaria/Polytrichum
4. Study of Lycopodium – sectional view of stem
5. Study of Selaginella highlighting heterospory
6. Ecological adaptations of Equisetum: Study of shoot and strobilus
7. Collection and study of locally available Pteridophytes
8. Morphology, rachis, pinna & sori of a fern
9. *Pinus*– vegetative and reproductive structures
10. Plant evolution I –activity based learning with Geological time scale
11. Plant evolution II – study of fossils (preferably with a field visit to Ariyalur)
12. Visit to hill station

**References:**

- Bendre, A. M., and Kumar, A. (2006). A text book of practical botany. (Vol I). Rastogi Publication New Delhi. ISBN 81-7133-809-7
- Bendre, A. M. and Kumar,A. (2006). A text book of practical botany. (Vol II) Rastogi Publication New Delhi. ISBN 81-7133-852-6

**C - Genetics and Plant breeding****2hrs/wk***Genetics*

1. Verification of Mendel's law – I ( Monohybrid ,test and back crosses)
2. Verification of Mendel's law - II (Dihybrid cross)
3. Gene interactions – problem solving
4. Study of Mendelian traits in human
5. Barr bodies & Giant chromosome - Chironema
6. Blood grouping- multiple alleles
7. Probability test – beads/coin/dice
8. Chromosome mapping
9. Drosophila experiment

*Plant breeding*

10. Collection and submission of local rice / vegetable cultivars
11. Determination of seed viability
12. Method of emasculation – pollen dusting and bagging
13. Visits - Cotton, millet, sugarcane research centres (Coimbatore), Banana Research Centre (Trichy), National facilities - NBPGR, ICRISAT.

**Reference**

1. Gardner, E.J., Simmon, M.J and Snustad .D.P. (1991) . Principles of Genetics. John Willey and Son (Asian) Ltd. Singapore. ISBN:0-471-50487-4
2. Stansfield, W.D. (1991). Theory and problems of Genetics. 3<sup>rd</sup> ed. McGraw Hill Inc. ISBN 0-07-060877-6
3. Chahal, G.C and Gosal, S.S (2002) Principles and procedures of Plant breeding. Narosa Publi. House. ISBN 81-7319-374-6

**BOT 2439****Botany for Chemists– I**  
(Lab cum Theory)**(3+2)hr /(3+1)cr**

**PREAMBLE:** This course is designed for the chemistry students as a major supportive course, hence a basic understanding of plant forms and functions are dealt. A general understanding of the abuse of earth's natural resources particularly hazards that the plants face due to habitat destruction and global climate change will be taught. Chemical composition and the uses of plant nutrient are informed.

**Objectives:**

1. To introduce a few representatives of plant kingdom in order to give a comprehensive picture of plant diversity.
2. To highlight the inorganic and organic chemicals that actively participate in plant growth and metabolism.

**Unit 1: An overview of plant groups:**

Salient features of Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

**Unit 2: Cell as the basic entity:**

Prokaryotic and eukaryotic cells, endosymbiosis, chemistry of cell wall and plasma membrane, Structure and function of chloroplast and mitochondria.

**Unit 3: Nucleus:**

Organization – nucleic acids and chromosome – functions of nucleus.

**Unit 4: Plant – water and plant - carbon relations:**

Biological significance of water molecule (uptake and conduction). Photosynthesis (light reaction and carbon assimilation). Respiration (Glycolysis, TCA cycle and ETS).

**Unit 5: Plant growth and nutrition:**

Plant nutrients – NPK (organic and inorganic sources) - deficiency symptoms – plant growth regulators (auxins, cytokinins, gibberellins, ABA and ethylene).

**References:**

1. Berg, L.R. (1997). Introductory Botany: Plants, People & the Environment. ISBN-13: 978-0030248443
2. Sheeler, P and Bianchi, E.D. (1987). Cell and Molecular Biology . 3<sup>rd</sup> ed. John . Willey and Son (Asian) Ltd. Singapore. ISBN: 9814-12-648-9
3. Devlin, R M and Witham, F.H. (1999). Plant Physiology, 4edn. CBS Publishers, New Delhi.

4. Pandey, B. P. (2005). College Botany, Vol I. 5<sup>th</sup> Edn., S. Chand & Company New Delhi. ISBN 81-219-0593-1
5. Pandey, B. P. (2009). College Botany, Vol II. 7<sup>th</sup> Edn., S. Chand & Company New Delhi. ISBN 81-219-0601-6
6. Sinha, R.K. (2004). Modern plant physiology. Narosa Publishing House New Delhi. ISBN 81-7319-333-9

#### **Suggested laboratory experiments / Field work**

1. Morphology of *Sargassum*, *Riccia*, *Fern* and identification of cryptogams in field
2. Morphology of *Cycas*
3. Angiosperms – morphology of monocot and dicot plant
4. Survey of campus trees.
5. A study on plant cell - Onion peel/ *Tradescantia*, *Hydrilla* & *Vernonia* (c.s. of stem)
6. Soil test – pH, temperature, EC, alkalinity, acidity.
7. Plant growth measurement and movement – auxanometer, phototropism.
8. Plant water relations: Potato osmoscope
9. Photosynthesis – DCPIP experiment, starch test
10. Transpiration – Cobalt Chloride paper test, stomatal index
11. Respiration – Kuhns tube, Ganongs respiroscope
12. Collection and submission of plants with mineral deficiency symptoms

#### **References:**

1. Bendre, A. M., and Kumar, A. (2006). A text book of practical botany. (Vol I). Rastogi Publication New Delhi. ISBN 81-7133-809-7
2. Bendre, A. M. and Kumar, A. (2006). A text book of practical botany. (Vol II) Rastogi Publication New Delhi. ISBN 81-7133-852-6

### **BOT 2532**

### **MYCOLOGY & PATHOLOGY**

**5hr/5cr**

**Preamble:** This course uncovers the eukaryotic and achlorophyllous world of fungal biology, its classification and its biotic interaction. Later part of the course deals with the concept of pathogenesis and host response, citing examples of local disease occurrence and finally deals with conventional and modern methods of disease management. As an outcome of this course student will understand and appreciate the diversity and uniqueness of fungal kingdom and students are expected to identify, diagnose and manage the common disease of important crops.

#### **Objective:**

1. To understand the logic behind classification of fungi and to familiarise the suitable habitats that supply essential nutrition for growth and reproduction of fungi
2. To unravel pathogenic relationship between fungus and their host plants

#### **Unit 1: Basics of mycology:**

General features of fungi, reproductive biology, fruiting body and spore print, spore dispersal and dormancy – fungal habitats and mode of nutrition -Economic importance.

**Unit 2: Classification of fungi:**

Alexopoulos and Mims (1979) classification salient features of Gymnomycota (cellular and slime moulds), Mastigomycota (Oomycetes), and Amastigomycota (Ascomycetes and Basidiomycetes) – Fungal associations (lichens, mycorrhiza and endophytes)

**Unit 3: Introduction to Pathology:**

Concept of plant disease – Koch's postulates – Disease tetrahedron – Pathogenesis (enzymes and toxins) – Structural and functional defense in plants. Plant diseases and human civilization

**Unit 4: Plant diseases:**

Classification, symptoms and diagnosis – traditional and molecular methods. Case studies: Bacterial disease (Citrus canker), Fungal disease (Rice blast), Viral disease (TMV)

**Unit 5: Disease Management:**

Epidemiology and forecasting – agrometeorology - Disease severity and estimation of crop loss - Plant Quarantine – chemical, cultural and biological methods of disease management (*Pseudomonas fluorescens* and *Trichoderma viride*) – Integrated disease management.

**Reference:**

- Agrios GN. 2006: Plant pathology. 5<sup>th</sup>Edn. Elseviers Publication, Academic press. New Delhi. ISBN- 13: 978-81-312-0639-3
- Alexopoulos CG and Blackwell M. 1996: Introduction to modern mycology, John Wiley. New York. ISBN 9814-12-612-8
- Chaube HS and Pundir VS. 2005. Crop disease and their management. Prentice Hall of India Pvt. Ltd. New Delhi. ISBN 81-203-2674-1
- Hull.R .2002. Plant Virology. Elsevier Publication. Academic Press. New Delhi. ISBN 0-12-361160-1
- Mehrotra RS and Agarwal A. 2003. Plant pathology. 2<sup>nd</sup>Edn. Tata McGraw Hills Publi. Co. New Delhi ISBN 0-07-047399-4
- Singh RS. 2005. Plant disease. Oxford and IBH publishing. Co. Pvt. Ltd. New Delhi. ISBN 81-204-1658-9

**BOT 2434****CELL BIOLOGY****4hr/4cr**

This course is designed as an introductory course to understand and appreciate the living cells that serves as invisible backbones of all the life forms found in our earth. Architectural significance of organelles and other sub cellular components are highlighted for the students to explore and relate the structure and function of a typical cell. Various modes of cell multiplication mechanisms are also taught to motivate students to learn the basics of normal and abnormal cell division. A few tools and techniques commonly employed in cell biology are introduced to monitor and record the behaviour of a living cell. Students expected to get a holistic picture of life cycle pattern of a cell at the end of the course.



**Objectives:**

1. To gain a holistic understanding about structural and functional relationship of living cells.
2. To learn principles of basic tools and techniques used to highlight internal architecture of a cell.

**UNIT 1: Cell as a basic unit of life:**

Cell- Discovery, theory - Organization of prokaryotic and eukaryotic cells, endosymbiotic theory - Unique features of plant cell.

**UNIT 2: Cell Surface and Matrix:**

Cell wall organization, plasmodesmata, pit fields, middle lamella- Plasma membrane structure (Unit membrane, Fluid-mosaic models) and functions- Properties of Cytoplasm.

**UNIT 3: Sub cellular components:**

Ultrastructure of Chloroplast - Mitochondria- Endoplasmic reticulum, Golgi apparatus, lysosomes, ribosomes, Micro bodies, cytoskeletons, Vacuoles and Ergastic substances (Crystals and raphides). **Nucleus** – Membrane, nucleoplasm, chromatin reticulum, chromosome and nucleolus.

**Unit 4: Cell cycle and Cell Division:**

Cell division in lower forms- binary fission and budding. Cell cycle, mitosis & meiosis- Abnormal cell cycle (Tumour and Cancer cells).

**Unit 5: Microscopy and analytical procedures:**

Principle and working mechanism of compound and electron microscope – Sample preparation and Isolation of organelles (homogenisation, sub-cellular fractionation), Haemocytometry, Photomicrography.

**REFERENCES**

- Gerald Karp (2003), Cell Biology 7<sup>th</sup> Edn (international student version) John Wiley ISBN :9781118318744
- Geoffrey M. Cooper (2015), 7<sup>th</sup> Edn The Cell- A Molecular Approach, ASM publications Washington.
- Albertis B, Johnson A, Lewis J Raff M, Roberts K and Walter P., 2002 Molecular Biology of cell, 4<sup>th</sup> Edn. Garland Science Publ. ISBN 0-8153-4072-9.
- Singh and Tomer , (2015), 10<sup>th</sup> Edn Cell biology .Rastogi publications. Meerut. ISBN-978-81-7133-969-3
- P.K.Gupta (2015) 4<sup>th</sup> Edn, A text book of cell and Molecular Biology. Rastogi publications ISBN-978-93-5078-072-5

**BOT 2436 Anatomy and Reproductive Biology of Angiosperms (ARBA) 4hr/4cr**

This course exposes students into the internal structure and organization of plants mostly angiosperms. Anatomy of vegetative and reproductive structure is given emphasis to know the complete changes in internal morphology that happens in the lifecycle of plants. Students will be trained to identify the tissue types and meristems which form the basis of growth. The reproductive organs which give rise to the gametes followed by the development of seed will be taught to the students to understand the essentials of reproduction.

**Objectives:**

1. To apply the theoretical knowledge of anatomy in applied botany.
2. To acquire additional skills in anatomy to improve employability, such as making permanent slides, anatomical structures in printing technology, use of stains and mordant to print textiles.
3. To learn the art of induction of polyembryony and parthenocarpy in horticulture.

**Unit 1: Cells and Tissues:**

Tissues as architectural skeleton of plants - Tissue types – structure and functions – localization of cell – Meristems– theories.

**Unit 2: Anatomy of vegetative structures:**

Primary structure of root and stem (Dicot and Monocot) – secondary structure – Anomalous secondary growth — Leaf anatomy – nodal anatomy.

**Unit 3: Reproductive structures:**

Stamen and pistil structure – pollen structure-male gametophyte -pollen germination-ovule structure and types – female gametophyte and embryo sac.

**Unit 4: Pollination and fertilization:**

Types of pollination- agents of pollination–pollen - pistil interaction, double fertilization – triple fusion- embryo formation -embryo types -endosperm formation and types- seed.

**Unit 5: Techniques in anatomy and applied embryology :**

Stains used in anatomy- Maceration techniques – procedure for sectioning-permanent slide preparation. Wood anatomy and pharmacognosy -Applied embryology: polyembryony - parthenocarpy.

**References:**

1. Maheshwari.P (1985) An introduction to the embryology of angiosperm. Tata McGraw Hill. ISBN 0 0709 9434 X
2. Fahh,A (1989) Plant Anatomy. Mac Millan pub. New York. ISBN 008 028030 7.
- 3.Raghavan V. 1986. Embryogenesis in angiosperms. Cambridge University Press. ISBN 0 5212 6771 4.
- 4.Esau,K . 2002. Plant Anatomy. John Wiley and sons. ISBN 9 8141 2649 7.
5. Burgess,J. 1985. An introduction to plant cell development. Cambridge University press. ISBN 05213 0273 0.

**BOT 2638****LAB IV (Myco+Cellbio+ARBA)****6hr/6cr****I -- Mycology & Pathology****2h/wk**

1. Observations of *Mucor* and *Rhizopus*
2. Observations of *Pilobolus*
3. Documentation of macro fungi from college campus
4. Documentation of plant diseases – rust, wilt, blast, rot, canker
5. Isolation of fungal plant pathogens
6. Isolation of plant pathogenic bacteria
7. Testing Koch's postulates – (*Rhizoctonia solani*) potted plants
8. Study of endophytes in plants
9. Disease assessment methods – different assessment scales (paddy)

10. Testing antagonistic property – biocontrol agent against pathogens – dual culture assay
  11. Mass production and formulation of biocontrol strains
  12. *In- vitro* screening of fungicides against pathogens
  13. Disease forecasting – web based model
- Visit to TNAU  
Submission of summative Report on disease incidence in the state

### Reference:

- Aneja KR. 2009. Experiments in Microbiology, Plant Pathology, and Biotechnology. New Age International Publishers, New Delhi. ISBN 978-81-224-1494-3
- Alexopoulos CG and Blackwell M. 1996: Introduction to modern mycology, John Wiley. New York. ISBN 9814-12-612-8

## II -- Cell Biology

2h/wk

1. Light and electron microscope - working principles through models
2. Cytological investigations: animal (mouth swab) and plant cell (Onion peel).
3. Cell inclusions: Starch grains, raphides, Cystolith Cytoplasmic streaming (Hydrilla and Tradescantia)
4. Cytochemistry I: Staining for starch, reducing sugar, proteins.
5. Cytochemistry II: Staining for lipids, terpenes and secondary metabolites.
6. Cytochemistry III: Chromosome staining
7. Microscopic observation of Chloroplast
8. Cell isolation technique
9. Mitosis: smear technique with onion.
10. Meiosis: Rheo / Tradescantia anther Squash.
11. Chromosomal structure: Satellite and Giant Chromosome.

### REFERENCES

- Sheeler P and Bianchi ED 1987. Cell and Molecular Biology. 3<sup>rd</sup> ed. John Wiley and Son (Asian) Ltd. Singapore. ISBN: 9814-12-648-9.
- Shanmugam G 1988 Cell biology A laboratory Manual, Macmillan India Limited ISBN 033392 087 2
- Santra S.C Chatterjee T.P. Das A.P (1989) College Botany Practical – Volume 1, New central book agency, Kolkatta.

## III -- Plant Anatomy And Reproductive Biology Lab

2h/2wk

1. Examination of plant tissues –types.
  2. Anatomy of meristems – shoot tip and root tip
  3. C.S. of primary structures (Dicot & monocot stem and root)
  4. T.S. of secondary structure of stem
  5. Anamolous secondary growth.
  5. Anatomy of leaf (Dicot & monocot) & node.
  6. Wood anatomy - any three timber
  7. Maceration and micrometry
  8. Study of reproductive structure (Stamen and pistil).
  9. Pollen types and pollen germination.
  10. Ovule structure and placentation.
  11. Excision of embryo (*Tridax*) and poly embryony in citrus
  12. Endosperm types, aril and haustoria
- Submission – Report of group activity

**REFERENCES:**

1. Johri.B.M 1982. Experimental Embryology of Vascular plants –springer-verlag. Nerlin. ISBN 3 5401 0334 1.
2. Esau,K. 1977. Anatomy of seed plants.Wiley Eastern.Publ. ISBN 04712 4520 8.
3. Raghavan V. 1986. Embryogenesis in angiosperms, Cambridge University press . ISBN 05212 6771

**BOT 2440 Botany for Chemists II (Theory cum Lab)****H(3+2)/C(4+1)**

**Preamble:** Plant life is essential for the survival of all animals and human being on earth. This course is aimed to inculcate the chemistry of economically important plants which are intertwining in our day today life and also the course is designed to cater the need of young mind of students who take chemistry as major. This course will kindle the inquisitiveness of the students. After completing this course the students will be able to appreciate the plants in terms of its chemical makeup.

**Objectives:**

1. To trace the source of biochemicals used in our everyday life
2. To estimate the value of plants that yield economically important drugs and bioresources.
3. To understand the importance of plant conservation and restoration of natural landscapes.

**Unit 1: Introduction:**

Bioresources and human welfare – types of bioresources (food, beverages, fiber, medicine, industrial resources, fuel), food and culture.

**Unit 2: Chemistry of plant medicine:**

Brief study of Phytochemicals (secondary metabolites): source, useful part, active principles and uses of the following: Essential oil: menthol, citronella; Alkaloids: curcumin, Morphine and Vincristine; Glycosides – digitalin, steviosides; Steroids – *Dioscorea*; Flavanoids – *Pelargonium*; Terpenoids– cannabinoids (*Cannabis*) curcuminoids (mustard seed) an outline of drug discovery and design.

**Unit 3: Plant produce as industrial inputs:**

Botany and chemistry of Rubber. Pulp woods – grapes - papaya – potato – tapioca. Beverages: Non- alcoholic beverages – history, botany, chemistry of tea, coffee and cocoa.

**Unit 4: Bioprospecting and drug development:**

Jeevani, Artemisin, Noni, Brahmi, Indian Ginseng. Traditional knowledge as marker for bioprospecting: access and benefit sharing. Drug abuse and addiction.

**Unit 5: Trade and conservation of resources:**

Supply and demand assessment –threats – loss of resources - sustainable management.

**References:**

1. Annonymus . The Ayurvedic Pharmacopoeia of India Volume-I and IV, Govt. of India, Ministry of Health and Family Welfare, Department of Ayush Page 41.
2. Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
3. Kochhar, S.L. 2011. *Economic Botany in the Tropics*, MacMillan Publishers India Ltd., New Delhi. 4th edition. (ISBN ( 13) 978-0230- 63893-8)
4. Kokate C.K. 2014. Practical Pharmacognosy, Vallabhprakashan, New Delhi, 5 th edition
5. Trease G.E. and Evans. W.C. (2002) Pharmacognosy ELBS 15<sup>th</sup> Edition
6. Verma, V. 2009. *Text book of economic botany* Ane Books Pvt Ltd. New Delhi (ISBN ( 13) 978-81-8052-167-6)
7. Wallis, T.E. (2003) Test books of pharmacognosy CBS publishers and distributors New Delhi (Latest Edition )
8. Simpson, B B. . and Ogorzaly, M.C. (2000) Economic Botany: Plants in our World 3rd Edition, McGraw Hill Book Company, New Delhi, ISBN-13: 978-0072909388.
9. Hill, a. F. 1937. *Economic botany: a textbook of useful plants and plant products*, mcgraw-hill book company, inc. New york and london 1937

**Suggested laboratory experiments / Field work**

1. Identification of plant resources mentioned in syllabus
2. Locating potential plant resources on and off campus
3. Survey of plant based medicines in local market
4. Histo-chemical staining and identification of important phytochemicals
5. Solvent extraction of selected plant ingredients
6. Distillation of essential oil
7. Extraction of bio-fuel from *Madhuca / Pongamia*
8. Tea adulteration and testing
9. Homemade chocolate preparation
10. Fermentation - Wine preparation
11. Biogas unit – design and demo
12. Natural dyes – extraction and dyeing of fibres

**References:**

1. Hill, a. F. 1937. *Economic botany: a textbook of useful plants and plant products*, mcgraw-hill book company, inc. New york and london 1937
2. Trease G.E. and Evans. W.C. (2002) Pharmacognosy ELBS 15<sup>th</sup> Edition

### Undergraduate Department of Zoology

#### Program for B.Sc. Zoology– 2015-2016 onwards (CBCS)

SEM	Part	Course No.	Course Title	Hours	Credits	Marks
1	I	TAM/FRE/HIN/ 0000		3	2	30
1	II	ENG 1201	Conversational skills	3	2	30
1	III C	ZOO 1621	Invertebrata	6	6	90
1	III C	ZOO 1223	Invertebrata Laboratory	2	2	30
1	III C	ZOO 1531	Cell Biology (Theory cum Lab)	(3+2) 5	(3+2) 5	75
1	III S	BOT 1437	Plant biology – I (Theory cum Lab)	(3+2) 5	(3+1) 4	60
1	IV E	NME 0000	Non-Major Elective 1	3	2	30
1	IV LS	XXX 0000	Life Skill course – I	3	2	30
1	V	XXX 0000	NCA/NCN/NSS/PED/SLP			
<b>Total</b>				<b>30</b>	<b>25</b>	<b>375</b>
2	I	TAM/FRE/HIN/0000		3	2	30
2	II	ENG 1202	Reading and writing skills	3	2	30
2	III C	ZOO 1622	Chordata	6	6	90
2	III C	ZOO 1224	Chordata Laboratory	2	2	30
2	III C	ZOO 1532	Economic Zoology (Theory cum Lab)	(3+2) 5	(3+2) 5	75
2	III S	BOT 1438	Plant biology – II (Theory cum Lab)	(3+2) 5	(3+1) 4	60
2	IV E	NME 0000	Non-Major Elective 2	3	2	30
2	IV LS	XXX 0000	Life Skill course – II	3	2	30
2	V	XXX 0000	NCA/NCN/NSS/PED/SLP			
<b>Total</b>				<b>30</b>	<b>25+1</b>	<b>375/390</b>
3	I	TAM/FRE/ HIN/0000		3	2	30
3	II	ENG 2201	Study skills	3	2	30
3	III C	ZOO 2623	Microbiology (Theory cum Lab)	(4+2) 6	(4+2) 6	90
3	III C	ZOO 2625	Animal Physiology (Theory cum Lab)	(4+2) 6	(4+2) 6	90
3	III C	ZOO 2433	Genetics	4	4	60
3	III C	ZOO 2335	Evolution	3	3	45
3	III S	CHE 2413	Chemistry for zoologists – I (Theory cum lab)	5	(3+1) 4	60
3	V	XXX 0000	NCA/NCN/NSS/PED/SLP			
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

EM	Part	Course No.	Course Title	Hours	Credits	Marks
4	I	TAM/FRE/ HIN/0000		3	2	30
4	II	ENG 2202	Career skills	3	2	30
4	III C	ZOO 2624	Biological Chemistry (Theory cum Lab)	(4+2) 6	(4+2) 6	90
4	III C	ZOO 2626	Ecobiology (Theory cum Lab)	(4+2) 6	(4+2) 6	90
4	III C	ZOO 2428	Molecular Biology	4	4	60
4	III C	ZOO 2330	Molecular Biology Laboratory	3	3	45
4	III S	CHE 2414	Chemistry for zoologists-II (Theory cum Lab)	5	4	60
<b>Total</b>				<b>30</b>	<b>27+1</b>	<b>405/420</b>
5	III C	ZOO 3637	Immunology (Theory cum Lab)	(4+2) 6	(4+2) 6	90
5	III C	ZOO 3639	Entomology (Theory cum Lab)	(4+2) 6	(4+2) 6	90
5	III C	ZOO 3641	rDNA technology (Theory cum Lab)	(4+2) 6	(4+2) 6	90
5	III C	ZOO 3543	Developmental Biology (Theory cum Lab)	(3+2) 5	(3+2) 5	75
5	IV LS	XXX 0000	Life Skill course-III	3	2	30
5	IV	ZOO 3245	Environmental Studies	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
6	III C	ZOO 3838	Biotechnology (Theory cum Lab)	(5+3) 8	(5+3) 8	120
6	III C	ZOO 3440	Nanobiology	4	4	60
6	III C	ZOO 3642	Biodiversity (Theory cum Lab)	(4+2) 6	(4+2) 6	90
6	III C	ZOO 3544	Bioinformatics (Theory cum Lab)	(3+2) 5	(3+2) 5	75
6	IV LS	XXX 0000	Life Skill course – IV	3	2	30
6	IV VE	VAL 3230	Value Education	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
<b>Grand Total for Semester I – VI</b>				<b>180</b>	<b>158+2</b>	<b>2370 / 2400</b>

**C: CORE    S: SUPPORTIVE    E: NON MAJOR ELECTIVE    LS: LIFESKILL  
VE: VALUE EDUCATION**

### **Courses offered by the Department of Zoology to Non-Major Students**

#### **Part III Supportive**

<b>SEM</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Hrs.</b>	<b>Cr</b>	<b>Marks</b>
III	ZOO 2447	General Zoology – I Theory cum Lab	<b>(3+2) 5</b>	<b>(3+1) 4</b>	<b>60</b>
IV	ZOO 2448	General Zoology – II Theory cum Lab	<b>(3+2) 5</b>	<b>(3+1) 4</b>	<b>60</b>
<b>Total</b>			<b>10</b>	<b>8</b>	<b>120</b>

#### **Part IV Non-Major Electives**

<b>SEM</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Hrs.</b>	<b>Cr</b>	<b>Marks</b>
I	ZOO 1251	Human Biology	<b>3</b>	<b>2</b>	<b>30</b>
II	ZOO 1252 / ZOO 1254	Forensic Biology / Apiculture	<b>3</b>	<b>2</b>	<b>30</b>
<b>Total</b>			<b>6</b>	<b>4</b>	<b>60</b>

#### **Part IV: Life Skill Courses**

<b>SEM</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Hrs.</b>	<b>Cr</b>	<b>Marks</b>
I	ZOO 1249	Poultry Farming	<b>3</b>	<b>2</b>	<b>30</b>
II	ZOO 2252	Ornamental Fish Culture	<b>3</b>	<b>2</b>	<b>30</b>
V	ZOO 3255/ ZOO 3257	Medical Lab Technology / Ornithology	<b>3</b>	<b>2</b>	<b>30</b>
VI	ZOO 3258	Human Reproduction and Conception Control	<b>3</b>	<b>2</b>	<b>30</b>
<b>Total</b>			<b>12</b>	<b>8</b>	<b>120</b>



**ZOO2623****Microbiology  
(Theory cum Lab)****(4+2=6 h/wk) (6cr)**

This theory cum laboratory course deals with structure and applications of microorganisms. The major areas include history, scope of microbiology and various classifications of microorganisms. The theory part deals with microbial taxonomy, microbial interactions, food borne microbes and medically important microbial diseases. The laboratory part includes the study of ubiquitous nature of microbes, growth curve, types of food borne microbes, medically and agriculturally important bacteria and coliform analysis.

- 1. Fundamentals of microbiology:** Members of the microbial world - Characteristics of prokaryotic and eukaryotic cells - Microbial evolution - Phylogeny - Sterilization methods - Culture media - Microbiology and its origin - Microbiology today.
- 2. Microbial taxonomy and microbial physiology:** Nomenclature and classification of bacteria - Structure and classification of viruses, algae, fungi and protozoa - Ultrastructure - cell wall, flagellum, fimbria, capsules, sheath, prosthema, stalk, spore and cyst - Bacterial growth curve - Factors affecting bacterial growth.
- 3. Food and Industrial microbiology:** Food contamination - Spoilage and preservation of milk, meat, fish, chicken, vegetables and fermented foods - Microbes of perishable, semi perishable and non-perishable foods - Food borne diseases – Salmonellosis, Botulism and Parasitic disorders - Microbial enzymes - Selection and production of industrially important organisms and their products - Fermentors - Fermentations - Production of penicillin and single cell proteins.
- 4. Agricultural and Environmental Microbiology:** FDA regulations - Agricultural products - Transgenic foods and their disorders - Fungal and bacterial diseases transmitted by crop plants - Microbial interactions and microbial associations - Purification of water and coliform analysis.
- 5. Medical Microbiology and Virology:** Host-microbe relationships - Normal microbial biota of humans - Nosocomial diseases - Zoonotic diseases - Epidemic, endemic and pandemic diseases - Bacterial, fungal and protozoan diseases – Diagnosis and treatment of diseases with antimicrobial agents - Structure of HIV, adenovirus and pox viruses - Antiviral chemotherapy and vaccines.

**The laboratory component includes the following exercises:**

- Principle and working of laminar flow and autoclave.
- Sterilization methods – wet heat and dry heat sterilization.
- Preparation of media and culture methods.
- Preparation of bacterial smear and staining methods.
- Inoculation methods.
- Biochemical tests – IMVic, TSI, Starch hydrolysis, Casein hydrolysis, urea hydrolysis and gelatin liquefaction.
- Bacterial growth curve.
- Quality analysis of food samples – Methylene blue reduction test of milk.
- Coliform analysis.
- Study of *Rhizobium* from the roots of leguminous plants.
- Isolation of medically important bacteria.
- Kirby-Bauer method – Studying antimicrobial agents.
- Industrial / Field visit.

**Text book:**

Willey UM, Sherwood LM and Woolverton CJ (2011) Precott's Microbiology. VIII Edition, Mc Graw-Hill international.

**References:**

Gunasekaran, P (1995) Laboratory Manual in Microbiology. New Age International Pvt. Ltd., New Delhi.

Pelczar MJ, Chan ECS and Kreigh NR (2000) Microbiology. VIII Edition, Tata McGraw Hill, New Delhi.

**ZOO 2625****Animal Physiology  
(Theory cum Lab)****(4+2= 6h/wk)(4cr)**

The theory part of this course covers the principles, mechanism and adaptations in digestion, excretion, respiration, circulation, thermo regulation, osmo-iono regulation, muscle contraction, neuronal conduction, sensory perception and hormonal control are discussed in detail. The laboratory component is complementary to the theory which includes experiments on enzyme activity, analysis of excretory products, types of respiration, temperature effects on metabolism, osmo-iono regulation, heart beat recording, blood glucose level testing and muscle twitch.

1. **Digestion and Excretion:** Intracellular and extracellular - Digestion and absorption of carbohydrate, protein, lipid and fat - Coprophagy – Cellulose digestion in animals. Protonephridia - Metanephridia - Nitrogenous wastes - Antennal gland - Malpighian tubules - Glomerular filtration - Mechanism and regulation of urine formation.
2. **Respiration and Circulation:** Mechanism of tracheal, gill, cutaneous and pulmonary respirations - Air breathing by fishes - Transport of respiratory gases – Types of heart - Mammalian heart - Regulation of heart beat - Capillary circulation – Composition and function of blood, Blood coagulation and pigments.
3. **Thermal and Osmo-iono regulation:** Heat balance - Temperature regulations of homeotherms - Torpor and hibernation - Hypo regulation - Osmo-iono regulation in Elasmobranchs and Teleosts.
4. **Neuro-muscular and Sensory Physiology:** Action potential - Nerve impulse - Synaptic transmission - Myosin and actin filament - Sliding filament theory - Neuro-muscular junction. Mammalian visual cycle, Physiology of vision, mechanism of hearing, taste in mammal, electricity in ray fish.
5. **Endocrine Physiology:** Mechanism of hormone action - Regulatory action of pituitary, thyroid, parathyroid, adrenal, pancreas and sex glands - Neuro-endocrine glands - Role of hormones in reproduction – Endocrine glands in crustacean and insects.

**Laboratory component includes exercises as follows:**

- Enzyme activity: Influence of temperature and pH.
- Respiration in fishes: Estimation of dissolved oxygen with reference to body sizes and activity.
- Respiration in terrestrial insects – Manometer technique.
- Opercular movement in fishes: Influence of temperature and calculation of Q10.
- Temperature preference by fishes.
- Study of human heart beat.

- Measurement of blood pressure of students and interpretation of variation.
- Water regulation and ionic regulation in animals such as crab and earthworm.
- Analysis of samples containing excreta of various animals.
- Blood sugar analysis in rabbit at normal condition and after injection of insulin.
- Simple muscle twitches and kymograph.
- Observation of circadian rhythm pattern in selected animals.

**Text Book:**

Schmidt-Nielsen, K (2005) Animal Physiology: Adaptation and Environment. V Edition. Cambridge University Press, London.

**References:**

Hoar WS (1989) General and comparative physiology. Prentice Hall, New Delhi.

Kulshrestha, W (1977) Experimental physiology. Vikas Publishing House Pvt. Ltd., New Delhi.

Siddique, AH (1974) Experimental physiology. Oxford and IBH Pub. Co, New Delhi.

**ZOO 2445****Genetics****(4h/wk) (4Cr)**

This course aims to focus on the basic principles of genetics by presenting the important concepts of classical, microbial, population and human genetics. It deals with basic concepts of simple inheritance characters and gene mapping.

- 1. Mendelism and chromosomal basis of Mendelism** Mendel's study of heredity - multiple alleles - gene interactions - quantitative traits - inbreeding - chromosome theory of heredity - non-disjunction - sex chromosomes and sex determination - dosage compensation - variation in chromosome number and structure.
- 2. Linkage, crossing over and chromosome mapping:** Linkage as exception to Mendel's principle of independent assortment - cytological proof for crossing over - mechanism of recombination - chromosome mapping from recombination data - tetrad analysis.
- 3. Behavioural genetics:** Nest cleaning behavior - defensive behavior - hoarding behaviour in honey bees - biological rhythms in *Drosophila* - *per* gene - single gene mutations and human behavior.
- 4. Genetics of viruses and bacteria:** Genetic recombination in phage - transformation, conjugation and transduction - mechanisms - significance - experiments of Griffith, Zinder and Lederberg, Woolman and Jacob.
- 5. Human and population genetics:** Mendelian traits in man - pedigree analysis - karyotype analysis - chromosomal abnormalities - twin studies - nature and nurture - genetic diseases - inborn errors of metabolism - genetic counseling - theory of allele frequencies - calculating gene and genotypic frequencies.

**Text book:**

Snustad, DP and Simmons, JM (2010) Principles of Genetics. V Edition, John Wiley & Sons, Inc.

**References:**

Hexter, W and Yost, HT (1980) The Science of Genetics. Prentice Hall of India Pvt. Ltd., New Delhi.

Levine, L (1969) Biology of the Gene. The CV Mosby Company, St. Louis, USA.

**ZOO 2335****Evolution****(3h/wk) (3Cr)**

Evolution influences every aspect of the form and behavior of organisms. This course includes origin of life and evidences for evolution, theories of evolutionary thought, fossilization, isolation, speciation, natural selection and emphasis the biological and cultural evolution of man.

1. **Origin of life and evidences for evolution:** Origin of life - theories - creation - Cosmozoic - spontaneous generation - Chemical evolution - Bio-elements - selection - opinion of J.B.S. Haldane and A.L. Oparin - Urey Miller hypothesis - Origin of bio-molecules - Coacervation - Origin of pro- and eukaryotic cell – Evidences - Comparative, anatomical, vestigial organs, physiological, embryological, Biochemical evidences - Geographical distribution and realms.
2. **Theories of evolution:** Greek thinkers - ideas of evolution before Darwin - Lamarckism and Neo-Lamarckism - Darwinism and Neo-Darwinism - Germplasm theory - Mutation theory - Modern synthetic theory - Hardy Weinberg law and its importance.
3. **Trends in evolution:** Geological eras - Fossils and fossilization - dating of fossils - Extinctions - Living fossils – Adaptations – variations and origin - adaptive trends - Polymorphism - transient and stable – Mimicry and Coloration - Batesian and Mullerian – Sexual selection – Convergent, Divergent and Parallel evolution – Co-evolution.
4. **Isolation and its role in evolution:** Isolating mechanisms - different types - Species concepts - definition of species - origin of species - Allopatric and Sympatric speciation – Genetic drift - Founder's Principle.
5. **Evolutionary Processes:** Natural selection in action - Industrial Melanism - Evolution of horses - Time and place of origin, major evolutionary trends, phylogeny of probable sequence species of horse - Eocene, Oligocene, Miocene, Pliocene, and Pleistocene forms - Orthogenesis – Evolution of man - evolutionary trends in humans - Ancestors of primates - Apes-the closest relatives of man - fossil ancestors of man - Dryopithecus, Australopithecus (The Man-Ape of Africa), *Homo habilis* (The Handy Man), *H. erectus*, *H. Neanderthalensis* (Neanderthal man), The Cro-magnon, *Homo sapiens* (Modern man) - Socio-cultural evolution.

**Text book:**

Stebbins, GL (1966) Process of Organic Evolution. Prentice Hall, New Delhi.

**References:**

- Dodson, EO (1960) Evolution: process and product. Affiliated East-West Press, New Delhi.  
 Simpson, GC (1967) The meaning of Evolution. New Haven, Yale University Press.  
 Colbert, EH (1969) Evolution of vertebrates, Wiley, New York.  
 Mayr, E (1973) Animal species and Evolution. The Belknap Press of Harvard University, Cambridge.  
 Dobzansky, T (1976) Genetics and the origin of species. Oxford and TBH Publishing Co., New Delhi.

**ZOO 2624****Biological Chemistry  
(Theory cum Lab)****(4+2 = 6h/wk) (6cr)**

Biological chemistry includes enzymes, and mechanism of enzyme action. It also includes chemistry and metabolism of carbohydrates, amino acids & proteins, lipids & nucleic acids. Citric acid cycle and oxidative phosphorylation are also included.

- 1. Chemistry and metabolism of carbohydrates:** Monosaccharides – Structure - Classification - Disaccharides – Polysaccharides - Glycosaminoglycans- Glycoproteins and glycolipids – Basic concepts of metabolism – Glycolysis – Fermentation - Glycogen metabolism - Gluconeogenesis – significance of HMP shunt – Biological significance of carbohydrates.
- 2. Chemistry and metabolism of amino acids and proteins:** Standard and non standard amino acids – Protein - Structure - Primary, secondary, tertiary and quaternary – Amino acid metabolism - deamination – transamination – transmethylation - Urea cycle - Amino acids as biosynthetic precursors – Biological significance of amino acids and proteins.
- 3. Chemistry and metabolism of lipids:** Lipid classification - Lipoproteins – Fatty acid oxidation - Metabolism of cholesterol – Biological significance of lipids.
- 4. Chemistry and metabolism of nucleic acid, Citric acid cycle and Oxidative phosphorylation:** Chemistry of nucleotides and nucleic acids - Synthesis of purine and pyrimidine - Nucleotide degradation – Convergence of metabolic pathways - Citric acid cycle- Amphibolic pathway - Electron transport - Oxidative phosphorylation.
- 5. Enzymes:** Classification - Substrate specificity - Transition state – Michaelis-Menten equation - Factors affecting rate of enzyme activity – Mechanisms of enzyme action - Regulation of enzyme activity - Enzyme inhibition – Coenzymes and cofactors - Isozymes.

**Laboratory component includes exercises as follows:**

- Colorimetry
- Spectrophotometry
- pH metry
- Paper Chromatography
- Electrophoresis
- Centrifugation
- Qualitative analysis of carbohydrates
- Qualitative analysis of amino acids & proteins
- Qualitative analysis of lipids
- Enzyme kinetics I
- Enzyme kinetics II

**Text book:**

Voet D and Voet JG (2004) Biochemistry. III Edition. John Wiley & Sons Inc. USA.

**References:**

- Murray RK, Granner DK, Mayes PA and Rodwell VA (2000) Harper's Biochemistry. XXV Edition. Appleton & Lange, USA.
- Lehninger AC, Nelson DL and Cox MM (2001) Principles of Biochemistry. IV Edition, W.H. Freeman Company, USA.
- Plummer DT (1996) An introduction to Practical Biochemistry. Tata McGraw Hill, New Delhi.

**ZOO 2626**

**Ecobiology**  
**(Theory cum Lab)**

**(4+2=6hr/wk) (6cr)**

This course deals with the study of living things in relation to their environment. Starting with the abiotic factors of the environment, the course runs through the population dynamics, biotic community structure, development and energy flow model. Unique environmental conditions and faunal adaptations of major habitats will be studied. Finally, major terrestrial biomes and zoogeography will be covered. Laboratory exercises supplement its theory counterpart to ensure better understanding. Physico-chemical analysis of water and soil, identification of planktonic forms and ecological adaptations in animals will be studied. Experiments on primary productivity and pollution analyses will be carried out. Established microcosm will be ecologically investigated. Field studies will be undertaken to observe and understand natural ecosystems in its reality and totality.

- 1. Limiting and abiotic factors:** Soil profile and types – Limiting factors – Biological effects of temperature, light, water, precipitation, wind, fire and nutrients.
- 2. Biotic community and ecosystem dynamics:** Interspecific interactions - Gause principle - Niche concept - Types of niches - Ecological equivalents- Models of Ecosystem development - Theories of climax state – Concept of productivity - Energy flow model – Phosphorus and Nitrogen cycles.
- 3. Population dynamics:** Characteristics - Lincoln index - Life table - Survivorship curve - Net reproductive rate - Age pyramids - Growth rate - Point of inflection - Biotic potential - Exponential and logistic growth equations - Phases of logistic growth curve - Attributes of r- and K- selection.
- 4. Habitat Ecology:** Environmental conditions and Faunal adaptations in: Halobiotic littoral zone (Rocky and sandy) - Pelagic zone (Neritic and oceanic) - Deep sea - Estuary - Mangroves - Lentic and Lotic systems.
- 5. Zoogeography:** Precipitation and temperature regimes of world - Occurrence of biomes based on precipitation and temperature - Major terrestrial biomes of world –Latitudinal and altitudinal life zones – Means of animal distribution - Factors affecting animal distribution - Zoogeographical realms of world with emphasis on Oriental region - Wallace line.

**Laboratory component includes the following exercises:**

Estimation of:

- Dissolved oxygen
- Carbon di oxide in water
- Salinity in water
- Calcium and Magnesium in water
- Biological Oxygen Demand
- Chemical Oxygen Demand
- Primary Productivity of aquatic ecosystems.

## Quantitative analysis of

- Organic carbon in soil
- Zooplankton
- Nutrients in water and soil
- Survey of pollutants
- Observation of Inter- and Intra-specific relationships
- Observation of ecological adaptations in animals.
- Maintenance of Microcosm and investigating the ecological changes.
- Field visits to many ecosystems.

**Text book:**

Odum, EP and Barrett, GW (2012) Fundamentals of Ecology. V Edition, Cengage Learning India Pvt. Ltd., Delhi, India.

**References:**

- Eaton, AD and Franson MAH (2005) Standard methods for the examination of water and waste water. American Public Health Association, American Water Works Association, the Water Environment Federation, Washington DC.
- Batish, SK (1992) Freshwater zooplankton of India. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- Subramanyam, NS and Sambamurty, AVSS (2000) Ecology. Narosa Publishing House, Chennai.

**ZOO 2428****Molecular Biology****(4h/wk) (4cr)**

Molecular biology deals with the study of structure and function of genes and genomes. Students will learn the finest details of molecular configurations of genes, their physical properties and their nature of replication, transposition and recombination. This course also introduces how genes express and accurately transmit genetic information, and the mechanism of its regulation.

1. **The molecular nature of DNA and RNA:** Introduction to gene structure and function – DNA double helix – Structure of RNA – Alternate forms of DNA – Physical properties – G:C content, c-value and c<sub>0</sub>t curves – Extra nuclear genomes – Introduction to Genomics, Proteomics and Metabolomics – Human genome project.
2. **DNA replication, recombination and transposition:** Semiconservative replication - bidirectional - unidirectional - rolling circle and  $\theta$  model replication - enzymology of DNA replication – DNA damages and various types of DNA repair mechanisms – Homologous and site specific recombination – Mobile genetic elements in prokaryotes and eukaryotes.
3. **Transcription:** Prokaryotic and eukaryotic RNA polymerases – Events in transcription of prokaryotes and eukaryotes – General transcriptional factors of eukaryotes – Post-transcriptional processing - capping, polyadenylation, splicing and alternate splicing – Catalytic RNA – RNA editing.
4. **Translation:** Genetic code - Deciphering of genetic code - Salient features of genetic code - 3D structure of tRNA – codon-anticodon interaction – Wobble hypothesis – Mechanism of protein synthesis in prokaryotes and eukaryotes – Inhibitors of protein synthesis – Post translational modification of proteins – Polyprotein.

5. **Regulation of gene expression:** i) Gene regulation in prokaryotes: Fine control of prokaryotic transcription - *lac* operon and *trp* operon - Regulatory RNA ii) Gene regulation in eukaryotes: GAL system in yeast - DNA binding proteins - Homeobox in gene regulation.

**Text book:**

Malacinski GM (2003) Freidfelder's Essentials of Molecular Biology. IV Edition, Narosa Publishing House, New Delhi, India.

**References:**

Brown TA (2007) Genomes 3. III Edition, Garland Science Publishing, New York.  
Watson JD, Kopkins NK, Roberts JW, Stertz JA and Weiner AM (1994) Molecular Biology of the Gene. Benjamin and Cummings Pub Co., California, USA.

**ZOO 2330**

**Molecular Biology Laboratory**

**(3/wk) (3cr)**

The laboratory course introduces the basic molecular biological methods of isolation and purification of nucleic acids (DNA and RNA) from prokaryotic and eukaryotic cells. The quantification of DNA, RNA and protein involving both traditional and modern methods are also dealt. Students gain hand-on experience from start to finish in isolation, purification and characterization of nucleic acids and protein.

1. Basic molecular biology lab – Micropipetting exercises, serial dilution, media and reagent preparation.
2. Isolation and purification of DNA from bacteria.
3. Isolation of DNA from blood.
4. Isolation of RNA from liver cells – Acid phenol extraction and Trizol method.
5. Agarose gel electrophoresis for DNA and RNA.
6. Quantification of DNA and RNA by spectrophotometry.
7. Estimation of DNA by diphenylamine method.
8. Estimation of RNA by Orcinol method.
9. Estimation of protein by Bradford microassay.
10. Study of mutagenesis in *E. coli*.
11. Study of *lac* operon –  $\beta$ -galactosidase activity.
12. Visit to university/institutional laboratories.

**References:**

Rajamanickam C (2001) Experimental Protocols in Basic Molecular Biology. Osho Scientific Publishers, Madurai.  
Bansal MP (2013) Molecular Biology and Biotechnology Protocols. TERI, New Delhi.  
Carson S, Miller HB and Witherow DS (2012) Molecular Biology Techniques: A classroom Laboratory Manual. Third Edition. Academic Press, San Diego, USA.



ZOO 3637

**Immunology**  
**(Theory cum lab)**

(4+2=6h/wk) (6cr)

This course attempts to provide a basic understanding in Immunology. The course covers cells and organs of the immune system, antigens, antibody structure, antibody diversity, antigen-antibody interactions, cell mediated and humoral immune response and complement. In the section on disorders of immune system, autoimmunity, hypersensitivity reactions, immunodeficiency disorders that includes AIDS are dealt. The laboratory component includes identification and enumeration of blood cells, location of lymphoid organs in selected vertebrates, preparation of antigens. Immunization techniques, methods of raising polyclonal antibodies, repetitive bleeding methods, antibody titration, complement mediated hemolysis, ELISA test for AIDS and skin test for allergy reactions.

1. **Cells and organs of the immune system:** Introduction –historical perspectives – innate (non-specific) and acquired (specific) immunity – cells involved – primary & secondary lymphoid organs – tertiary lymphoid tissues.
2. **Antigens, antibody and their interactions:** Epitopes, haptens – immunogenicity-adjuvants - antibody structure - Deducing structure of IgG, IgM and IgA. Biological properties of various Ig classes - Primary interactions-affinity and avidity - secondary interaction-agglutination-precipitation
3. **Antibody diversity and humoral response:** Multigene organization of Ig genes – generation of antibody diversity - Role of T<sub>H</sub> cells in humoral response-primary and secondary response-affinity maturation-class switching-generation of plasma cells and memory cells.
4. **Cell mediated immunity:** Structure and functions of MHC- Antigen processing and presentation- Activation of T<sub>H</sub> cells and cytotoxic T cells - NK cells-antibody dependent cell mediated cytotoxicity (ADCC) – delayed type hypersensitivity (DTH).
5. **Regulation of immune response, complement and disorders of immune system:** Cytokines - Immune tolerance - regulation of immune response-complement. Classical and alternative pathways – biological properties of complement components. Auto-immunity-hypersensitivity reactions- Immunodeficiency disorders – AIDS.

The Laboratory component includes exercises as follows:

- Total and differential count of blood cells
- Lymphoid organs in vertebrates I – fish and amphibians
- Lymphoid organs in vertebrates II-reptiles, birds and mammals
- Raising polyclonal antibodies I-preparation of antigens
- Raising polyclonal antibodies II-routes of immunization
- Raising polyclonal antibodies III- bleeding techniques and separation of serum
- Raising polyclonal antibodies IV-antibody titration
- Complement mediated hemolysis
- Ouchterlony double immunodiffusion (ODI)
- Mancini's single radial immunodiffusion (SRID)
- Immunology of ABO blood grouping
- ELISA test for AIDS
- Skin test for allergy reactions

**Text:**

Coico R and Sunshine G (2009) Immunology – a short course. 6<sup>th</sup> Edition, Wiley Blackwell, New York.

**References:**

Kindt TJ, Osborne BA and Goldsby RA (2006) Kuby Immunology. 6<sup>th</sup> Edition. W.H. Freeman and Co., New York.

Hudson, L and Hay, F (1989) Practical Immunology. 3<sup>rd</sup> Edition, Blackwell Science Publishers, Oxford.

Roitt IM, Brostoff J and Male D (2001) Immunology. 6<sup>th</sup> Edition, Mosby, London.

**ZOO 3639**

**Entomology  
(Theory Cum Lab)**

**(4+2 = 6h/wk) (6cr)**

This course is designed to make the students know about the basics of insect classification, morphology, anatomy, physiology and other facts of insect's life and about their economic importance. Classification up to order level with a special mention about significant families, their diversity, body plan, structure and function of various organs. Role of insect as pests, as vectors and beneficial insects will be taught. The laboratory course intended to systematically collect, preserve and identify insects. Students are taken to field to gain knowledge in the methods of collecting insects and preservation.

1. **Introduction and insect taxonomy:** Definition, scope of entomology - biological success of insects - insect diversity - insect evolution. Insect collection, preservation, dichotomous key – classifications up to orders.
2. **Insect anatomy:** Integument of insects - Head - Types of mouth parts, antennae, legs and wings.
3. **Insect physiology:** Feeding and digestion - Respiration - Circulation - Nervous system - Endocrine system - Reproductive system - Metamorphosis.
4. **Harmful insects:** Pests of paddy, coconut, sugar cane, cotton, brinjal - damage, symptoms and control.
5. **Beneficial insects:** Biology, rearing and economic importance of silk worm, honey bees and lac insects - Insects of medical and forensic importance.

**Laboratory component includes exercises as follows:**

- Collection and identification of insects.
- Study of beneficial insects.
- Investigation of a few agricultural pests.
- Investigation of insects of public health importance.
- Identification of storage pests.
- Survey on the insects available in the campus.
- Identification and comments on a few pterygotan insects.
- Evaluation of pesticide toxicity (LC<sub>50</sub>).
- Identification of economic values of productive insects.
- Estimation of biodiversity of insects in an ecosystem.
- Field study.

**Text book:**

David BV and Ananthakrishnan TN (2004) General and Applied Entomology. Tata McGraw-Hill publishing Company Limited, New Delhi.

**References**

Ambrose DP (2004). The Insect Structure, Function and Biodiversity. Kalyani publishers, New Delhi.

Fennemore PG and Alka Prakash (1992) Applied Entomology, Wiley Eastern Ltd., New Delhi.

Richards OW and Davies RG (1977) Imm's General Text book of Entomology Vol. 1 & 2. 10<sup>th</sup> Edition. B<sub>1</sub> Publication Pvt Ltd., New Delhi.

**ZOO 3641****rDNA Technology  
(Theory cum Lab)****(4+2=6h/wk) (6cr)**

This course is intended to introduce gene cloning and DNA analysis. It deals with extraction, purification and manipulation of DNA by restriction and other enzymes. An outline about the conventional and modern methods of rDNA transfer into living cells, the biology of cloning and expression vectors and the methods of gene analysis are also dealt. The course also provides a detailed account on the applications of gene cloning in the welfare of mankind. The laboratory course includes experiments on isolation and purification of genomic DNA and plasmids from bacteria, restriction digestion and ligation of DNA. It also includes exercises on the isolation of DNA from higher organisms and transformation of bacteria using rDNA by conventional competent cell transformation.

- 1. Isolation, purification and manipulation of DNA:** Isolation of genomic DNA from bacteria, plant and animal cells – Purification of plasmid DNA and bacteriophage DNA – DNA manipulation - restriction endonucleases and other DNA manipulative enzymes – restriction digestion and ligation techniques – *in vitro* mutagenesis.
- 2. Introduction of rDNA into living cells:** Transformation of bacteria with rDNA – competent cell transformation – Methods of gene transfer in higher organisms - electroporation, biolistics, microinjection and liposome mediated gene transfer.
- 3. Biology of cloning and expression vectors:** *E. coli* based vectors –  $\lambda$  and M13 based vectors – Cosmids – Phagemids – Yeast vectors – Ti and Ri plasmids – Plant and animal viral vectors – P element cloning vector – Cloning vectors for mammals - SV40 and adenoviruses – Expression vectors - types of promoters for expression vectors.
- 4. Analysis of cloned gene:** Obtaining the clone of specific gene - direct selection and gene libraries – Studying gene location and structure - Southern transfer, *in situ* hybridization and FISH – Transcript and translation product analysis – DNA sequencing – PCR.
- 5. Applications of gene cloning:** Transgenesis – production of recombinant proteins, vaccines, human insulin, diagnostic probes and other pharmaceutical compounds – Gene therapy and Stem cell therapy.

**The laboratory component includes exercises as follows:**

- Isolation and purification of Genomic DNA from *E.coli*.
- Isolation and purification of genomic DNA from plant and animal tissues.
- Purification of plasmids from *E. coli*.
- Restriction digestion of DNA.
- Ligation of DNA.
- Agarose gel electrophoresis of DNA samples.
- Competent cell preparation of bacteria.
- Transformation of competent cells using rDNA.

**Text book:**

Brown, TA (2010) Gene Cloning and DNA Analysis – an Introduction. VI Edition. Blackwell Science Publishers Ltd., Oxford, UK.

**References:**

Sambrook J and Russell DW (2001) Molecular cloning: A Laboratory Manual. III Edition. Cold Spring Harbor Press, Cold Spring Harbor, New York.  
 Becker JM, Caldwell GA and Zachgo EA (1996) Biotechnology – A Laboratory Course. II Edition. Academic Press, San Diego, USA.  
 Harisha, S (2007) Biotechnology Procedures and Experiments Handbook. Infinity Science Press LLC, New Delhi, India.

**ZOO 3543**

**Developmental Biology**  
**(Theory cum Lab)**

**(3+2=5/h) (5 Cr)**

This course is designed to impart classical views and essential mechanisms regarding various aspects of development of animals with experimental approach. The course deals with gametogenesis, fertilization, cleavage patterns, embryonic stem cells, cleavage & gastrulation, and organogenesis in a mammal. Experimental embryological aspects such as embryonic induction, differentiation and nucleocytoplasmic interaction are discussed in detail.

- 1. Gametogenesis and fertilization:** Anatomy of testis and ovary - spermatogenesis and oogenesis - Types of eggs - Polarity - Mechanism of fertilization - Post fertilization changes - Parthenogenesis.
- 2. Cleavage, gastrulation and organogenesis:** Planes and patterns of cleavage - Types of blastula - Morphogenetic movements - Gastrulation process - Neurogenesis - Development of eye and kidney in chick.
- 3. Embryonic and postembryonic adaptations:** Structure and types of placentae - Placental physiology - Hormonal control - Patterns and mechanism of regeneration - Metamorphosis of frog.
- 4. Experimental embryology-I:** Embryonic induction - Spemann's primary and secondary organizers - Types and process of differentiation - Nucleo-cytoplasmic interactions.
- 5. Experimental embryology-II:** Nuclear transplantation experiments - Embryonic stem cells and pharmaceutical applications - Embryo transplantation techniques - *in vitro* fertilization - birth defects and teratology.

**Laboratory component includes exercises as follows:**

- Microscopic observation on invertebrate larval forms and their adaptations.
- Role of thyroxin in metamorphosis of frog.
- Chick embryo developmental stages – organogenesis.
- Role of retinoic acid signals that control posterior-anterior axis patterning in zebra fish.
- Role of retinoic acid during limb regeneration.
- *In vitro* culture and differentiation of frog tadpole cells.
- Induced breeding in mice by using HCG
- Blastoderm mounting in chick embryo.

**Text book:**

Balinsky, BI (2012) An introduction to Embryology. 5<sup>th</sup> Edition Thomson Asia Pvt. Ltd., Singapore

**References:**

- Laura RK, Evans JH and Keller, TCS (1999) Experimental Developmental Laboratory: A Laboratory Manual. Academic Press, UK
- Jain, PC (1994) Elements of Developmental Biology. Vishal Publications, Jalandhar, New Delhi.
- Verma, PS and Agarwal, VK (2006) Chordate Embryology. S. Chand & Company Ltd., New Delhi.

**ZOO 0000****Environmental Studies****(4h/wk) (2c)**

The course is designed to develop environmental awareness to under graduate students in an extensive manner. It deals with the natural resources, ecosystems and the impact of human activity on them. The course also imparts the biodiversity and pollution in the present status and the suggestion for sustenance.

- 1. Renewable and non-renewable resources:** Definition, scope, awareness – Renewable and non renewable resources – Forest - use, overexploitation and deforestation – Water - use and over utilization of surface and ground water – Mineral - environmental effects of extracting and using mineral resources – Food - world food problems – Energy - growing energy needs – Land - land degradation – Conservation of natural resources.
- 2. Ecosystems:** Concept, structure and function - Energy flow - Food chains and Food web - Ecological pyramids - Ecological succession – Ecosystems - aquatic, forest, grassland, desert and caves. Biogeochemical cycles.
- 3. Environmental pollution:** Definition, causes, effects and control measures of air, water soil, noise and thermal pollution – Hazards of nuclear wastes and control.
- 4. Sustainable environment issues:** Unsustainable and sustainable development - urban problems related to energy and water - Rain water harvesting - Watershed management - resettlements and rehabilitation problems - Environmental ethics.
- 5. Environmental disasters:** Global warming - Green house gases - Ozone depletion – Case studies - Bhopal tragedy - Chernobyl disaster - Fukusima disaster - Prestige and deep horizon oil spill.

**Text book:**

Thatheyus, AJ (2011) Text book of Environmental Studies. Alpha Science International Ltd., Oxford, U.K.

**References:**

Bharucha E (2005) Text book of Environment studies. University Press Pvt. Ltd, Hyderabad.  
 Odum, EP (1971) Fundamental of ecology, WB Saunders, London  
 Sharma, PD (1999) Ecology and environment, Rastogi Publishers, Meerut.

**ZOO 3838****Biotechnology****(5+3=8h/wk) (8Cr)**

Students will be trained in various aspects of biotechnology such as animal, plant, microbial and environmental biotechnology. The course also imparts biosafety, bioethics and intellectual property rights, issues related to biotechnology. The laboratory course integrates theory with extensive practical training on plant and animal cell culture, fermentation technology, vermicomposting, biodecolourization and environmental monitoring.

- 1. Animal Biotechnology:** Animal cell and Tissue culture - Media - Suspension culture - Fibroblast culture - Development and maintenance of cell line - Hybridoma technology - Monoclonal antibody production - Application of animal cell and tissue culture - Transgenic animals – Cloning - Cell banking - Downstream processing.
- 2. Plant Biotechnology:** History and scope of plant biotechnology - *in vitro* culture techniques of explants - Organogenesis and micropropagation - single cell culture - protoplast culture - Plant genetic engineering using *Agrobacterium* - Transgenic plants and Bt based genetically modified crops.
- 3. Microbial Biotechnology:** History and scope of microbial technology – microbial biomass – microbial metabolites – range of fermentation products – aerobic and anaerobic fermentation – culture media – immobilization – scale up of bioprocess – primary and secondary screening of production strains – fermentation economics.
- 4. Environmental Biotechnology:** Environmental monitoring - Sampling analysis - Biosensor - Bioindicators - Biomarker - water quality criteria - Alternative energy sources - Renewable sources of energy - Oil recovery - Biofuels - Bioremediation - Biocontrol - Biofertilizer.
- 5. Biosafety and Bioethics:** Definition - Requirement - Biosafety - Bioethics - social issues, Bioweapons and Patent laws - Patent rights – Case studies - Biopiracy – Ice minus bacteria - Monsanto

**Laboratory component includes the following exercises**

- Initiation of embryonic cell culture of frog.
- Mouse embryo Fibroblasts mono layer culture.
- Chick embryo Fibroblasts mono layer culture.
- Surface sterilization of explants.
- Initiation of callus on MS medium.
- Formation of shoot and roots of *Oryza sativum*.
- Formation of callus by phytohormones.
- Screening of microbes for metabolites.
- Aerobic and anaerobic fermentations of grape wine.
- Factors affecting fermentations.
- Biogas from animal wastes.
- Role of vermicompost on plant growth.
- Decolourisation of dyes employing microbes.
- Biodiversity indices in environmental monitoring.

**Text book:**

Satyanarayana, U (2005) Biotechnology. Books and Allied Pvt. Ltd., Kolkata.

**References:**

Ignacimuthu, SJ (2001) Methods in Biotechnology, Phoenix Publishing House Pvt., New Delhi.

Primrose, S.B (2001) Molecular Biotechnology. II Edition, Panima Publishing Corporation, New Delhi.

Gupta, PK (1996) Elements of Biotechnology. Rastogi and Co., Meerut.

**ZOO 3440****Nanobiology****(4hrs/wk) (4Cr)**

It is an emerging area encompassing knowledge from all the fields of science. It includes introductory aspects, nanomolecular tools and techniques, nanostructures, applications of bionanotechnology in disease diagnosis and therapy and nanoproducts.

1. **Introduction:** Nanotechnology – Emergence – Scope – Nanoscale molecules – Advantages – Basic molecular plans
2. **Nanomolecular tools and techniques:** Quantum dots – Nanoparticles – Dendrimers – Nanotubes – Virus like particles – Atomic Force Microscopy – Confocal microscope.
3. **Nanostructures:** Biology as a model system for building nanostructures – Nanomotors – Micro Electro Mechanical Systems – Nano Electro Mechanical Systems.
4. **Applications of bionanotechnology in disease diagnosis and therapy:** Nanobiosensors – Tissue engineering – Cancer diagnostics – Drug delivery – Cancer therapy.
5. **Bionanoproducts:** Nanogel – Nanosponge – Bionanofabrics – Milk silk – Soya silk – Spider silk – Bioelectricity – Biobatteries – Biomimicry.

**Text book:**

Gonsalves, KE (2008) Biomedical Nanostructures. John Wiley & Sons Inc., Hoboken, New Jersey.

**References:**

Niemeyer, CM and Mirkin, CA (2004) Nanobiotechnology. I. Concepts, Applications and Perspectives. Wiley-VCH, Verlag GmbH & Co., Weinheim.

Stroscio, MA and Dutta, M (2004) Biological Nanostructures and Applications in Biology. Kluwer Academic Publishers, New York, Boston, USA.

**ZOO 3642****Biodiversity  
(Theory cum Lab)****(4+2=6/h) (6cr)**

The course aims to provide students a broad foundation in Biodiversity and Conservation. The course inculcate students in understanding of biodiversity in the context of ecosystem dynamics, ecosystem functioning and ecosystem services. The course also imparts the assessment of biodiversity and its threat using different methodologies, and analysis of measures to manage biodiversity threats by applying relevant scientific principles.

1. **Basics of Biodiversity:** Introduction - Concept and Definition - Scope of biodiversity - Constraints of biodiversity - Genetic, Species, Ecosystem biodiversity - Measuring biodiversity – Alpha, Beta and Gamma Diversity - Species richness – Evenness-Dominance - Approaches to estimating diversity and dominance - Shannon and Simpson's index - India as a mega-diversity nation - Hotspots of Biodiversity.
2. **Value and significance of biodiversity:** Tangible benefits - food, fiber, fodder, medicines, and construction material - Intangibles - pollination, pest control, soil development and maintenance of soil fertility - soil and water conservation - nutrient cycling - Human-animal conflicts - existing conservation projects - Tiger, Rhino, Elephant, Turtles, Crocodiles, Birds, Coral reefs and Mangroves.
3. **Threats to biodiversity:** Loss of Biodiversity and its causes - Patterns of losses - Causes and factors of mass extinction - Listing of Threatened biodiversity including vulnerable, rare, threatened, Endangered and extinct plant and animal species - Wildlife Trade and Laws - Wildlife protection Act of India - CITES - TRAFFIC - RED Data Book - IUCN - Measures to control poaching and wildlife trade
4. **Conservation of biodiversity:** Aim for conservation - Current practices - Conservation of Genetic, Species and Ecosystem biodiversity - International conventions on conservation - Treaties on nature & conservation - *Ex situ* & *In situ* conservation - Vavilov seed bank - Institutions and their role in conservation – Zoos - Natural history museums & collections - Zoological survey of India - Botanical survey of India - Forest research Institutes - Central Marine Fisheries research Institutes.
5. **Role of NGOs in conservation:** International NGOs - UNEP, GEF, WCS, Bird Life International - Important NGOs in India and their contributions - WWF, ATREE, BNHS, WTI and Kalpavriksha - Important NGO movements - Chipko movement - Silent valley - Narmada Bachao Aandholan - Pani Panchayats - Seed Movement.

**Laboratory component includes the following exercises:**

- Understanding the concept of sampling: Random sampling, sample size, quadrat, transect and point method for the study of community structure.
- Determination of frequency, density and abundance of different species present in the community.
- Determination of Species richness and evenness.
- Study the dispersion of the species by calculating mean and variance of species.
- Estimating Alpha ( $\alpha$ ), Beta ( $\beta$ ) and Gamma ( $\gamma$ ) diversity.
- Estimating species diversity by Shannon and Simpson's Index
- Preparation of field data sheet.
- Identification of butterflies, amphibians and reptiles (up to the species), bats and birds up to genus.
- Documentation of Avifauna within the college campus and adjoining areas.
- Visit to Zoos, Sanctuaries, National park.
- GPS field data collection and import to computer.

**Text:**

Krishnamurthy KV (2009) An Advanced Textbook on Biodiversity Principles and practice. Oxford & IBH publishing Co Pvt. Ltd., New Delhi.



## References

- Ghosh, A (2009) Biodiversity Conservation, APH Publications, New Delhi.  
 Sharma, PD (2005) Ecology and Environment. Rastogi Publication, New Delhi  
 Dutta, A (2001) Biodiversity and Ecosystem Conservation. Kalpaz Publications, New Delhi.  
 Negi ,SS (1993) Biodiversity and its Conservation in India. Indus Publications, New Delhi.  
 Ladle, RJ (2009) Biodiversity and Conservation: Response to biodiversity loss. Taylor and Francis, UK.

## ZOO 3544

## Bioinformatics (Theory cum Lab)

(3+2=5h/wk) (5cr)

This course is designed to introduce bioinformatics tools and analysis methods to students. Upon completion of the course, students should feel confidence in dealing with the vast amounts of biomedical and genomic data and online tools that will be relevant to their work in the coming decades.

- 1. Operating systems and Internet:** Operating System concept - Windows 98/XP, Windows server NT/2000, UNIX/LINUX - Internet evolution - Working of Internet - Use of Internet - Working with E-mail - An overview of Computer viruses - General Precautions.
- 2. Search Engine:** Overview of World Wide Web (Web Server and Client) - Introduction to Search engine and Searching the Web - Searches on MEDLINE, PUBMED and bibliographic databases - Downloading files - Introduction to Web Browsers - Understanding HTML and URL, Domain name, IP Address – Blogging - Overview of available Bioinformatics resource in web.
- 3. Bioinformatics and data generation:** Bioinformatics and its relation with molecular biology - Examples of related tools (FASTA, BLAST, BLAT, RASMOL), databases (GENBANK, Pubmed, PDB) and software (RASMOL, Ligand Explorer) - Data generation - Generation of large scale molecular biology data - Applications of Bioinformatics.
- 4. Biological Database:** Introduction to data types and Source - Population and sample - Classification and Presentation of Data - Quality of data, private and public data sources - Biological Databases - Nucleic acid databases (NCBI, DDBJ, and EMBL) - Protein databases (Primary, Composite, and Secondary) - Specialized Genome databases (SGD, TIGR, and ACeDB) - Structure databases (CATH and SCOP).
- 5. Sequence Alignments:** Introduction to Sequences, alignments and Dynamic Programming - Local alignment and Global alignment (algorithm and example) - Pairwise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm) - Methods for presenting large quantities of biological data.

## Laboratory component includes exercises as follows:

- Types of biological databases and using it - Genbank, Protein Data Bank, Uniprot.
- Sequence Analysis Tools: BLAST, FASTA (Nucleic acids & Proteins), Clustal W and EMBOSS.
- Sequence Comparisons (Pairwise Sequence Alignments).
- To identify an unknown nucleotide sequence using the NCBI search tool BLAST
- Phylogenetic Analysis - Phylip.
- Molecular Modeling: Homology Modeling – Swiss modeller.

**Text book:**

Ignacimuthu, S (2005) Basic Bioinformatics. II Edition, Narosa Publishing House, New Delhi.

**References:**

Teresa K, David A and Parry-Smith (2001) Introduction to Bioinformatics. I Edition, Pearson Education, New Delhi.

Lesk, AM (2002) Introduction to Bioinformatics. I Edition, Oxford University Press, USA

Claverie JM and Notredame C (2006) Bioinformatics for Dummies. II Edition, John Wiley & Sons, Inc., USA.

Xiong, J (2006) Essential Bioinformatics. Cambridge University Press, New York.

**ZOO 2447**

**General Zoology-I** (3+2=5h/wk) (4cr)  
(Theory cum Lab - Supportive course)

This course is an introduction to animal phyla. The theory part deals with the general characters and classification up to class level in animal kingdom. The groups Acoelomata, Pseudocoelomata, Coelomata, Prochordata, Pisces, Amphibia, Reptilia, Aves and Mammalia will be dealt with examples.

1. **Acoelomata:** Levels of organization – Outline classification up to phylum with examples - General characteristics – Protozoa - *Amoeba* sp. - life cycle of *Plasmodium* sp. - protozoan diseases – Porifera - canal system – Coelenterata – *Hydra* sp. - biology of corals and coral reefs.
2. **Pseudocoelomata:** Platyhelminthes - general characters - classification - *Taenia solium* – Life cycle of *Ascaris lumbricoides* - Helminth parasites in man.
3. **Coelomata:** General characteristics - Arthropoda, Mollusca and Echinodermata – *Periplaneta* sp. – Economic importance of insects – *Pila* sp. – torsion – *Asterias* sp. - water vascular system – larval forms.
4. **Prochordata, Pisces and Amphibia:** General characters of *Amphioxus*, *Balanoglossus* and *ascidia* – General characters of Pisces - *Scoliodon* sp. - accessory respiratory organs in fishes – economic importance of fishes – Amphibia - general Characters - *Rana* sp.
5. **Reptilia, Aves and Mammals:** General characters – Identification of poisonous and non-poisonous snakes – *Columba livia* - flight adaptations in birds - migration in birds - adaptive radiation of beak and feet – *Oryctolagus* sp. - dentition in mammals - aquatic mammals - economic importance of mammals.

**The laboratory component includes the following exercises:**

- Spotters- microscopic forms
- Spotters – lower invertebrates
- Spotters – higher invertebrates
- Spotters- Pisces
- Spotters – Tetrapods
- Mouthparts and digestive system of cockroach
- Salivary gland of cockroach
- Nervous system of cockroach

- Buccal cavity of frog - entire view
- Viscera of frog
- Digestive system of frog
- Urinogenital system of frog
- Nervous system of frog

**Text book:**

Chaki, KK, Kundu, G and Sarkar, S (2005) Introduction to General Zoology. Vol-1, New Central Book Agency Pvt. Ltd., Kolkata, India.

**References:**

Iyer, E (1993) Manual of Zoology Vol. II. Viswanathan (Printers & Publishers), Chennai.  
Jordan, EL and Verma, PS (2013) Chordate Zoology. S. Chand & Co Ltd., New Delhi.

**ZOO 2448**

**General Zoology – II  
(Theory cum Lab - Supportive course)**

**(3+2=5h/wk) (4cr)**

This is a theory cum laboratory, which aims at imparting knowledge about the economical importance and applied aspects of zoology. The theory part deals with the principles and applications of genetics, health and hygiene with reference to man. It also emphasizes details on areas like entomology, immunology and applied zoology. The laboratory part includes the collection and preservation of insects, estimation of metabolic rate in fish, human traits, lymphoid organs of fish, hypersensitivity and experiments related to applied zoology.

1. **Human genetics:** Human chromosomes - gene maps - DNA fingerprinting - chromosomal abnormalities - human hereditary traits - Eugenics - Euphenics - Euthenics - Gene therapy - Human Genome Project.
2. **Human health and Hygiene:** Diseases - detection - types - infectious and non-infectious diseases - causes - prevention - treatment and control - drug resistance and abuse.
3. **Entomology:** Introduction - scope - common insects - general characters and structure - metamorphosis - beneficial and harmful insects - integrated pest management.
4. **Immunology:** Immune system - cells - organs - immune responses - antigen and antibodies - vaccines - hypersensitivity - autoimmune disorders.
5. **Applied Zoology:** Introduction to poultry farming and vermicomposting.

**Laboratory component includes the following exercises:**

- Insect collection, preservation and identification
- Study of beneficial and harmful insects
- Estimation of O<sub>2</sub> consumption in fish
- Lymphoid organs of fish – Demonstration
- Hypersensitivity – Demonstration
- Analysis of human traits – Mendelian's, fingerprinting/blood group
- Human karyotype and Ideogram
- Visits to poultry farming, vermicomposting, aquaculture and apiculture.

**Text book:**

Taylor DJ, Green, NPO and Stout SW (2005) Biological Science. R. Soper Editor, III Edition. Cambridge University Press, United Kingdom.

**References:**

Nigam, HC (1996) Modern Trends in Biology. Shohanlal Naginchand & Co, Jalandhar.

Sobti, RC (1991) Medical Zoology. Shohanlal Naginchand & Co, Jalandhar

**ZOO 3255**

**Medical Laboratory Technology**  
**(Life skill course)**

**(3h/wk) (2Cr)**

The objective of this course is to introduce various laboratory techniques involved in the analysis of the samples and the interpretation of the results. Further, students will be informed about the setting of a clinical laboratory. This course includes the collection and analysis of samples like urine, stool and sputum to test protein urea, glycemia and the presence of pus cells, parasite and various microorganisms. It also includes the examination of gastrointestinal contents, routine and special haematological tests, histopathology and serological tests.

1. **Biomedical laboratory:** Normal and abnormal conditions of body - Symptoms – Samples to be collected for analysis and diagnosis – Instruments – Rules and regulations to be followed for hazardous chemicals – sterilization methods.
2. **Biosamples:** Urine - Collection and preservation, physical and chemical analysis for kidney diseases, proteinuria, glycemia and hereditary disorders – Stool - Types and collection, microscopic and culture methods, interpreting microbial diseases – Gastro-intestinal contents – Sputum – Collection and staining for microscopic examination for respiratory disorders.
3. **Clinical haematology:** Phlebotomological methods - chemical analysis - cell counting (DC/TC) - estimation of ESR for pathological, physiological and hereditary disorders – Blood banking - Blood grouping and typing – Glucose tolerance test - Impaired glucose tolerance test - diabetic disorders - HbA1c test.
4. **Biomedical instrumentation:** ECG - EEG - X-ray - Stethoscope – Microscopic examination of cells from the body fluids for identifying disorders – Microtome and processing of tissues for tumors.
5. **Fertility test:** Semen analysis - hormonal changes - hormonal tests and pregnancy tests – factors affecting fertility.

**Text:**

Sood, R (1988) Medical Laboratory Technology. Jaypee Pub Ltd., New Delhi.

**References:**

Mukherjee, KL (1989) Medical Laboratory Technology. Vol, I, II & III, Tata McGraw Hill Pub, Co, New Delhi.

Syrey MF, William JM and Elvyn GS (1978) Diagnostic microbiology. The C.V. Mosby Co.

ZOO 3257

**Ornithology**  
**(Life skill course)**

(3h/wk) (2cr)

Learn about bird behavior, migration, ecology, conservation, and many other subjects. Each student will carry out documentation of local bird fauna which may result into a compilation of scientific publication. Students will develop expertise in bird studies which will be useful in taking up bigger challenges for studying birds with respect to their life history, behavior, ecology and also contribute to the ongoing Ornithological researches carried across the country.

1. **Bird Morphology, bird Communities, birds and Man:** Characteristics of birds - naming and classification - study of general bird morphology - morphological adaptations - Guilds - Stratification - Resource partitioning - Migration - Communication - Economic importance of birds - hazards of birds to aviation - effects of anthropogenic activity on birds.
2. **Field Ornithology:** Bird study techniques - Equipments - Areas of study - Field kit - Sampling - Bird photography - Bird ringing techniques - application - recording body measurements - usefulness of bird ringing data - ring recovery - Radio-telemetry - Use of gadgets like GPS, Camcorder, CCTV camera, night vision scope in bird study - Satellite pictures - Google Maps.
3. **Analysis of Field Data and Pterological Studies:** Analysis of field data - Applying statistics to evaluate data - Interpretation of data - Time budget analysis - Habitat utilization - Moulting pattern - Pellet and excreta analysis - Preparation of bird distribution maps - Role of birds in Ecosystem - Pollination, seed dispersal and insect control - Pterological studies - feather structure, types.
4. **Birds of India:** An overview of the history of Ornithology in India, SACON - Birds in folklore and Indian culture - Grassland - desert - wetland - forest - Himalayan birds - Bird biodiversity hotspots in India. Case study - Fall of House sparrow.
5. **Conservation of Birds:** Endangered bird species - Threatened birds - Red Data Book - IUCN criteria - Artificial breeding and release of endangered birds - Recent conservation issues - Decline of vultures - Role of NGO's in conservation of birds - Legal protective measures - Bird sanctuaries.

**Text:**

Ali, S (2002) The Book of Indian Birds. Bombay Natural History Society, Mumbai, India

**References:**

- Ali S and Ripley, SD (2002) Handbook of the Birds of India and Pakistan. Vol 1-10, Oxford University Press, India.
- Grimmett R, Inskipp C and Inskipp, C (2001) Pocket Guide to the Birds of the Indian Subcontinent: Helm Field Guides. Second Edition. Christopher Helm.
- Kazmierczak K and van Perlo BA (2000) Field Guide to the Birds of the Indian Subcontinent. Yale University Press, New York.

**ZOO 3258                      Human Reproduction and Conception Control    (3h/wk) (2cr)**  
**(Life Skill Course)**

The course on Human Reproduction and Conception Control includes female and male sexual anatomy and physiology, patterns of sexual behavior, conception, pregnancy, child birth, contraceptive methods, sexually transmitted diseases, reproductive disorders and therapy.

1. **Anatomy and physiology of female reproductive system:** External genitalia and internal structures - breasts – menstruation - ovulation - hormonal control.
2. **Anatomy and physiology of male reproductive system:** External genitalia and internal structures – male sexual function - erection - ejaculation - circumcision.
3. **Sexual behavior pattern, conception and pregnancy:** Love - types - celibacy - erotic dreams - fantasy - masturbation - homosexuality - atypical sexual behavior – Sexual arousal - role of hormones, brain, senses, food and chemicals – Sexual response - three stage and four phase model – Conceiving - pregnancy - fetal development - stages of child birth - breast feeding.
4. **Contraceptive methods and fertility control:** Contraceptive methods - hormone based oral and non-oral contraceptives - barrier methods - intrauterine devices - methods based on menstrual cycle - post-coital contraceptive methods - abortion - choice of contraception at different ages – Fertility control - male and female sterilization - vaccines for fertility control.
5. **Sexual diseases and disorders of reproductive system:** Common vaginal infections - Sexually transmitted diseases - gonorrhea - syphilis - AIDS - prevention – Disorders - hypoactive sexual desire, erectile, dyspareunia and orgasmic disorders - chronic illnesses and disabilities - menstrual cycle problems – Basics of sexual enhancement and sex therapy – Specific suggestions for men and women.

**Text book:**

Crooks, R and Baur, K (1996) Our sexuality. VI Edition, Brook /Cole publishing company, California, USA.

**References:**

- Shapiro, HI (1988) The birth control book. Prentice Hall Press, New York.
- Chaudhuri, SK (1999) Practice of fertility control - A comprehensive text book. IV Edition, B.I. Churchill Livingstone Pvt. Ltd., New Delhi.
- Vander, AJ, Sherman, JH and Luciano DS (2001) Human Physiology: The Mechanism of Body Function. VIII Edition, McGraw Hill Inc. New Delhi.

PROGRAMME/COURSE FRAME (2016-17)  
UG DEPARTMENT OF ECONOMICS  
Choice Based Credit System (CBCS) Programme

Sem	Part	Course No.	Course Title	Hours	Credits	Marks
1	I	TAM/FRE/HIN		3	2	
1	II	ENG 1201	Conversational Skills	3	2	
1	IIIC	ECO 1531	Micro Economics I	5	5	
1	IIIC	ECO 1433	Economic Statistics I	4	4	
1	IIIC	ECO 1435	History of Economic Thought	4	4	
1	LS I	ECO1237	Decision Making Goal Setting	3	2	
1	E	ECO1239	Population Dynamics	3	2	
1	S	MAT	Mathematics for Economics	5	4	
		<b>TOTAL</b>		<b>30</b>	<b>25</b>	
2	I	TAM/FRE/HIN		3	2	
2	II	ENG 1202	Reading & Writing Skills	3	2	
2	IIIC	ECO 1532	Micro Economics II	5	5	
2	IIIC	ECO 1434	Economic Statistics II	4	4	
2	IIIC	ECO 1436	Tamil Nadu Economy	4	4	
2	LS II	ECO1238	Skills for Work Effectiveness	3	2	
2	E	ECO1240	Health Economics	3	2	
2	S	MAT	Fundamentals of Computer Applications	5	4	
2	V	XXX0000	Extension Activity (PED/NSS/NCC/SLP)	2	1	
		<b>TOTAL</b>		<b>30+2</b>	<b>25+1</b>	
3	I	TAM/FRE/HIN		3	2	
3	II	ENG 2201	Study Skills	3	2	
3	III C	ECO 2531	Macro Economics I	5	5	
3	III C	ECO 2533	Public Finance	5	5	
3	III C	ECO 2535	International Trade	5	5	
3	III C	ECO 2437	Mathematical Economics I	4	4	
3	S	ECO 2439	Entrepreneurial Development	5	4	
		<b>TOTAL</b>		<b>30</b>	<b>27</b>	

Sem	Part	Course No.	Course Title	Hours	Credits	Marks
4	I	TAM/FRE/HIN		3	2	
4	II	ENG 2202	Career Skills	3	2	
4	III C	ECO 2532	Macro Economics II	5	5	
4	III C	ECO 2534	Monetary Economics	5	5	
4	III C	ECO 2536	Trade Documentation	5	5	
4	III C	ECO 2438	Mathematical Economics II	4	4	
4	S	ECO 2440	Industrial Strategies	5	4	
4	V	XXX0000	Extension Activity (PED/NSS/NCC/SLP)	2	1	
		<b>TOTAL</b>		<b>30</b>	<b>27+1</b>	
5	IIIC	ECO3631	Indian Economics I	6	6	
5	IIIC	ECO3633	Development Economics and Planning	6	6	
5	IIIC	ECO3635	Environmental Economics	6	6	
5	IIIC	ECO3537	Econometrics I	5	5	
5	LS	ECO3239	Economic Journalism	3	2	
5	VAL	VAL	Value Education	4	2	
		<b>TOTAL</b>		<b>30</b>	<b>27</b>	
6	IIIC	ECO3632	Indian Economics II	6	6	
6	IIIC	ECO3634	Financial Market and Services	6	6	
6	IIIC	ECO3636	Labour Economics	6	6	
6	IIIC	ECO3538	Econometrics II	5	5	
6	LS	ECO3240	Personal Empowerment	3	2	
6	EVS	EVS	Environmental Studies	4	2	
		<b>TOTAL</b>		<b>30</b>	<b>27</b>	
		<b>Grand Total</b>		<b>180</b>	<b>158+2</b>	

C- Core E- Elective LS- Life Skill S – Supportive



**ECO 2531****MACRO ECONOMICS – I****5 Hrs/ 5 Cr**

To identify the major macro – economic variables.

To impart fundamentals concepts of macro economics.

**Unit I: Introduction to Macro Economics**

Definitions – Origin and Growth – Micro Vs Macro Economics – Fallacy of Composition – Scope of Macro Economics – Main Concepts – Static and Dynamic – Stock and Flow – Equilibrium - Significance – Limitations.

**Unit II: National Income**

Definitions – National Income - Types Related Concepts – Methods of measuring National Income – Difficulties in the Measurement of National Income.

**Unit III: Circular Flow of Income**

Meaning – Determining Factors - Product Market – Factor Market – Capital Market – Two Sector – Injections and Leakages - Three Sector – Four Sector Models – Importance of the Circular flow of Income.

**Unit IV: Classical Theory of Employment**

Meaning – Full Employment – Unemployment – Under employment – Causes for unemployment and Remedies - Classical Theory of Employment – Say's Law of Market – Pigouvian Formulation of Say's Law.

**Unit V: Effective Demand**

Meaning – Principles – Aggregated Demand Function Aggregated Supply Function – Determinants – Importance.

**Reference**

1. Rana, K.C. and Verma, K.N., (2012), *Macro Economic Analysis*, Vishal Publishing Company, NewDelhi.
2. Andrew B. Abel and Ben S. Bernanke, (2011), *Macro Economics*, Pearson Education, Inc., New Delhi.
3. Robert J. Gordon, (2011), *Macro Economics*, Prentice-Hall India Limited, New Delhi.
4. Dornbusch, Fischer and Startz, (2010), *Macro Economics*, McGraw Hill, NewDelhi.
5. Gregory Mankiw, N., (2010), *Macro Economics*, Worth Publishers.

**ECO 2533****PUBLIC FINANCE****5 Hrs/ 5 Cr**

To impart the students the knowledge of public finance.

To make them understand its applications in day to day life.

**Unit I: Introduction**

Definitions – Scope – Private Finance vs Public Finance – Objectives – Principles of Public Finance – Principle of Maximum Social Advantage Theory.

**Unit II: Public Revenue**

Definition – Sources of Public Revenue – Taxes: Direct Taxes and indirect taxes – Canons of Taxation- Effects of Taxes, Principles of taxes - Progressive, Regressive - Taxable capacity - Tax buoyancy.

**Unit III: Public Expenditure**

Definition - Classification of Public Expenditure - Canons of Public Expenditure – Reasons for the Growth of Public Expenditure – Wagnor's law of expenditure – Effects.

**Unit IV: Public Debt**

Meaning – Classification of public debt – Causes and Effects of borrowing – Burden of Public Debt – Public Debt Management – Methods of debt - Redemption.

**Unit V: Budget**

Meaning - Types of Budget – Features – Objectives – Budgetary Procedures – Types of Deficit. Deficit Financing: Nature, Significance and Methods – Fiscal Policy and Objectives

**References:**

1. M.Maria John Kennedy, (2012), Public Finance, PHI Learning Private Ltd, New Delhi.
2. B.P Tyagi, (2009), Public Finance, Jai Prakash Nath & Company, Meerut.
3. K.P.M Sundaram and K.K. Andley, (2006) Public Finance – Theory and Practice, S.Chand & Company Limited, New Delhi.
4. D.M. Mithani,(2007), Money Banking International Trade and Public Finance, Himalayan Publishing House, Mumbai.

**ECO 2535****INTERNATIONAL TRADE****5 Hrs/ 5 Cr**

To familiarize the students with fundamental principles of foreign trade.

To highlight the gains and issues of international trade.

**Unit I: Introduction to International Trade**

Meaning and Related Concepts - Differences between Internal and International trade - Significance, Argument for and against trade, Comparative Cost Theory – Opportunity Cost Theory – Factor Endowments Theory.

**Unit II: Gains from Trade**

Meaning - Types: Direct- Indirect- Static-Dynamic- Short and Long term Gains - Factor determining gains of Trade, Trade Policy: Free Trade vs. Protection - For and against free trade and protection – Tariff and Quota.

**Unit III: Balance of Payments and Balance of trade**

Meaning - Balance of Payments vs Balance of Trade – Equilibrium and Disequilibrium in BOP – Causes and Measures.

**Unit IV: Monetary and Non – monetary Measures**

Meaning - Foreign Exchange- Foreign Exchange Market - Exchange Rate- Exchange Control - Methods of Exchange Control - FERA and FEMA - Mint Theory - Purchasing Power Parity Theory.

**Unit V: International Trade and Economic institutions**

International liquidity – International financial Institutions – IMF , IBRD, EEC, MNC, GATT, WTO, BRIC - World Bank – Euro Dollar – Objectives – Functions.

**References**

1. Domonick Salvatore, (2014), International Economics, Trade and Finance, Wiley Publication.
2. Jhingan, M.L. (2012), International Economics, Vrinda Publications, (P) Ltd., New Delhi.
3. Francis Cherunilam, (2010), International Business: Text and Cases, Kindle Edition, New Delhi.
4. Jhingan, M.L., (2008), International Economics, Himalaya Publishing, Bombay.
5. Francis Cherunilam, (2008), International Economics, Tata McGraw– Hill, New Delhi.

**ECO 2437****MATHEMATICAL ECONOMICS - I****4Hrs/ 4 Cr**

To develop the skill of using mathematical tools in economic analysis.

To help the students how mathematics can be applied in economic principles.

**Unit I: Introduction**

Meaning – Economics vs. Mathematical Economics – Variables – Constant – Function: Types: General Function, Specific Function, Implicit Function, Explicit Function – Inverse Function – Role of Mathematics in Economics.

**Unit II: Differentiation of single variable**

Derivatives of Single Variable – Distinction between Demand and Supply – Marginal Function from Total Function - Elasticity of Demand – Maximum – Minimum value of function - Point of Inflexion – Applications - Utility Maximization – Cost minimization – Profit maximization – Sales Maximizations.

**Unit III: Differentiation of two variables**

Differentiation of two Variables – Partial Derivatives – Uses: Substitutes vs Complementary Goods – Cross Elasticity of Demand – Maximization and Minimization - Utility Maximization- subject to Constraint - Lagrangian Method – Total Differentiation.

**Unit IV: Integral**

Meaning – Simple Problems – Total Function from the Marginal Function - Definite Integral – Consumer's Surplus – Producer's Surplus.

**Unit V: Production Function**

Meaning – Homogeneous and Non-Homogeneous Production Function – Properties – Cobb-Douglas Production Function – Properties – Euler's Theorem – CES Production Function.

## References

1. Bose D (2007), *An Introduction to Mathematical Methods*, Himalaya Publishing House, Mumbai
2. Mehta, B.C. and Madnani, G.M.K, (2003), *Mathematics for Economists*, Sultan Chand & Sons, New Delhi
3. Allen R.G.D, (1986), *Mathematical Analysis for Economists*, Macmillan, London.
4. Chiang, A.V. (1986), *Mathematics for Economics*, Prentice Hall, Englewood Cliffs, New Jersey.
5. Henderson and Quandt, (1985), *Micro Economic Theory: A Mathematical Approach*, Student Edition, Macmillan Press, London.

**ECO 2439****ENTREPRENEURIAL DEVELOPMENT****5 Hrs/ 4 Cr**

To enrich awareness to the students about the entrepreneurial society.

To make them understand the feasible business ventures and the supporting facilities.

**Unit I : Entrepreneurship**

Definitions – Types – Functions - Role of Entrepreneurship – Role of Women Entrepreneurs  
– Factors Affecting Entrepreneurial Growth – Essential Qualities of a Successful Entrepreneur - Role of Entrepreneurs in Economic Development

**Unit II: Types of Business Ventures**

Demand - Resourced and Service Based Industries – Import Substitution Oriented Industries  
– Export Promotions Units – Location based and Foot Loose Industries – Rural Micro Enterprises – Tiny Sector – Large, Medium and Nucleus Industries – Ancillary Industries.

**Unit III: Project Planning, Project Preparation of Enterprise**

Creation of Project Ideas – Project Life Cycle – Project Planning – Project Planning Cycle – Procedures to Micro, Small and Medium Enterprises – Project Report Preparation – Opportunity Analysis .

**Unit IV: Issues and Challenges of Enterprises**

Problems of Enterprises- Industrial Sickness: Definition – Causes – Remedies – Steps for Improvement – Problems – Location – Financial – Technical – Environment – Labour Qualities – Prospects: Information – Communication – Technology – Transportation.

**Unit V: Support and Assistance to Entrepreneurship**

Role of State: Incentives, Subsidies, Tax Concessions, Capital Investment Subsidy – Backward Area Incentives – Marketing Assistance – Rehabilitation Allowance – Role of Financial Institutions – Venture Capital – Industrial Finance – Commercial Banks: Entrepreneurial Education and Training: Role of District Industries Centre, Industrial Estate, Science and Technology Park, Special Economic Zone, Small Industries Service Institute, NSIC, SIPCOT and ITCOT.

**References:**

1. Gupta and Srinivasan, (2015), Entrepreneurial Development, Sultan Chand, New Delhi.
2. Agrawal, R.C, (2015), Fundamentals of Entrepreneurship, Lakshmi Narain Agrawal, Agra.
3. Vasant Sathe, (2014), Entrepreneurship Development, Himalaya Publishing House, Mumbai.
4. Balu,V. (2012), TholilMunaivuMembadu (Tamil), Venkateswara Publishers, Chennai.
5. Banga, T.R, (2010), Project Planning and Entrepreneurship Development, CBS Publications, New Delhi.

**ECO 2532****MACRO ECONOMICS - II****5 Hrs/ 5Cr**

This course is a sequential course to ECO 2531.

**Unit I: Consumption Function**

Definitions - Propensity to Consume – Average Propensity to Consume (APC) – Marginal Propensity to Consume (MPC) - Keynesian Psychological Law of Consumption - Subjective and Objective Factors Influencing Consumption.

**Unit II: Investment Function**

Meaning – Related Concepts – Types – Determinants of MEC and MEI – Measurement.

**Unit III: Multiplier and Accelerator**

Multiplier: Definition – Derivations - Types - Working of Multiplier – Forward and Backward Operation of Multiplier – Leakage of Multiplier – Factors Determining Leakages – Importance. Accelerator: Meaning – Working of Acceleration Principle – Multiplier Vs. Acceleration - Super Multiplier.

**Unit IV: Keynes Theory of Income, Output and Employment**

Meaning – Keynesian Theory of Income, Output and Employment - Nature and Extent of Keynesian Revolution – Criticisms – Philips Curve.

**Unit V: Macro Economic Policy**

Macro Economic Policy – Objectives of Macro Policy – Types - Instruments and Conflicts in Policies – Limitations.

**Reference**

1. Rana, K.C. and Verma K.N., (2012), Macro Economic Analysis, Vishal Publishing Company, NewDelhi.
2. Andrew B. Abel and Ben S. Bernanke, (2011), Macro Economics, Pearson Education, Inc.
3. Robert J. Gordon,(2011), Macro Economics, Prentice-Hall India Limited, New Delhi.
4. Dornbusch, Fischer and Startz ,(2010), Macro Economics, McGraw Hill.
5. Gregory Mankiw, N., (2010), Macro Economics, Worth Publishers.



**ECO 2532****MACRO ECONOMICS - II****5 Hrs/ 5Cr**

This course is a sequential course to ECO 2531.

**Unit I: Consumption Function**

Definitions - Propensity to Consume – Average Propensity to Consume (APC) – Marginal Propensity to Consume (MPC) - Keynesian Psychological Law of Consumption - Subjective and Objective Factors Influencing Consumption.

**Unit II: Investment Function**

Meaning – Related Concepts – Types – Determinants of MEC and MEI – Measurement.

**Unit III: Multiplier and Accelerator**

Multiplier: Definition – Derivations - Types - Working of Multiplier – Forward and Backward Operation of Multiplier – Leakage of Multiplier – Factors Determining Leakages – Importance. Accelerator: Meaning – Working of Acceleration Principle – Multiplier Vs. Acceleration - Super Multiplier.

**Unit IV: Keynes Theory of Income, Output and Employment**

Meaning – Keynesian Theory of Income, Output and Employment - Nature and Extent of Keynesian Revolution – Criticisms – Philips Curve.

**Unit V: Macro Economic Policy**

Macro Economic Policy – Objectives of Macro Policy – Types - Instruments and Conflicts in Policies – Limitations.

**Reference**

1. Rana, K.C. and Verma K.N., (2012), Macro Economic Analysis, Vishal Publishing Company, NewDelhi.
2. Andrew B. Abel and Ben S. Bernanke, (2011), Macro Economics, Pearson Education, Inc.
3. Robert J. Gordon,(2011), Macro Economics, Prentice-Hall India Limited, New Delhi.
4. Dornbusch, Fischer and Startz ,(2010), Macro Economics, McGraw Hill.
5. Gregory Mankiw, N., (2010), Macro Economics, Worth Publishers.

**ECO 2536****TRADE DOCUMENTATION****5 Hrs/5Cr**

To help the students to identify the potential products and markets.

To acquaint the learner with the procedures of trade formalities.

**Unit I: Documentation services**

Documents Required by Various Authorities – Documents to the Customs, to the Port, to the bank – commercial invoice, Mate Receipt, Bill of Lading, Letter of Credit, Certificate of Origin, Marine Insurance Quality Control Certificate.

**Unit II: Trade Services**

Communication Network – Inventory – warehousing – material handling – adequacy of packing – containerisation – marking and labelling of export shipments – quality control and pre-shipment inspection.

**Unit III: Export Procedure**

Starting an export firm - Selection of an Export Product, Market and Buyer- Registration.

**Unit IV: Import Procedure and Documentation**

Global Sourcing – Types of Global Procurement - Tender – Negotiation – Contract– Customs Regulations and Import Clearance Formalities.

**Unit V: Trade Incentives**

Role of Commercial Banks, EXIM Bank, ECGC – Insurance for Export – Types – Export Credit Insurance - Risk Management – Types of Risks - Mitigation Methods, Export Promotion Organisations: EOUs and EPZ, SEZs.

**References**

1. Larry Blethen, (2013), Export- Import Documentation, Kindle Edition, New Delhi.
2. Justin Paul, (2011), Export-Import Management, Oxford University Education.
3. Francis Cherunilam, (2010), International Trade and Export Management, Himalaya Publishing, New Delhi.
4. Francis Cherunilam, (2008) Export Management, Himalaya Publishing House, Bangalore.

**ECO 2438****MATHEMATICAL ECONOMICS – II****4Hrs/4 Cr**

It is a sequential course to ECO 2438.

This course deals with equilibrium of firms under various market conditions and also applied tools related to decision making.

**Unit I: Market Equilibrium - I**

Market Equilibrium – Conditions – Profit Maximization under Perfect Competition – Long Run and Short Run Supply Function.

**Unit II: Monopoly**

Meaning – Profit Maximisation with and without Taxation – Sales Maximization- Monopoly Power –Discriminating Monopoly – Conditions – Profit Maximization.

**Unit III: Duopoly and Oligopoly**

Meaning – Profit Maximization – Cournot Solution, Collusion Solution, Stackelberg Solution and Market Sharing Solution.

**Unit IV: Game Theory**

Meaning – Strategy – Pure Strategy and Mixed Strategy – Two Person Zero Sum Game - Two Person Constant Sum Game – Saddle Point - Dominance Rule –  $2 \times n$  and  $m \times 2$  Games - Graphical Solution.

**Unit V: Matrix and Input – Output Analysis**

Matrix – Types – Inverse Matrix – Cramer's Rule – Input and Output Analysis – Meaning – Assumptions – Uses and Limitations – Simple Problems.

**References**

1. Chiang, A.V. (1986), Mathematics for Economics, Prentice Hall, Englewood Cliffs, New Jersey.
2. Henderson and Quandt, (1985), Micro Economic Theory: A Mathematical Approach, Student Edition, Macmillan Press, London.
3. Allen, R.G.D, (1974), Mathematical Analysis for Economists, Macmilan Press, London.
4. Koutsoyiannis, A., (1970), Modern Micro Economics, Macmilan, London.

**ECO 2440****INDUSTRIAL STRATEGIES****5 Hrs/4Cr**

The objective of this course is to impart industry friendly knowledge to the learner.

To know the industrial environment and strategies.

**Unit I: Introduction**

Meaning– Internal analysis and External analysis – Information Symmetry and Asymmetry – Competitive or Co-operative Strategic role of Private sector in relation to Public enterprises – Blue Ocean Strategy.

**Unit II: Growth Strategies**

Rationale of Industrial Strategies – Horizontal integration and vertical integration – Agriculture and Industry linkage - Diversification and expansion strategies – Merger and Acquisition – Industrial combinations – Small and Large scale Industrialization.

**Unit III: Locational Strategy**

Industrial concentration – Locationalisation – Weber's and Sargent Florence Theories- Backward Area Development programme.

**Unit IV: Industrial Efficiency Strategy**

Rationalization – Industrial Productivity – Partial Factor Productivity and Total Factor Productivity - Low Cost Strategy and Differentiation Strategy.

**Unit V: Labour Efficiency Strategies**

Labour Efficiency Strategies: Transactional vs Transformational leadership to motivate labour – Downsizing and rightsizing – Product Promotion and Innovation - Turnaround Strategy – SWOC – Global Corporate Strategy.

**References**

1. Sumit K. Majumdar (2012), India's Late Late Industrial Revolution, Cambridge University Press, New York.
2. Bharatwall R.R., (2010), Industrial Economics: An Introductory Textbook, New Age International (P) Limited, New Delhi.
3. Basanko, Dranove, Shanley, Schaefer, (2004), Economics of Strategy, Wiley Student Edition, Singapore.
4. John Pamell, (2003), Strategic Management Theory and Practices, Biztantra, New Delhi.
5. Kuchhal, S.C., (1995), Industrial Economy of India, Chaitanya, Allahabad.
6. Sivayya, Das, (1993), Indian Industrial Economy, S.Chand, New Delhi.

PROGRAMME/COURSE FRAME (2016-17)  
UG DEPARTMENT OF ECONOMICS  
Choice Based Credit System (CBCS) Programme

Sem	Part	Course No.	Course Title	Hours	Credits	Marks
1	I	TAM/FRE/HIN		3	2	
1	II	ENG 1201	Conversational Skills	3	2	
1	IIIC	ECO 1531	Micro Economics I	5	5	
1	IIIC	ECO 1433	Economic Statistics I	4	4	
1	IIIC	ECO 1435	History of Economic Thought	4	4	
1	LS I	ECO1237	Decision Making Goal Setting	3	2	
1	E	ECO1239	Population Dynamics	3	2	
1	S	MAT	Mathematics for Economics	5	4	
		<b>TOTAL</b>		<b>30</b>	<b>25</b>	
2	I	TAM/FRE/HIN		3	2	
2	II	ENG 1202	Reading & Writing Skills	3	2	
2	IIIC	ECO 1532	Micro Economics II	5	5	
2	IIIC	ECO 1434	Economic Statistics II	4	4	
2	IIIC	ECO 1436	TamilNadu Economy	4	4	
2	LS II	ECO1238	Skills for Work Effectiveness	3	2	
2	E	ECO1240	Health Economics	3	2	
2	S	MAT	Fundamentals of Computer Applications	5	4	
2	V	XXX0000	Extension Activity (PED/NSS/NCC/SLP)	2	1	
		<b>TOTAL</b>		<b>30+2</b>	<b>25+1</b>	
3	I	TAM/FRE/HIN		3	2	
3	II	ENG 2201	Study Skills	3	2	
3	III C	ECO 2531	Macro Economics I	5	5	
3	III C	ECO 2533	Public Finance	5	5	
3	III C	ECO 2535	International Trade	5	5	
3	III C	ECO 2437	Mathematical Economics I	4	4	
3	S	ECO 2439	Entrepreneurial Development	5	4	
		<b>TOTAL</b>		<b>30</b>	<b>27</b>	

Sem	Part	Course No.	Course Title	Hours	Credits	Marks
4	I	TAM/FRE/HIN		3	2	
4	II	ENG 2202	Career Skills	3	2	
4	III C	ECO 2532	Macro Economics II	5	5	
4	III C	ECO 2534	Monetary Economics	5	5	
4	III C	ECO 2536	Trade Documentation	5	5	
4	III C	ECO 2438	Mathematical Economics II	4	4	
4	S	ECO 2440	Industrial Strategies	5	4	
4	V	XXX0000	Extension Activity (PED/NSS/NCC/SLP)	2	1	
		<b>TOTAL</b>		<b>30</b>	<b>27+1</b>	
5	IIIC	ECO3631	Indian Economics I	6	6	
5	IIIC	ECO3633	Development Economics and Planning	6	6	
5	IIIC	ECO3635	Environmental Economics	6	6	
5	IIIC	ECO3537	Econometrics I	5	5	
5	LS	ECO3239	Economic Journalism	3	2	
5	VAL	VAL	Value Education	4	2	
		<b>TOTAL</b>		<b>30</b>	<b>27</b>	
6	IIIC	ECO3632	Indian Economics II	6	6	
6	IIIC	ECO3634	Financial Market and Services	6	6	
6	IIIC	ECO3636	Labour Economics	6	6	
6	IIIC	ECO3538	Econometrics II	5	5	
6	LS	ECO3240	Personal Empowerment	3	2	
6	EVS	EVS	Environmental Studies	4	2	
		<b>TOTAL</b>		<b>30</b>	<b>27</b>	
		<b>Grand Total</b>		<b>180</b>	<b>158+2</b>	

C- Core E- Elective LS- Life Skill S – Supportive

ECO-2531

பேரியல் பொருளாதாரம் - I

5Hrs/ 5Cr

முக்கிய பேரியல் பொருளாதார காரணிகளை கண்டறிதல்.

பேரியல் பொருளாதார முறையை புரிந்து கொள்ளல்.

**அலகு – I பேரியல் பொருளாதாரம்**

இலக்கணம் - தோற்றம் மற்றும் வளர்ச்சி - நுண்ணினயல் பொருளாதாரத்திற்கும் பேரியல் பொருளாதாரத்திற்கும் உள்ள வேறுபாடுகள் - கூட்டுதலின் தவறு - பரப்பு எல்லை, கருத்துகள்- இயங்கா மற்றும் இயங்கு நிலை - இருப்பு மற்றும் வெளியீடு மாறிகள் - சமநிலை - முக்கியத்துவம் - குறைபாடுகள்.

**அலகு – II தேசிய வருமானம்**

இலக்கணம் - வகைகள் - தேசியவருமானம் - தொடர்புள்ள கருத்துகள் - தேசிய வருமானம் அளவிடும் முறைகள் - வகைகள் - அளவிடும் முறைகளில் உள்ள சிக்கல்கள்.

**அலகு – III வருவாய் வட்ட சுழல் ஓட்டம்**

பொருள் - நிர்ணயக்கும் காரணிகள் - உற்பத்தி அங்காடி - உற்பத்திக்காரணிகளின் அங்காடி - மூலதன அங்காடி - இருதுறை - உட்செலுத்துதல் மற்றும் கசிவுகள்- மூன்றுதுறை மற்றும் நான்குதுறை மாதிரி - முக்கியத்துவம்

**அலகு – IV தொன்மை பொருளியலின் வேலை வாய்ப்புக்கோட்பாடுகள்**

பொருள் - முழு வேலை வாய்ப்பு - வேலையின்மை - குறைநிலை வேலைவாய்ப்பு - தொன்மை பொருளியலின் வேலை வாய்ப்புக்கோட்பாடுகள் - சேயின் அங்காடி விதி - பிகுவியன் விளைவு.

**அலகு – V விளைவுள்ள தேவை**

பொருள் - கொள்கைகள் - தொகு தேவை செயல்பாடு - தொகு அளிப்பு செயல்பாடு - முக்கியத்துவம்..

ECO 2533

பொது நிதி

5Hrs/5Cr

மாணவர்களுக்கு பொது நிதி பற்றிய அறிவினை அளித்தல்.

நடைமுறை வாழ்வில் அதன் செயல்பாடுகளை அவர்கள் புரிந்து கொள்ளல்.

#### அலகு I: அறிமுகம்

இலக்கணம் - பரப்பெல்லை - பொது நிதிக்கும் தனியார் நிதிக்கும் உள்ள வேறுபாடு  
— நோக்கங்கள் - சமுதாய உச்ச நன்மைக் கோட்பாடு.

#### அலகு II : பொது வருவாய்

இலக்கணம் - பொது வருவாயின் மூலங்கள் - வரிகள்: நேர்முக வருவாய் மற்றும் மறைமுக வருவாய் — வரி விதிகள் - வரி விளைவுகள் , வரி கொள்கைகள் - வளர்வீத வரி மற்றும் தேய்வு வீத வரி — வரி தாங்கும் திறன் - வரி நிலைப்பாடு காணுதல்

#### அலகு III : பொதுச் செலவு

இலக்கணம் - பொது செலவின் வகைப்பாடுகள் - விதிகள் - பொது செலவு அதிகரிக்க காரணங்கள் - வேக்னர்ஸ் விதிச் செலவு — விளைவுகள்.

#### அலகு IV: பொதுக்கடன்

பொருள் - பொதுக்கடன் வகைப்பாடுகள்- கடன் பெறுவதற்கான காரணங்கள் மற்றும் விளைவுகள் - பொதுக்கடன் சுமை - பொதுக் கடன் மேலாண்மை — பொதுக் கடன் முறைகள் - தீர்வு முறைகள்.

#### அலகு V: வரவு செலவுத் திட்டம்:

பொருள் - வரவு செலவுத் திட்டத்தின் வகைகள் - இயல்புகள் - நோக்கங்கள் - வரவு செலவுத்திட்டம் தயாரிக்கும் வழிமுறைகள் - பற்றாக்குறையின் வகைகள் - பற்றாக்குறை நிதியாக்கம்: இயல்புகள், முக்கியத்துவம் மற்றும் வழிமுறைகள் - நிதி கொள்கை மற்றும் நோக்கங்கள்.

#### தேர்மானம் நுண்கள்

மா.பா. குருசாமி (2012) , பொது நிதி, குரு தேமொழி பதிப்பகம் ,திண்டுக்கல்.

நா.சீனிவாசன் (2012), பொது நிதி, மீனாட்சி பதிப்பகம், மதுரை.



ECO2535

பன்னாட்டுவாணிபம்

5 Hrs/ 5 Cr

அயல்நாட்டுவாணிபகோட்பாடுகளைமணவர்கள் உள்வாங்கிக்கொள்ளுதல்.

அயல்நாட்டுவாணிபத்தின் ஆதாயங்களையும் ,கருத்துக்களையும் வெளிப்படுத்துதல்.

### அலகு - I பன்னாட்டுவாணிபஅறிமுகம்

பொருள் மற்றும் தொடர்புடையகருத்துகள் -உள்நாட்டுமற்றும் பன்னாட்டுவாணிபவேறுபாடுகள் -முக்கியத்துவம் - வணிகத்தின் ஆதரவுமற்றும் எதிரானவாதங்கள் - ஒப்பீட்டுச் செலவுக் கோட்பாடு-வாய்ப்புவழிச் செலவுக் கோட்பாடு- காரணிச் செரிவுக் கோட்பாடு.

### அலகு - IIவாணிபஆதாயங்கள்

பொருள் - வகைகள்:நேர்முக-மறைமுக- இயங்கு- இயங்கா-குறுகியமற்றும் நீண்டகாலஆதாயங்கள் - வணிகஆதாயம் ஏற்படுவதற்கானகாரணிகள் . வாணிபகொள்கை: தடையில்லாவாணிபம் vsதொழிற்பாதுகாப்பு-ஆதரவுமற்றும் எதிரானவாதங்கள் - சுங்கவரிகள் மற்றும் பங்களவுகள் .

### அலகு - IIIசெலுத்துநிலைமற்றும் வாணிபச் சமநிலை

பொருள் -செலுத்துநிலைமற்றும் வாணிபச் சமநிலைவேறுபாடுகள் - சமன் மற்றும் சமன்கேடு-காரணங்கள் மற்றும் நடவடிக்கைகள் .

### அலகு-IVபணம் மற்றும் பணவியலற்றநடவடிக்கைகள்

அந்நியச் செலாவணி-அயல்நாட்டுமாற்றுஅங்காடி-மாற்றுவீதம் - மாற்றுவீதகட்டுப்பாட்டுமுறைகள் -மாற்றுவீதகட்டுப்பாட்டுச் சட்டம் மற்றும் மாற்றுவீதமேலாண்மைச் சட்டம் - வாங்கும் திறன் சமன்பாட்டுகோட்பாடுமற்றும் நாணயச் சாலைசமன்பாட்டுக் கோட்பாடு.

### அலகு - Vபன்னாட்டுவாணிகமற்றும் பொருளாதாரநிறுவனங்கள்

சர்வதேசநீர்மை-சர்வதேசநிதிநிறுவனங்கள் - பன்னாட்டுபணநிதி- புனரமைப்புவளர்ச்சிபன்னாட்டுவங்கி- ஐரோப்பியபொருளாதாரக் குழுமம் -பன்னாட்டுதொழில் குழுமங்கள் - சுங்கவரிமற்றும் வாணிபம் பற்றியபொதுஒப்பந்தம் - உலகவாணிகஅமைப்பு,BRIC - உலகவங்கி-ஐரோப்பியவட்டாரப் பணம் -நோக்கங்கள் - பணிகள் .

### மேற்பார்வைநூல்கள்

மா.பா. குருசாமி(2012),பன்னாட்டுபொருளாதாரம், குரு தேமொழிபதிப்பகம்,திண்டுக்கல்.

மா.பா. குருசாமி(2012),பன்னாட்டுவாணிபம் , குரு தேமொழிபதிப்பகம்,திண்டுக்கல்.

ராதா. வ, (2012),பன்னாட்டுபொருளியல்,பிரசன்னாபதிப்பகம்,சென்னை.

ECO 2437

கணிதப்பொருளாதாரம் - I

4Hrs/ 4Cr

பொருளாதார கோட்பாடுகளில் கணிதவியலை பயன்படுத்த மாணவர்களுக்கு உதவுதல்.

### அலகு I: அறிமுகம்

பொருள் - பொருளாதாரம் மற்றும் கணிதப்பொருளாதாரத்திற்கான வேறுபாடுகள் - மாறிகள் - மாறாதவை - சார்புகள்: வகைகள் - பொதுவான சார்பு , மறைமுகச் சார்பு, வெளிப்படையச் சார்பு, எதிர்மறைச் சார்பு - பொருளாதாரத்தில் கணிதத்தின் பங்கு.

### அலகு II: ஒரு மாறிக்கான வகையீடல்

ஒரு மாறிக்கான வகையீடுகள் - தேவை மற்றும் அளிப்பு வேறுபாடு - மொத்த சார்பிலிருந்து இறுதிநிலை சார்பு - தேவை நெகிழ்ச்சி - உச்ச மற்றும் குறைந்த மதிப்புச் சார்பு - திருப்புமுனைப் புள்ளி - பயன்படுத்துதல் - குறைந்தச் செலவு - உச்ச அளவு லாபம் - உச்ச அளவு விற்பனை - உச்ச அளவு பயன்பாடு.

### அலகு III: இரண்டு மாறிகளுக்கான வகையீடல்

இரண்டு மாறிகளுக்கான வகையீடுகள் - பகுதி வகையீடு - பயன்கள்: பதிலீட்டுப் பொருள்கள் மற்றும் கூட்டுப் பொருட்கள் , குறுக்குதேவை நெகிழ்ச்சி - மீப்பெரு மற்றும் மீச்சிறு மதிப்புகள் - உச்சப் பயன்பாடு நிபந்தனைக்குட்பட்டு - லெக்ராஜியன் முறை - மொத்த வகையீடல்.

### அலகு IV: தொகையீடல்

பொருள் - எளிய கணக்குகள் - இறுதிநிலை சார்பிலிருந்து மொத்தச்சார்பு - திட்டமான தொகையீடு - நுகர்வோர் உபரி மற்றும் உற்பத்தியாளர் உபரி.

### அலகு V: உற்பத்திச் சார்பு

பொருள் - ஓரியல்பு மற்றும் ஓரியல்பற்ற உற்பத்தி சார்பு - பண்புகள் - காப் - டக்ளஸ் உற்பத்திச் சார்பு - பண்புகள் - ஆய்லின் கோட்பாடு - மாறாத பதிலிட்டு நெகிழ்ச்சி (CES) உற்பத்தி சார்பு.

### மேற்பார்வை நூல்கள்

D. Bose (2011), An Introduction to Mathematical Methods, Himalaya Publishing House, Mumbai.

தேவஇரக்கம் (2012), ஜோதி பதிப்பகம், திருநெல்வேலி, தமிழ்நாடு.

ECO 2439

தொழில் முனைவுமேம்பாடு 5 Hrs/4 Cr

தொழில்முனைவியல் சமுதாயத்தைப் பற்றிவிழிப்புணர்வைஅளித்தல்.  
நடைமுறைசாத்தியமுள்ளவணிகத்தையும் அதற்குள்ளஆதரவுசதிகளையும்  
பரிந்துகொள்ளல்

#### அலகுI: தொழில் முனைவு

இலக்கணம் - வகைகள் - பணிகள் - பொருளாதாரமுன்னேற்றத்தில் தொழில் முனைவின் பங்கு - பெண் தொழில் முனைவோரின் பங்கு—தொழில் முனைவோரின் வளாச்சியைபாதிக்கும் காரணிகள் - வெற்றிகரமானதொழில் முனைவோரின் முக்கியத் தன்மைகள் - பொருளாதாரவளர்ச்சியில் தொழில் முனைவின் பங்கு.

#### அலகுII :தொழில் அணைப்பின் வகைகள்

தேவை - வளங்கள் -சேவைசார்ந்ததொழில்கள் - இறக்குமதிபதிலீடுசார்ந்ததொழில்கள் - ஏற்றுமதிசார்ந்தபிரிவுகள் - இட அமைப்புசார்ந்ததொழில்கள் - வட்டாரசிறுதொழில்கள் - குறு தொழில் —பெரியமற்றும் இடைநிலை,மீச்சிறுதொழில்கள் - துணைத் தொழில்கள்.

#### அலகுIII:சிறுதொழில்களில் தொழில் திட்டமும் திட்டஆய்வுபரித்தலும்

தொழில் கருத்து - உருவாக்கம் - தொழில் வாழ்க்கைசுழற்சி—தொழில் ஆய்வுத் திட்டத்தில் குறு, சிறுமற்றும் நடுத்தரநிறுவனங்கள் - திட்டசுழற்சி - சிறுதொழில்கள் ஏற்படுத்துவதில் உள்ளவழிமுறைகள் - தொழில் ஆய்வுஅறிக்கையாரிப்பு - பிறவாய்ப்புகுத்தாய்வு.

#### அலகுIV: சிறுதொழில்களில் சவால்களும்பிரச்சனைகளும்

சிறியதொழிற்சாலைகளில் உள்ளபிரச்சனைகள் - தொழில் நலிவடைதல்: இலக்கணம் - காரணங்கள் - தீர்க்கும் வழிமுறைகள்- முன்னேற்றபடிநிலைகள் - பிரச்சனைகள் - இடவமைப்பு- நிதிநிலைகள் - தொழில் நுட்பம் - சுற்றுச்சூழல் - தொழிலாளர் குணாதிசயங்கள் - வாய்ப்புகள்: தகவல் அமைப்பு—தொலைதொடர்பு—தொழில் நுட்பம் - போக்குவரத்துவசதி.

#### அலகுV:தொழில் முனைவோருக்கானஆதரவுமற்றும் உதவி

அரசின் பங்கு: ஊக்கம் ,மானியங்கள் ,வரிதளர்வுகள் - முதலீட்டுமானியம் - பின் தங்கியபகுதிகளின் ஊக்கம் - அங்காடிஉதவி—மறுசீரமைப்புபடித்தொகை - நிதிநிறுவனங்களின் பங்கு—துணிகரமுதலீடு—தொழில் நிதி—வணிகவங்கிகள்: தொழில் முனைவுகல்விமற்றும் பயிற்சி: மாவட்டதொழில் மையத்தின் பங்கு,தொழில் பேட்டை,அறிவியல் மற்றும் தொழில்நுட்பபூங்கா,சிறப்புபொருளாதாரமண்டலம் - சிறியதொழில் சேவைநிறுவனம் ,தேசியசிறுதொழில் கமிசன் (NSIC)தமிழ்நாடுமாநிலதொழில் முன்னேற்றக் கழகம் (SIPCOT) மற்றும் தமிழ்நாடு,தொழில் மற்றும் தொழில்நுட்பகழகம்; (ITCOT)

#### மேற்பார்வைநூல்கள்

ந. சீனிவாசன் (2012),தொழில் முனைவுமேம்பாடு ,மீனாட்சிபதிப்பகம் ,மதுரை.

V. ராதா.(2011),தொழில் முனைவுமேம்பாடு ,பிரசன்னாபதிப்பகம் ,சென்னை.

ECO 2532

பேரியல் பொருளாதாரம் - II

5Hrs/5Cr

இப்பாடத்திட்டம் ECO 2531 கீழ் வரிசைப்படுத்தப்பட்டுள்ளது.

### அலகு – I: நுகர்வுச்சார்பு

இலக்கணம் - நுகர்வு நாட்டம் - சராசரி நுகர்வு நாட்டம் (APC) - இறுதிநிலை நுகர்வு நாட்டம் (MPC) - கீன்ஸ் நுகர்வின் உளவியல் விதி - நுகர்வுச்சார்பை தீர்மானிக்கும் அகக்காரணிகள் மற்றும் புறக்காரணிகள்.

### அலகு – II: முதலீட்டுச்சார்பு

பொருள் - தொடர்புள்ள கருத்துகள் - வகைகள் - மூலதனத்தின் இறுதிநிலை ஆக்கத்திறன் (MEC) மற்றும் முதலீட்டின் இறுதிநிலை ஆக்கத்திறன் (MEI) - தீர்மானிக்கும் காரணிகள் - அளவிடும் முறைகள்.

### அலகு – III: பெருக்கி மற்றும் முடுக்கி

**பெருக்கி:** இலக்கணம் - வருவித்தல் - வகைகள் - முன்னோக்கி மற்றும் பின்னோக்கிச் செயல்படும் பெருக்கி - கசிவுகள் - கசிவை நிர்ணயிக்கும் காரணிகள் - முக்கியத்துவம்.

**முடுக்கி:** இலக்கணம் - கோட்பாடு - பெருக்கிக்கும் முடுக்கிக்கும் உள்ள வேறுபாடுகள் - மிகை முடுக்கி.

### அலகு – IV: கீன்ஸின் வருவாய் வெளியீட்டு மற்றும் வேலைவாய்ப்பு கோட்பாடு

பொருள் - கீன்ஸின் வருவாய் வெளியீட்டு மற்றும் வேலைவாய்ப்புக் கோட்பாடு - கீன்ஸின் மறுகூற்றுக் கோட்பாடு - திறனாய்வு - பிலிப்ஸ் வளைகோடு.

### அலகு – V: பேரியல் பொருளாதாரக் கொள்கை

பேரியல் பொருளாதார கொள்கை - பேரியல் கொள்கையின் நோக்கங்கள் - வகைகள் - கருவிகள் மற்றும் முரண்பாடுகள் - வரையறைகள்.

### மேற்பார்வை நூல்கள்

மா.பா. குருசாமி, (2012) பேரியல் பொருளாதாரம், குரு தேமொழி பதிப்பகம், திண்டுக்கல்.  
நா.சீனிவாசன்,(2012), பேரியல் பொருளாதாரம், மீனாட்சி பதிப்பகம், மதுரை.

ECO 2534

பணப்பொருளாதாரம்

5 Hrs/5Cr

பணவியல் பொருளாதாரத்தின் படிமங்களை மாணவர்களுக்கு அறிமுகப்படுத்துதல்.

பணவியல் சம்மந்தமான போட்டி தேர்வுகளுக்கு மாணவர் தயாராக உதவுதல்.

**அலகு I : பணத்தின் இயல்பு மற்றும் பணிகள்**

இலக்கணம் - தோற்றம் - வகைகள் - பணிகள் - பணத்தின் முக்கியத்துவம் மற்றும் குறைபாடுகள்.

**அலகு II : பணத்திட்டம்**

பொருள் - வகைகள்- உலோகத் திட்டம் - தங்கத் திட்டம் - இரு உலோகத் திட்டம் - காகித பணத்திட்டம் - குழை பொருள் பணத்திட்டம் (ATM, credit and debit cards) – கிராஷாம் விதி - பண வெளியீட்டு முறைகள் கொள்கைகள் - நிறை மற்றும் குறைகள் - நல்ல பணத்திட்டத்தின் இயல்புகள்.

**அலகு III : பணக் கோட்பாடுகள்**

பணத்தின் மதிப்பு – பிஷ்ர்ஸின் பண அளவு கோட்பாடு: பணபரிவர்த்தனை மற்றும் ரொக்க இருப்பு அணுகுமுறை - பண அளவுக் கோட்பாடு எவ்வாறு பரிவர்த்தனை கோட்பாட்டினைவிட சிறந்தது – மில்டன் பிரிட்மேனின் பண அளவுக் கோட்பாடு

**அலகு IV : பணத்தின் தேவை மற்றும் அளிப்பு**

பணத் தேவை – கீன்ஸின் நீர்மை விருப்பக் கோட்பாடு: நோக்கங்கள், நீர்மை பொறி. பண அளிப்பு: பண அளிப்பின் பல்வேறு கருத்து - பண அளிப்பின் பகுதிகள் - பண அளிப்பை தீர்மானிக்கும் காரணிகள்.

**அலகு V : பணவீக்கம் மற்றும் வாணிபச்சுழல்**

**பணவீக்கம்:** பொருள் - இலக்கணம் - காரணங்கள் - விளைவுகள் மற்றும் கட்டுப்படுத்தும் முறைகள்.

**வாணிபச்சுழல்:** பொருள் - இயல்புகள் - வகைகள் மற்றும் நிலைகள்.

**பணக் கொள்கை:** இலக்கணம் - நோக்கங்கள் - கருவிகள்.

**மேற்பார்வை நூல்கள்**

மா.பா. குருசாமி (2012) பணம் , வங்கி இயல்கள் , குரு தேமொழி பதிப்பகம், திண்டுக்கல்.

ECO 2536

வணிக மற்றும் ஆவணங்கள்

5Hrs/5Cr

**மாணவர்கள் வணிகத்தில் சாத்தியமான பண்பங்களையும் சந்தைகளையும் கண்டறிதல்.**

**கற்று கொள்பவர்கள் வணிக நடைமுறைகளில் சிறப்புடன் செய்தல்.**

### **அலகு I ஆவணமிடுதலின் சேவைகள்**

பல்வேறு ஏற்றுமதி ஆணையங்களின் ஆவணங்கள் - சுங்கவரி ஆவணங்கள் , துறைமுக ஆவணங்கள் , வங்கி ஆவணங்கள் - வணிக சிட்டைகள் , கப்பல் சீட்டு , கப்பல் இடை இருப்பு சீட்டு , கடன் கடிதம் , சான்று உற்பத்தி தோற்ற சான்றிதழ் , கடல் காப்பீடு, தரக் கட்டுப்பாட்டு சான்றிதழ்.

### **அலகு II வணிக சேவைகள்**

தகவல் தொடர்பு பிணையம் - இருப்பு நிலை - கிடங்கு - சரக்கு கையாளுதல் - கட்டுமம் தொடர்பு - பெட்டகப்படுத்துதல் - ஏற்றுமதி கப்பலிட குறித்தல், குறியிடுதல் கப்பலிடுமுன் தரக்கட்டுப்பாடு மேற்பார்வையிடல்.

### **அலகு III ஏற்றுமதி செயல்முறை**

ஏற்றுமதி நிறுவனத்தை தொடங்குதல் - ஏற்றுமதி பொருளை தெரிவுச் செய்தல், அங்காடி மற்றும் வாங்குவோர் - பதிவுசெய்தல்.

### **அலகு IV இறக்குமதி செயல்முறை மற்றும் ஆவணங்கள்**

உலகளாவிய வளங்கள் - கொள்முதல் வகைகள் - ஏலமிடுதல் - பேரப்பேச்சு - ஒப்பந்தம் தொடர்பான - சுங்கவரி நெறிமுறை மற்றும் இறக்குமதி தடை நீக்கும் முறைகள்.

### **அலகு V வாணிப ஊக்க நடவடிக்கைகள்**

வணிக வங்கியின் பங்கு , ஏற்றுமதி மற்றும் இறக்குமதி வங்கி - ஏற்றுமதி கடன் மற்றும் உத்தரவாத கழகம்,- ஏற்றுமதிக் காப்பீடு - வகைகள் - ஏற்றுமதி கடன் காப்பீடு - இடர்மேலாண்மை - இடர் வகைகள் - தீர்வு முறைகள், ஏற்றுமதி வளர்ச்சி முகைமை: ஏற்றுமதி தொழில் நிறுவனம் (EOUs) & ஏற்றுமதி தொழில் வளாகம் (EPZ) சிறப்பு பொருளாதார மண்டலம் (SEZ).

### **மேற்பார்வை நூல்கள்**

பன்னாட்டு பொருளாதாரம் மா.பா. குருசாமி 2012 , குரு தேமொழி பதிப்பகம் , திண்டுக்கல்.

பன்னாட்டு வாணிபம் , மா.பா. குருசாமி 2013 , குரு தேமொழி பதிப்பகம் , திண்டுக்கல்.

ECO 2438

கணிதப்பொருளாதாரம் - II

4 Hrs/ 4Cr

**இப்பாடத்திட்டம் ECO 2438 கீழ்வரையறுக்கப்பட்டுள்ளது.**

**அலகு I: அங்காடி சமநிலை**

அங்காடி சமநிலை – நிபந்தனைகள் - நிறைவுப்போட்டியில் உச்ச லாபம் - குறுகிய மற்றும் நீண்ட கால அளிப்பு சார்பு.

**அலகு II: முற்றரிமை**

பொருள் – வரி மற்றும் வரியில்லா நிலையில் உச்ச லாபம் - உச்ச விற்பனை – முற்றரிமைத் திறன் - விலைபேதம் காட்டுதல் - நிபந்தனைகள் - உச்சலாபம்.

**அலகு III: இருவர் மற்றும் சில்லோர் முற்றரிமை**

பொருள் - உச்ச லாபம் - கூர்னாட், இணைந்து செயல்படல், ஸ்டேகில்பெர்க் மற்றும் அங்காடி பங்கு தீர்வு.

**அலகு IV: விளையாட்டுக் கோட்பாடு**

பொருள் - உத்தி – தூய உத்தி மற்றும் கலப்பு உத்தி - இரண்டு நபர்கள் பூஜ்ய கூட்டுத் தொகை விளையாட்டு - இரண்டு நபர்கள் மாறாத கூட்டுத் தொகை விளையாட்டு – சேனைப் புள்ளி – ஆதிக்க விதி -  $2 \times n$  மற்றும்  $m \times 2$  விளையாட்டுகள் - வரைபடத் தீர்வு.

**அலகு V: அணி மற்றும் உள்ளீட்டு - வெளியீட்டு பகுத்தாய்வு**

அணி: பொருள் - வகைகள் - எதிரணி – கிரம்மர்ஷ் விதி - உள்ளீட்டு மற்றும் வெளியீட்டு பகுத்தாய்வு: பொருள் - எடுகோள்கள் - பயன்கள் மற்றும் வரையறைகள் - எளிய கணக்குகள்.

**மேற்பார்வை நூல்**

D. Bose , (2012), An Introduction to Mathematical Methods, Himalaya Publishing House, Mumbai.

தேவஇரக்கம்,(2011), ஜோதி பதிப்பகம் , திருநெல்வேலி. தமிழ்நாடு.

ECO 2440

தொழிற்சூழல் உத்திகள்

5Hrs/4Cr

கற்பவர்களுக்குத் தொழில்கள் சம்மந்தமான அறிவை வழங்குதல்.  
தொழில்களில் சுற்றுச்சூழலையும், உத்திகளையும் புரிந்துகொள்ளுதல்.

### அலகு I: அறிமுகம்

பொருள் - அக மற்றும் புறபகுத்தாய்வு - தகவல் சமச்சீர் மற்றும் சமச்சீர் இன்மை - பொதுத்துறையில் தனியார் துறையின் போட்டி அல்லது இணைந்து செயல்படும் உத்தி - நீலகடல் உத்தி.

### அலகு II: வளர்ச்சி உத்திகள்

தொழில் உத்திகளின் முக்கியத்துவம் - படுகிடை மற்றும் செங்குத்து ஒருங்கிணைப்பு - வேளாண்மை மற்றும் தொழில் இணைப்பு-பரவல் மற்றும் விரிவடைதலின் உத்திகள் - இணைப்பு மற்றும் கையகப்படுத்துதல் - தொழில் இணைப்பு முறைகள் - சிறு மற்றும் பெரிய நிறுவனங்கள் தொழில்மயமாக்குதல்.

### அலகு III: இட அமைப்பு உத்திகள்

தொழில் செறிவு- இடச் செறிவு-வெப்பர் மற்றும் செர்ஜயன்ட் பிளாரன்ஸ் கோட்பாடு- பின்தங்கியப் பகுதி வளர்ச்சி திட்டம்.

### அலகு IV: தொழில் திறன் உத்திகள்

பகுத்தறிவு-தொழில் உற்பத்தித் திறன் - பகுதிகாரணி உற்பத்தித் திறன் மற்றும் மொத்த காரணி உற்பத்தித் திறன் - குறைந்த செலவு மற்றும் வேறுபடுத்தக் கூடிய உத்திகள்.

### அலகு V: உழைப்புத் திறன் உத்தி

உழைப்புத் திறன் உத்திகள்: உழைப்பு மற்றும் பரிவர்த்தனை மற்றும் பரிமாணம் தலைமைத்துவம் - கீழ்க்குறைப்பு மற்றும் சரியான- திருப்பம் -SWOC (பலம், பலவீனம், வாய்ப்பு, சவால்) -உலக பெருநிறுவன உத்திகள்.

### மேற்பார்வை நூல்கள்

மா.பா. குருசாமி(2012), இந்தியப் பொருளாதாரம், குரு தேமொழிபதிப்பகம், திண்டுக்கல்.  
நா.சீனிவாசன்(2012), இந்தியப் பொருளாதாரம், மீனாட்சிபதிப்பகம், மதுரை

V.ராதா(2011), ஆளுமை மேம்பாடு, பிரசன்னாபதிப்பகம், சென்னை.

V.ராதா(2011), தொழில் முனைவு மேம்பாடு, பிரசன்னாபதிப்பகம், சென்னை



**VAL 3230****SOCIAL ISSUES AND VALUE STAND****4 Hrs/ 2 Cr****Objectives**

This course aims at introducing and clarifying values amidst various issues in society. By internalizing the values on the basis of universal frame of reference such as the Indian constitution, the course helps the students to take appropriate value stands on wide ranging societal issues. Further this course provides scope for appropriate case studies that helps the students to take socially desirable value orientation, through exposure to agents of change such as NGOs, human rights organization and other legal bodies.

**I – Introducing the concept of Values**

Concept of “Value” – Dimensions of Values, Identification of Values, Values as socially desirable quality, Spatio-temporal and cultural relativeness of values – Philosophical / ethical, sociological and psychological aspects of values – Sources of Values, Values and rights – Indian constitutional basis for values – Discrimination, inequality, injustice, and limiting of freedom and liberty as instances against value orientation – Values and democracy – Importance of value Education

**II – Caste in Indian Society**

Features of Caste system and the principle of unequal ascribed status – hierarchical structural arrangement – Outcastes and conception of lesser human beings, impure and polluting principles – Understanding untouchability – Unequal access to power prestige & status, Economic, social and political inequality – Caste politics and identity issues – Honor Killing – Reservation and the concept of positive discrimination – Case studies involving caste discrimination and caste violence – Constitutional provisions of the values of equality, justice and liberty pertaining to caste – Social equality and justice.

**III – Gender in Indian Society**

Definition and concept of gender inequality – roots of discrimination - patriarchy system – women subordinate systems in various religious practices – Nexus between low status of women and lack of education & poverty – Data pertaining to inequality index in India – Economic participation, educational achievements, health & life expectancy & political empowerment – Female foeticide & infanticide, sex ratio, maternal mortality rate – Legal and constitutional safeguards against gender inequality – case studies on dowry harassment, child marriage, domestic violence, unequal opportunities and differential treatment in family, religious rites, politics, education and work place – gender equality, gender justice, gender consciousness and gender sensitivity.

#### **IV – Religion in Indian Society**

Basis of religious discrimination – fundamentalism, conflicts between majoritarianism and minoritarianism – cultural nationalism - Discrimination on the basis of prescribed and forbidden food habits – ghettoization – Religion and politics – Religion and patriarchy – denial of entry into places of worship – Religion and dress code – Taking an appropriate value stand on religious discrimination – Secularization – Constitutional rights on religious freedom – Case studies involving violence on religious minorities, religion and terror, religion and marginalization of communities – Religious co-existence and religious pluralism – Dharma, brotherhood, peace, forgiveness and love as religious values.

#### **V – Youth and Value orientation**

Youth and personal values – youth and peer group values – youth and social values – youth and family values – youth and religious values – youth and political values - value challenges in education, occupation and profession – Promotion of value based society.

#### **Reference**

- Jagan Karade, “Caste Discrimination”, Sage Publication, Rawat Books, (2015)
- Peggy Froerer, “Religious division and Social Conflict”, Social Science Press, New Delhi, (2007)
- Prahalada, (2000). Contemporary significance of value education. In Negi, U.R. (Ed.) Value education in India. New Delhi: Association of Indian Universities, 1-9. Periodic articles and news reports published in print media
- Rajiv Azad, “Gender Discrimination: An Indian Perspective”, Atlantic Publishers (2012)
- Ram Puniyani, “Religion, Power and Violence”, Sage Publications, (2005)
- Singh, R.P. (2004). Value education in Indian democracy. University News, 4294 1), October 1 1- 17,6-9.
- Vani Kant Borooah, Nidhi S. Sabharwal and et al, “Caste discrimination and exclusion in Modern India”

**UNDERGRADUATE DEPARTMENT OF ENGLISH (SF)****Programme for B.A. English (SF) from 2015 batch onwards**

Sem	Part		Code	Title	Hr/ Wk	Cr.	Marks
I	Part I		TAM/FRS/HIS		3	2	30
I	Part II		ENS 1201	Conversational Skills	3	2	30
	Part III Major	Core	ENS 1461	Prose I	4	4	60
			ENS 1463	English in Use	4	4	60
			ENS 1565	Short Story and One Act Play	5	5	75
		Supportive	ENS 1467	Literary Forms and Vocabulary	5	4	60
	Part IV	*Non-Maj. Elect.	TAM xxxx ENS 1221	Basic Tamil/Adv. Tamil/NME Film Appreciation	3	2	30
		Life Skill I	ENS 1223	Word Power	3	2	30
				<b>Total</b>	<b>30</b>	<b>25</b>	<b>375</b>
II	Part I		TAM/FRS/HIS		3	2	30
II	Part II		ENS 1202	Reading & Writing Skills	3	2	30
	Part III Major	Core	ENS 1562	Poetry I	5	5	75
			ENS 1464	Fiction I	4	4	60
			ENS 1466	Drama	4	4	60
		Supportive	ENS 1468	History of English Literature	5	4	60
	Part IV	*Non-Maj. Elect.	TAM xxxx ENS 1222	Basic Tamil/Adv. Tamil/NME Science Fictions	3	2	30
		Life Skill II	ENS 1224	Spoken English	3	2	30
	Part V	Extension	XXX xxxx	(NSS /NCC, NSS, SLP)	2	1	
				<b>Total</b>	<b>30+2</b>	<b>25 + 1</b>	<b>375</b>
III	Part I		TAM/FRS/HIS		3	2	30
III	Part II		ENS 2201	Study Skills	3	2	30
	Part III Major	Core	ENS 2561	Poetry II	5	5	75
			ENS 2463	Fiction II	4	4	60
			ENS 2565	Indian Literature in English	5	5	75
			ENS 2567	Shakespeare	5	5	75
		Supportive	ENS 2469/ FRS xxxx	English Phonetics & Phonology/ Introduction to French Language	5	4	60
			<b>Total</b>		<b>30</b>	<b>27</b>	<b>405</b>

Sem.	Part		Code	Title	Hr/ Wk	Cr.	Marks
IV	Part I		TAM/FRS/HIS		3	2	30
	Part II		ENS 2202	Career Skills	3	2	30
	Part III Major	Core	ENS 2466	Prose II	4	4	60
			ENS 2562	American Literature	5	5	75
			ENS 2564	Translation–Theories and Problems	5	5	75
		Supportive	ENS 2468	Advanced Grammar	5	5	75
			ENS 2470	Theories of Translation / Introduction to French Literature	5	4	60
			FRS xxxx				
Part V	Extension	XXX xxxx	Extension Activity (NSS/NCC, NSS, SLP)	2	1		
				<b>Total</b>	<b>30+2</b>	<b>27+1</b>	<b>405</b>
V	Part III Major	Core	ENS 3671	New Literatures	6	6	90
			ENS 3673	Literary Theory and Criticism	6	6	90
			ENS 3675	Fiction III	6	6	90
		Innovative	ENS 3577	English for Media	5	5	75
	Part IV	Life Skill Course	ENS 3279	Creative English	3	2	30
	Part IV	VAL	VAL xxxx	Value Education	4	2	30
				<b>Total</b>	<b>30</b>	<b>27</b>	<b>405</b>
VI	Part III Major	Core	ENS 3672	Teaching English as a Second Language	6	6	90
			ENS 3674	Basics of Linguistics	6	6	90
			ENS 3676	Contemporary Literature	6	6	90
			Innovative	ENS 3578	English at Work Place	5	5
	Part IV	Life Skill Courses	ENS 3280	English for Competitive Exam	3	2	30
			ENS 3200	Environmental Studies	4	2	30
				<b>Total</b>	<b>30</b>	<b>27</b>	<b>405</b>
<b>Grand Total for semesters I-VI</b>					<b>180+4</b>	<b>158 + 2</b>	<b>2370</b>

**\*Courses offered to Non-Major Students by the Department of English**

**PART III Supportive**

<b>SEM</b>	<b>COURSE NO</b>	<b>COURSE TITLE</b>	<b>Hrs.</b>	<b>Cr.</b>	<b>Marks</b>	<b>Students of</b>
I	ENS 1467	Literary Forms and Vocabulary	5	4	60	ENS
II	ENS 1468	History of English Literature	5	4	60	ENS
III	ENS 2469	English Phonetics and Phonology	5	4	60	FRS
IV	ENS 2470	Theories of Translation	5	4	60	FRS
	<b>Total</b>		<b>20</b>	<b>16</b>	<b>240</b>	

**PART IV Non-Major Electives**

<b>SEM</b>	<b>COURSE NO</b>	<b>COURSE TITLE</b>	<b>Hrs.</b>	<b>Cr.</b>	<b>Marks</b>
I	ENS 1221	Film Appreciation	3	2	30
II	ENS 1222	Science Fictions	3	2	30
	<b>Total</b>		<b>6</b>	<b>4</b>	<b>60</b>

**PART IV Life Skills Courses**

<b>SEM</b>	<b>COURSE NO</b>	<b>COURSE TITLE</b>	<b>Hrs.</b>	<b>Cr.</b>	<b>Marks</b>
I	ENS 1223	Word Power	3	2	30
II	ENS 1224	Spoken English	3	2	30
V	ENS 3279	Creative English	3	2	30
VI	ENS 3280	English for Competitive Exam	3	2	30
			<b>12</b>	<b>8</b>	<b>120</b>

**ENS 2201****Study Skills****3 Hrs. / 2 Cr.**

The third sequential General English Course aims at empowering second year undergraduate students with study skills necessary to continue their chosen major disciplines. The course assumes importance in the context of students lacking study skills and strategies for academic success.

At the end of the course, students shall be able to

- i. develop healthy study habits and improve homework habits
- ii. fine tune their academic skills
- iii. apply time management skills
- iv. understand psychological traits
- v. use ICT skills

**Unit 1****General**

Definition & scope of study skills, their needs, learning styles, study habits, homework habits, and strategies to improve study skills

**Unit 2****Academic Skills**

Effective, active listening, effective reading strategies & essay writing, note taking & making, summarizing, paraphrasing, information transfer, library skills, and dictionary skills

**Unit 3****Time Management**

Motivation & success, choosing study partners, creation of study space, barrier to time management, strategies to overcome barriers, punctuality & time management, time management during exam

**Unit 4****Psychological Traits**

Concentration skills, memory, remembering, stress management, coping with test anxiety, critical thinking

**Unit 5****ICT**

ICT skills, computer literacy skills at basic, intermediate and advanced levels

**Textbook**

Sekar, J.J. 2015. **Study Skills**. Madurai: Department of English, The American College

**ENS 2561****POETRY II****5 Hrs. / 5 Cr.**

This course includes the poetry of the Romantic, Victorian, Modern ages and the War poems. Thus Poetry II, as the continuation of Poetry I of the previous semester, becomes complete.

**Objectives**

At the completion of this course students will be able to:

- I. Understand, enjoy and appreciate poetry in general
- II. Understand the unique features of the poets and of the three major ages
- III. Understand the socio political changes as reflected by the poets
- IV. Understand the evolution of poetry that brings about change in theme, style and expression
- V. Understand the pain and agony that effected from world war

## **The Romantic Age**

### **Unit I**

William Blake:  
     A Poison Tree  
     Tyger tyger  
 William Wordsworth - The Solitary Reaper  
 Samuel Taylor Coleridge - Human Life  
 Lord Byron - She Walks in Beauty

### **Unit II:**

Percy Bysshe Shelley - A Tale Of Society As It Is: From Facts, 1811  
 Elizabeth Barrett Browning - The Cry of The Children  
 John Keats - La Belle Dame Sans Merci  
 Christina Rossette - Sleeping At last  
 James Henry Leigh Hunt - Death

### **Unit III The Victorian Age**

Alfred Lord Tennyson - The Lady of Shalott  
 Matthew Arnold - Growing Old  
 Robert Browning - After  
 Gerard Manley Hopkins - God's Grandeur

### **Unit IV War Poetry**

Rupert Brooke - The Dead  
 Thomas Hardy - Drummer Hodge  
 Wilfred Owen - Mental Cases  
 Arthur Graeme West - God! How I hate you, you young cheerful men

### **Unit V Modern Poetry**

W.H. Auden – Lullaby  
 Ted Hughes – Hawk Roosting  
 Philip Larkin – Aubade  
 George Orwell – Our Minds are Married, But We are Too Young

### **Self Study:**

A Poison Tree – William Blake  
 Sleeping At Last – Christina Rossette  
 After – Robert Browning  
 Mental Cases – Wilfred Owen  
 Lullaby – W.H. Auden

### **References:**

Walter E. Houghton, *Victorian Poetry and Poetics*. G. Robert Stange, 1936  
 Hirschbary, Stuart. *Myth in The Poetry of Ted Hughes*. Barnes and Noble Books, Dublin, 1971.  
 Bernbaum, Ernest. *Anthology of Romanticism*. The Ronald Press Company, New York, 1945.

**ENS 2463****FICTION II****4Hrs./4 Cr.**

The course aims at introducing students with the novels written by eminent writers of 19th century. It will also introduce Romantic Revival, Romantic Revolt and Conflict between Science and Religion.

**Objectives:**

**At the completion of this course the students shall be able to**

- i. Analyze the characters in the novel and relate those characters with the society
- ii. Critically appreciate the novels of 19<sup>th</sup> century
- iii. Narrate the story and summarize the main ideas
- iv. Read the novel and discuss the issues brought to light by the novelists
- v. Write their views after reading the novel

<b>UNIT I:</b>	Charles Dickens	- Oliver Twist
<b>UNIT II:</b>	George Eliot	-Silas Marner
<b>UNIT III:</b>	Charlotte Bronte	- Jane Eyre
<b>UNIT IV:</b>	Emily Bronte	-Wuthering Heights
<b>UNIT V:</b>	Thomas Hardy	- Far From the Madding Crowd

**SELF STUDY**

Charlotte Bronte - Jane Eyre

**Reference**

Malcolm, Bradbury. *Novel Today*. London: Fontana Press, 1990.

Stevenson, Randall. *The British Novel Since the Thirties: An Introduction*. Athens: The University of Georgia Press, 1986.

**ENS 2565****Indian Literature in English****5Hrs. /5cr**

This course will highlight the uniqueness of Indian Literature in English and also compare and contrast Indian Literature in English with the literatures of other nations. At the end of the course the students will be able to

- i. create literary sensibility and emotional response to the literary texts and to implant a sense of appreciation of literary text
- ii. expose students to the artistic and innovative use of language employed by the writers
- iii. explore imagination and values reflected in texts
- iv. understand the uniqueness of Indian Writing
- v. recognize the ideas and cultures of Indian people past and present



**Unit – 1 (Poetry)**

Toru Dutt	- Our Casuarina Tree
Sarojini Naidu	- Indian Dancers
Kamala Das	- Evening at the old Nalapat House
A.K.Ramanujam	- “The River”
Daruwalla	- On the contrariness of dreams
Nissim Ezekiel	- Night of the Scorpion
Jayanta Mahapatra	- Hunger
Arun Kolatkar	- Woman
Agha Shahid Ali	- Postcard from Kashmir
Manohar Shetty	- Gifts

**Unit – II (Short Story)**

Salman Rushdie	- “Free Radio”
Arun Joshi	- “The Survivor”

**Unit – III (Novel)**

R.K.Narayan	- The Guide
Mulkraj Anand	- Coolie
Shashi Deshpande	- That Long Silence

**Unit-IV (Drama)**

Girish karnad	- Hayavadana
Badal sircar	- Evam Indrajit

**Unit-V (Prose)**

R. L. Stevenson	- Capital Punishment
Jawaharlal Nehru	- A Passage to India (From Discovery of India)
Gita Mehta	- Reinventing the Wheel

**Self Study**

Manohar Shetty	- Gifts
Salmon Rushdie	- Free Radio
Mulkraj Anand	- Coolie
Girish karnad	- Hayavadana
R. L. Stevenson	- Capital Punishment

**Reference**

- Mehrotra, Arvind Krishna (ed.). *An illustrated History of Indian Literature in English*. Delhi: Permanent Black, 2003.
- Naik, M.K. and Shyamala A. Narayanan. *Indian English Literature 1980 - 2000: A critical survey*. Delhi: Pencraft International, 2001.
- Parthasarathy, (ed.) *Ten Twentieth- Century Indian Poets (New poetry in India)*. New Delhi: Oxford University Press, 1976.
- King, Bruce. *Modern Indian Poetry in English*. Rev. ed New Delhi: OUP, 2001.
- Sanga, Jaina C. *Salman Rushdie's Postcolonial Metaphors: Migration, Translation, Hybridity, Blasphemy, and Globalization*. Westport, Connecticut: Greenwood Press, 2001.

**ENS 2567****Shakespeare****5 Hrs. /5 Cr.**

The course intends to introduce students to the aspects and elements of Shakespearean sonnets and plays thus students will get acquainted with Shakespeare's dramatic and poetic genius through critical study of select works.

At the completion of the course students shall be able to

- i. understand and appreciate the important themes and concerns of Shakespeare's works.
- ii. demonstrate an understanding of and an appreciation for the literary elements and conventions.
- iii. appreciate Shakespeare's poetic diction, mastery of characterization and versatility in plot construction
- iv. comprehend dramatic elements and identify the unique qualities of Shakespeare
- v. perceive various techniques for approaching texts critically

**Unit 1: Sonnets**

- Sonnet 18 - Shall I compare thee to a summer's day?  
 Sonnet 23 - As an unperfect actor on the stage  
 Sonnet 29 - When in disgrace with fortune and men's eyes  
 Sonnet 48 - How careful was I when I took my way  
 Sonnet 96 - Some say thy fault is youth, some wantonness  
 Sonnet 130 - My mistress' eyes are nothing like the sun

**Unit 2: Comedy** - Twelfth Night

**Unit 3: Tragedy** - Macbeth

**Unit 4: History play** - Henry V

**Unit 5: Tragicomedy** - The Winter's Tale

**Self-Study:**

- Sonnet 29 - When in disgrace with fortune and men's eyes  
 Sonnet 48 - How careful was I when I took my way  
 Sonnet 96 - Some say thy fault is youth, some wantonness  
 Sonnet 130 - My mistress' eyes are nothing like the sun

**Reference**

- Bradby, G. *About Shakespeare and His Plays*. OUP, 1927  
 Bradley, A.C. *Shakespearean tragedy*. London : Macmillan, 1904  
 Brown, John Russell. *Shakespeare and His Comedies*. London : Methuen & Co. Ltd.,  
 Charlton, H. *Shakespearean Comedy*. London : Methuen & Co. Ltd., 1955  
 Wilson, Katherine M. *Shakespeare's Sugared Sonnets*. London : William Brothers, 1974.

**ENS 2469****English Phonetics & Phonology****5 Hrs./4 Cr.**

The Course, specially designed as a Major Supportive for second year students of BA French, aims at facilitating students to learn the theoretical material needed to understand phonetics, phonology and the pronunciation.

At the end of the course the students will be able to

- i. learn English Phonetics
- ii. learn English Phonology
- iii. classify and describe vowels and constants
- iv. identify supra-segmental features such as syllable, word stress, sentence stress, & intonation
- v. train themselves in transcription

**Unit 1: English Phonetics**

Air-streams; articulatory, acoustic, & auditory phonetics; pulmonic, phonatory, & articulatory systems

**Unit 2: English Phonology****Unit 3: Classification & description of vowels & consonants**

12 monophthongs & 8 diphthongs; 22 pure consonants & 2 semivowels; three-term label descriptions of vowels and consonants

**Unit 4: Supra-segmental features**

Syllable and syllabization; word-stress, sentence-stress, intonation

**Unit 5: Practice in accent and transcription****Reference**

- Balasubramanian, T. (1981) *A Textbook of English Phonetics for Indian Students*. Chennai. Macmillan
- Balasubramanian, T. (1992) *English Phonetics for Indian Students: A Workbook*. Chennai: Macmillan.
- Jeyalakshmi, G. (2007) *A Text Book on the English Sounds: Vowels and Consonants*. Madurai: Tharvas.

**ENS 2202****Career Skills****3 Hrs. / 2 Cr.**

The fourth sequential General English Course aims at empowering second year undergraduate students with communication & cognitive skills and personality traits necessary to empower their career skills. The course assumes importance in the context of students lacking career skills and strategies for successful profession.

At the end of the course students will be able to

- i. develop communication skills
- ii. acquire the interview skills
- iii. improve cognitive skills
- iv. enhance thinking skills
- v. master personal traits

- Unit 1            Communication Skills**  
Active Listening & speaking, written & oral communication
- Unit 2            Interview Skills**  
Interview questions, job application, CV preparation, self-introduction, presentation skills, negotiation skills, conducting a meeting, agenda setting, recording minutes
- Unit 3            Cognitive Skills**  
Self motivation, setting personal goals, problem solving, decision making, delegation
- Unit 4            Thinking Skills**  
Strategic thinking, organization, innovation, leadership skills
- Unit 5            Personal Traits Skills**  
Personal development & empowerment, confidence & rapport building, tact & diplomacy, emotional intelligence, self-esteem, humour and persuasion skills

**Textbook**

Sekar, J.J. 2015. **Career Skills**. Madurai: Department of English, The American College.

**ENS 2466****PROSE II****4 Hrs. /4 Cr.**

The course aims to introduce students the masters of English prose between 1800 and 1990. It will broaden the student's understanding of language and literature over the period. It also reflects the intellectual, religious, scientific and political history of England.

**Objectives**

- At the completion of this course the students shall be able to
- i. Read and interpret with proper understanding of the text
  - ii. Acquire new vocabulary and content words
  - iii. Express the ideas of the passage orally and in writing
  - iv. Develop their imagination
  - v. Enjoy reading and writing

**Unit I (1800-1850)**

- John Henry Newman    -Knowledge and Professional Skill (Discourse VII) From The Idea of University
- John Ruskin            -The Veins of Wealth
- George Meredith       -The Idea of Comedy

**Unit II(1850-1900)**

- Walter Pater            -The Renaissance
- R.L.Stevenson          -On the Choice of a Profession
- Mathew Arnold        -Sweetness & Light

**Unit III (1900-1950)**

E.V.Lucas	-The Reason
E.M Forster	-My Wood
G.K.Chesterton	-A Piece of Chalk

**Unit IV (1950-1970)**

J.B.Priestly	-Travel by Train
Robert Lynd	-On Forgetting
Bertrand Russell	-Knowledge and Wisdom

**Unit V (1970-1990)**

G.K.Chesterton	-A Defense of Nonsense
Hilaire Belloc	-The Mowing of a Field
Aldous Huxley	-Comfort

**Self Study:**

1. John Ruskin -The Veins of Wealth
2. Mathew Arnold -Sweetness & Light
3. E.V.Lucas -The Reason
4. Bertrand Russell -Knowledge and Wisdom

**References:**

- D'oyley Elizabeth .Essays Past and Present. London: Edward Arnold & Co.1936
- Gross ,John.(ed).The Oxford Book Of Essays,Newyork.Oxford University Press.1991
- Guth,Hans. Essay Wadsworth Publishing company,Inc. 1962
- Minto,William. A Manual of English Prose Literature. New Delhi: Atlantic Publishers and Distributors,1995
- Williams W.E.A Book Of English Essays.Penguin Books.1942`
- Whitridge,Arnold and John Wendell Dodds. An Oxford Anthology of English Prose. Newyork: Oxford University Press .1937

**ENS 2562****American Literature****5 Hrs. / 5 Cr.**

This course aims to introduce to students the American Literature that houses poetry, prose, fiction and drama. The course includes works of all the major authors from early period to the present.

On completion of the course, the students will be able to:

- i. Gain knowledge about the people of America, their beliefs, perceptions and philosophies
- ii. Explore the culture from looking closely at the religious and historical literature
- iii. Appreciate the diversity of individuals as represented in the fiction and poetry
- iv. Understand the language, thought and expression of the writers
- v. Attempt a comparative study of American and British literature

**Unit I**

Introduction to History of American Literature

Abraham Lincoln - Gettysburg Address

Martin Luther King. Jr. - "I Have A Dream"

## **Unit II Poetry**

Edgar Allen Poe - The Raven  
 Henry Wadsworth Longfellow - Henry Wadsworth Longfellow  
 Ralph Waldo Emerson - The Arrow and The Song & Ode to Beauty  
 Walt Whitman - I Sit and Look Out –  
 Emily Dickinson - A Bird Came Down The Walk  
 Robert Frost - The Road Not Taken

## **Unit III Prose**

Henry David Thoreau - “Where I lived and What I lived For”  
 William Faulkner- Nobel Prize Acceptance Speech

## **Unit IV Fiction**

Nathaniel Hawthorne - Young Good Man Brown  
 Ernest Hemingway - The Snows of Kilimanjaro

## **Unit V Drama**

Tennessee Williams - A Streetcar Named Desire  
 Arthur Miller - Death of a Salesman  
 Tony Kushner - Angels in America

## **Self Study**

Ralph Waldo Emerson - The Arrow and The Song  
 Arthur Miller - Death of a Salesman  
 Ernest Hemingway - The Snows of Kilimanjaro  
 Tony Kushner - Angels in America

## **Reference**

Cunliffe, Marcus. *The Literature of the United States*. Suffolk: Penguin, 1970.  
 Hart, James D. *The Oxford Companion to American Literature*. New York: OUP, 1995.

**ENS 2564**

**Translation: Theories and Problems**

**5 Hrs. / 5 Cr.**

This course intends to teach various theories of translation and make the students to practice translation as a skill.

After the completion of this course the students shall be able to

- i. understand the origin of translation
- ii. trace the various theories of translation
- iii. perceive the role of the of source/target language, culture and time in using translation strategies.
- iv. understand Cognitive pragmatics and literary translation
- v. translate various literary and non literary texts

**Unit 1** - Translation theories problems and techniques -Translation Norms & Text Structure -  
 Text structures; regionalism, archaism and individual style

**Unit 2** - Role of Source Language/ Target Language / Culture and time

**Unit 3** - Cognitive Pragmatics and Literary translation

**Unit 4** - Translation Practice -literary Texts

**Unit 5** - Translation Practice -Non Literary Texts

## Reference

- Flanders, Clifford E. Literary Translation: A Practical Guide. Multilingual Matters Limited (December 1, 2001). ISBN: 1853595195.
- Raymond Cohen. Negotiating Across Cultures. Washington. United States Institute of Peace Press. Third Printing. 2002. ISBN 1878379720
- Schulte/Biguenet. The Craft of Translation. University of Chicago Press. ISBN 0226048691
- Steiner, George. After Babel: Aspects of Language and Translation. Oxford University Press, 3rd edition (May 1, 1998). ISBN: 0192880934.
- Susan Bassnett. Translation Studies. Psychology Press, 2002

## ENS 2468

## Advanced Grammar

**5Hrs./ 5 Cr**

This course focuses on improving and refining students' grammar and editing skills. It further develops their ability to compose grammatically correct and comprehensible sentences, paragraphs, and essays through their complete theoretical understanding of grammar structures and syntaxes. It facilitates students to use English grammar for academic purposes, such as writing assignments and public speaking.

At the end of the course the students will be able to

- i. examine how grammar works and analyse word structure and classes in their writing and speaking.
- ii. understand the phrase structures and apply their structures in spoken and written discourse
- iii. understand the use of clause structures to express ideas at the sentence level.
- iv. analyze sentence structures to accurately and effectively express ideas at the paragraph level.
- v. edit their own work using the theory of grammar

**Unit I:** Analysing word structure (morphology) and word classes (noun, verb, adjectives, adverbs, determiners and pronouns)

**Unit II:** Analysing Phrase structures: - Structure of the noun group Phrase - structure of the Verb group phrase- structure of the adjective group phrase – structure of the adverb group phrase – structure of the prepositional group phrase

**Unit III:** Clause Structure, Clause relationships – coordination of clauses – subordination of clauses – Sentence and clause clusters

**Unit IV:** Analysing sentences – Sentence pattern, Direct and Indirect speech, conditionals, Passive voice and models

**Unit V:** Usage Issues: subject-verb agreement, Case, Auxiliaries, adjective and adverb confusions, spellings, Punctuation

### Reference

Greenbaum, Sidney. **Oxford English Grammar**. Oxford University Press, 1996

Kroeger, Paul R. **Analysing grammar An introduction**. Cambridge University Press, 2005

Swan, Michael. **Practical English Usage**. Oxford University Press, 2005

## ENS 2470

## Theories of Translation

**5 Hrs. / 4 Cr.**

This course is offered as a supportive course to the students of B.A french. This course intends to teach various theories of translation which will help them to understand the aspects and elements of translation.

At the completion of this course the students will be able to

- i. understand the origin of translation
- ii. trace the various theories of translation
- iii. perceive the role of the of source/target language, culture and time in using translation strategies.
- iv. discuss problems of translation of literary pieces and articles of general nature, and
- v. get training in translation from English to French and vice versa

**Unit 1:** Translation – definition and significance

**Unit 2:** Theories on Translation – Early theories of Homer, Cicero, Dryden, Shelley, Mathew Arnold, and Pope

**Unit 3:** Theories on translation - Modern theories of Edward Fitzgerald, Eugene Nida, George Steiner

**Unit 4:** Problems in Translation – Cultural and Linguistic untranslatability, Problems encountered in translation

**Unit 5:** Practice in Translation - Literary and Non Literary -

### Self Study

Translation - French to English and English to French



**Reference**

- Bassnet, Susan MacQuire & Harish Trivedi. 2000. *Post-Colonial Translation: Theory and Practice*. London: Routledge.
- Flanders, Clifford E. *Literary Translation: A Practical Guide*. Multilingual Matters Limited (December 1, 2001). ISBN: 1853595195.
- Raymond Cohen. *Negotiating Across Cultures*. Washington. United States Institute of Peace Press. Third Printing. 2002. ISBN 1878379720.
- Schulte/Biguenet. *The Craft of Translation*. University of Chicago Press. ISBN 0226048691.
- Steiner, George. *After Babel: Aspects of Language and Translation*. Oxford University Press, 3rd edition (May 1, 1998). ISBN: 0192880934.
- Susan Bassnett. *Translation Studies*. Psychology Press, 2002.

## DEPARTMENT OF MATHEMATICS

## Program for B.Sc. Degree in Mathematics (SF) - CBCS -2015-16

Sem	Part	Course Code	Course Title	Hr/ wk	Cr.	Marks
1	I	XXX xxxx	TAM/FRE/HIN	3	2	30
1	II	ENS xxxx	English - I	3	2	30
1	III M	MAS 1511	Classical Algebra	5	5	75
1	III M	MAS 1411	Analytical Geometry -3D	4	4	60
1	III M	MAS 1413	Differential Calculus	4	4	60
1	III S	PHS xxxx	Physics for Mathematics - I	5	4	60
1	IV LS	XXX xxxx	Life Skill - I	3	2	30
1	IV NME	XXX xxxx	Non-major Elective - I	3	2	30
<b>Total</b>				<b>30</b>	<b>25</b>	<b>375</b>
2	I	XXX xxxx	TAM/FRE/HIN	3	2	30
2	II	ENS xxxx	English - II	3	2	30
2	III M	MAS 1512	Algebra- I	5	5	75
2	III M	MAS1412	Analysis -I	4	4	60
2	III M	MAS 1414	Integral Calculus	4	4	60
2	III S	PHS xxxx	Physics for Mathematics - II	5	4	60
2	IV LS	XXX xxxx	Life Skill - II	3	2	30
2	IV NME	XXX xxxx	Non-major Elective - II	3	2	30
2	V	XXX xxxx	Ext. Activity NSS/PED/SLP		1	15
<b>Total</b>				<b>30</b>	<b>26</b>	<b>390</b>
3	I	XXX xxxx	TAM/FRE/HIN	3	2	30
3	II	ENS xxxx	English - III	3	2	30
3	III M	MAS 2511	Algebra -II	5	5	75
3	III M	MAS 2513	Analysis -II	5	5	75
3	III M	MAS 2515	Differential Equations	5	5	75
3	III M	MAS 2411	Statistics- I	4	4	60
3	III S	COS xxxx	Programming in C	5	4	60
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

Sem	Part	Course Code	Course Title	Hr/ wk	Cr.	Marks
4	I	XXX xxxx	TAM/FRE/HIN	3	2	30
4	II	ENS xxxx	English - IV	3	2	30
4	III M	MAS 2512	Algebra- III	5	5	75
4	III M	MAS 2514	Analysis- III	5	5	75
4	III M	MAS 2516	Vector Calculus & Trigonometry	5	5	75
4	III M	MAS 2412	Statistics- II	4	4	60
4	III S	COS xxxx	Programming in C++	5	4	60
4	V	XXX xxxx	Ext. Activity NSS/PED/SLP		1	15
<b>Total</b>				<b>30</b>	<b>28</b>	<b>420</b>
Sem	Part	Course Code	Course Title	Hr/ wk	Cr.	Marks
5	III M	MAS 3611	Mechanics	6	6	90
5	III M	MAS 3613	Graph Theory	6	6	90
5	III M	MAS 3615	Operations Research- I	6	6	90
5	III M	MAS3511	Combinatorics	5	5	75
5	IV LS	XXX xxxx	Life Skill- III	3	2	30
5	IV	MAS 3200	Environmental Studies	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
6	III M	MAS 3612	Number Theory	6	6	90
6	III M	MAS 3614	Complex Analysis	6	6	90
6	III M	MAS 3616	Fuzzy Mathematics	6	6	90
6	III M	MAS 3512	Operations Research- II	5	5	75
6	IV LS	XXX xxxx	Life Skill - IV	3	2	30
6	IV	VAL xxxx	Value Education	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

Courses offered to Non-major students by the Department of Mathematics (UG)

**Supportive**

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	III	MAS 1431	Maths for Physics- I	5	4	60
1	III	MAS 1433	Discrete Mathematics (BCA)	5	4	60
1	III	MAS 1435	Maths for Chemistry - I	5	4	60
1	III	MAS 1437	Business Statistics(BBA)	5	4	60
2	III	MAS 1432	Maths for Physics- II	5	4	60
2	III	MAS 1434	Discrete Mathematics (COS)	5	4	60
2	III	MAS 1436	Maths for Chemistry - II	5	4	60
2	III	MAS 1438	Statistics (BIT)	5	4	60
3	III	MAS 2431	Operations Research (BIT)	5	4	60
3	III	MAS 2433	Business Statistics (CME)	5	4	60
3	III	MAS 2435	Business Statistics (CMC)	5	4	60
3	III	MAS 2437	Business Statistics (CIT)	5	4	60
3	III	MAS 2439	Quantitative Techniques (BBA)	5	4	60
4	III	MAS 2432	Graph Theory and O.R. (COS)	5	4	60
4	III	MAS 2434	Business Mathematics (CME)	5	4	60
4	III	MAS 2436	Business Mathematics (CMC)	5	4	60
4	III	MAS 2438	Business Mathematics (CIT)	5	4	60
4	III	MAS 2440	Operations Research (BCA)	5	4	60
4	III	MAS 2452	Biostatistics (MIC)	5	4	60
4	III	MAS 2454	Biostatistics (BCH)	5	4	60

**Non-Major Elective**

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	IV	MAS1221	Arithmetic & Mathematical Logic	3	2	30
2	IV	MAS 1222	Recreational Mathematics	3	2	30

**Life Skill Courses**

Sem	Part	Course Code	Course Title	Hr/wk	Cr.	Marks
1	IV	MAS 1231	Mathematics for Life	3	2	30
2	IV	MAS 1232	Mathematical Reasoning	3	2	30
5	IV	MAS 3231	Mathematics for Competitive Exam.	3	2	30
6	IV	MAS 3232	Developing Quantitative Aptitude	3	2	30

**MAS 2511****ALGEBRA - II****5hr/ 5cr****Objective:**

The objective of this course is to create awareness on the existing structures such as rings, fields, lattices and their relevance in the contemporary world.

This course deals with basic ideas in Ring theory, Fields and Lattices.

**Unit I:**

Introduction to Rings – Types of rings – Sub rings – Examples.

**Unit II:**

Ideals – Integral domain – Quotient rings – Maximal ideal – Prime ideal – Homomorphism of rings.

**Unit III:**

Introduction to Fields – Field of quotients – Ordered integral domain – Unique Factorization Domain – Euclidean Domain – Principal ideal domain.

**Unit IV:**

Polynomial rings - Eisenstein Criterion.

**Unit V:**

Lattices – Modular Lattice, Distributive lattice– Boolean algebra - Boolean ring – Boolean functions – Canonical form.

**References:**

1. S.Arumugam and A.Thangapandian Isaac, 2006. **Modern Algebra**, SCITECH Publications Private. Limited.
2. J.N.Sharma and A.R.Vashishtha, 1981. **Linear Algebra**, Krishna Prakasha Mandir.

**MAS 2513****ANALYSIS - II****5hr/ 5cr****Objective:**

The course deals with metric spaces which is a classical extension of the real line and its properties in terms of the distance.

The course introduces to the students, metric spaces and its properties. The properties like connectedness, completeness and compactness which are inherent in nature in the real line are extended to the metric spaces. Also properties like continuity and uniform continuity are exploited.

**Unit I:**

Introduction to limits - Limit and continuity - Continuous Functions- Discontinuity - Types of discontinuity - Intermediate value theorem and its consequences.

**Unit II:**

Metric spaces- Open sets- Limit point- Closed sets- Closure of a set- Properties of closure of a set- Interior of a set- Properties of interior of a set- Dense sets- Nowhere dense sets - Limits in metric spaces- Reformulation of definition of continuous functions- Baire's theorem- Uniform continuity.

**Unit III:**

Connected metric spaces- Separated sets- Connected and Disconnected sets- Connectedness of product of connected metric spaces- Continuity and Connectedness.

**Unit IV:**

Completeness - Totally Boundedness.

**Unit V:**

Compact metric spaces- Continuous functions on compact metric spaces- Continuity of the inverse function - Bolzano-Weierstrass theorem.

**References:**

1. Arumugam Issac, 2006. **Modern Analysis**, New Gamma Publishing House.
2. Richard R.Goldberg, 2002. **Methods of Real Analysis**, New Delhi: Oxford & IBH Publishing Company Private Limited.
3. J.N.Sharma and A.R.Vasistha, 1997. **Real Analysis**, Krishna Prakashan Media (P) Limited.
4. Shanthi Narayan and M.D.Raisinghania, 2010. **Elements of Real Analysis**, Sultan Chand & Company Limited.
5. R.G.Bartle and D.R.Sherbert, 2002. **Introduction to Real Analysis**, Singapore: John Wiley and Sons(Asia) Private Limited.
6. K.A.Ross, 2004. **Elementary Analysis: The Theory of Calculus**, Undergraduate Texts in Mathematics, Springer (SIE), Indian Reprint.
7. J.M. Howie, 2007. **Real Analysis**, Springer.
8. Shirali, S. and H.L.Vasudeva, 2001. **Metric Spaces**, Springer.
9. Malik, S.C. and Savita Arora, 2001. **Mathematical Analysis**, New Age International Publishers.

**MAS 2515****DIFFERENTIAL EQUATIONS****5hr/ 5cr****Objective:**

The objective of this course is to enable the students to solve various types of differential equations and to apply them in various fields.

The topics covered includes formation of differential equations, solving various types of ordinary and partial differential equations, Laplace transforms and Laplace transforms as tool for solving differential equations.

**Unit I:**

Ordinary differential equation – Non-Homogeneous equations of the first degree in x and y – First order and first degree exact equation – Integrating factors – Equations of the first order but of higher degree – Equations solvable for p, y and x and Clairaut's form.

**Unit II:**

Linear differential equations with constant coefficients – Particular integrals – second order homogeneous equations with variable coefficients – Equations reducible to the linear homogeneous equations – Variation of parameters – Simultaneous differential equations of the form  $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$  -n<sup>th</sup> order exact differential equations – Orthogonal trajectory.

**Unit III:**

Partial differential equations of the first order – Derivation of partial differential equations – Classification of integrals – Lagrange's method of solving linear Partial differential equations – Standard forms – Equations reducible to the standard forms.

**Unit IV:**

Laplace transforms – Developing the theory to use it as a tool - Laplace transforms of periodic functions – Some general theorems – Evaluation of integrals – Inverse Laplace transform.

**Unit V:**

Solving ordinary differential equation with constant coefficients - variable coefficients and simultaneous linear equation using Laplace transform.

**References:**

1. S.Narayanan and T.K.Manickavachagom Pillay, 1996. **Calculus III**, S.Viswanathan Private Limited.
2. S.Narayanan and T.K.Manickavachagom Pillay, 1996. **Differential Equations**, S.Viswanathan Private Limited.
3. S.Arumugam and A.Thangapandian Isaac, 2002. **Differential Equations**, New Gamma Publishing House.

**MAS 2411****STATISTICS - I****4hr/ 4cr****Objective:**

The objective of the course is to enable the students to understand the theoretical background of statistics as a student of Mathematics.

The course essentially deals with the probability distribution theory which is the basis of statistics. The topics covered includes Correlation and Regression and curve fitting.

**Unit I:**

Sample space – Random Variable-Discrete and continuous Distribution function- Probability density function, joint probability function.

**Unit II:**

Mathematical expectation and generating functions – Moment generating function- Chebyche's inequality- Law of large numbers.



**Unit III:**

Theoretical Discrete and continuous distributions- Binomial, Poisson, Normal, Gamma, Exponential, Rectangular, Uniform distributions- Standard properties- Central limit theorem.

**Unit IV:**

Correlation and Regression.

**Unit V:**

Method of least squares – Curve fitting- linear, polynomial, exponential and logarithmic.

**References:**

1. S.C.Gupta and V.K.Kapoor, 2001. **Mathematical Statistics**, Sultan Chand and Sons.
2. S.Arumugam and A.Thangapandian.Isaac, 2003. **Statistics**, New Gamma Publications Private Limited.
3. Manmohan Gupta, 2001. **Statistics**, Sultan Chand and Sons.

**MAS 2512****ALGEBRA - III****5hr/ 5cr****Objective:**

The objective of this course is to enable the students to understand the basic ideas of vector spaces as algebraic structure, linear transformations and their relations to matrices are also dealt with.

The topics covered in this course are vector spaces, inner product space, linear transformations, matrix of linear transformation.

**Unit I:**

Vector space – Subspace – Quotient space.

**Unit II:**

Spanning set – Linear independent set- Basis – Dimension.

**Unit III:**

Linear transformations - Rank and Nullity of a linear transformation – Matrices - linear transformations – Vector space of linear transformations.

**Unit IV:**

Inner product space – Properties – norm and distance- Schwartz inequality, triangle inequality.

**Unit V:**

Orthogonal elements – Orthonormal set – Gram-Schmidt orthogonalization process – orthogonal complement

**References:**

1. J.N.Sharma and A.R.Vashishtha, 2002. **Linear Algebra**, Krishna Prakasha Mandir.
2. S.Arumugam and A.Thangapandian Isaac, 2006. **Modern Algebra**, SCITECH Publications Private Limited.

**MAS 2514****ANALYSIS - III****5hr/ 5cr****Objective:**

The first two semesters of the degree programme introduced calculus which includes differentiation and integration where integration was treated as the reverse process of differentiation. However, the Riemannian definition of integration gave a twist to the way it is looked at. Students are introduced to integration as a limit of summation by Riemann integration. The Riemann integrability of a function is looked at in detail. The necessary and sufficient condition for Riemann integrability is the central theme of this course.

Sequence of functions and their limits are introduced (pointwise limit and uniform limit). The ramifications of uniform convergence and their ramifications on integrability, differentiability and continuity are dealt in depth.

**Unit I:**

Riemann Integration - Riemann Integrable Functions - properties of the Riemann integral- Characterization theorem on Riemann integrable functions .

**Unit II:**

Derivatives - chain rule - Darboux's theorem - Rolle's Theorem - Law of the mean – The Fundamental theorem of calculus -Substitution theorem and application - improper integrals.

**Unit III:**

Taylor's theorem with Lagrange and Cauchy form of remainders- Taylor series- Maclaurin series - convex functions.

**Unit IV:**

Pointwise and uniform convergence of sequence of functions - uniform convergence and

Continuity - uniform convergence and differentiation - uniform convergence and integration - Cauchy criterion for uniform convergence.

**Unit V:**

Series of functions - convergence and uniform convergence of series of functions – Weierstrass M-Test - Dini's theorem for series - differentiation and integration of series of functions- power series - radius of convergence.

**References:**

1. Richard R.Goldberg, 2002. **Methods of Real Analysis**, New Delhi: Oxford & IBH Publishing Company Private Limited.
2. J.N.Sharma and A.R.Vasistha, 1997. **Real Analysis**, Krishna Prakashan Media (P) Ltd.
3. R.G.Bartle and D.R.Sherbert, 2002. **Introduction to Real Analysis**, Singapore: John Wiley and Sons (Asia) Private. Limited.
4. K.A.Ross, 2004. **Elementary Analysis: The Theory of Calculus**, Undergraduate Texts in Mathematics, Springer (SIE), Indian Reprint.
5. J.M. Howie, 2007. **Real Analysis**, Springer.
6. J.V. Deshpande, 1999. **Mathematical Analysis and Applications**, Narosa Publishing House.
7. Torense Tao, 2000. **Analysis I**, TRIM 37, Hindustan Book Agency.

**MAS 2516****VECTOR CALCULUS & TRIGONOMETRY****5hr/ 5cr****Objective:**

This is a foundational course for any student aspiring to complete B.Sc degree in mathematics. The applicability of the subject is enormous in nature. The first unit is primarily devoted for the basics on vectors. Trigonometry is an inevitable part of any branch of science, Demovire's theorem and its applications are exploited..

**Unit I:**

Introduction to vectors- dot product and cross product of vectors- product of three and four vectors- geometrical interpretation of dot and cross product and their related aspects- volume of parallelepiped- tetrahedron-vector equation(lines, circles etc..) algebraic equations and geometrical interpretations- problems related to aforesaid aspects on vectors.

**Unit II:**

Limit of a vector function- continuity- differentiation of vectors- Taylor's theorem for vector functions- Partial derivatives- differentiability of vector functions- related problems- Definition of gradient, divergent and curl with physical interpretation- curvilinear coordinates- cylindrical and spherical.

**Unit III:**

Vector integration- indefinite integrals- definite integral- line, surface and volume integrals- Green's theorem in plane – Green's theorem in space- Stoke's and Gauss theorems- problems related to the verification of these theorems- vector integrations.

**Unit IV:**

Demovire's theorem- geometrical interpretation- simplification of trigonometric function- expansion of trigonometric functions.

**Unit V:**

Hyperbolic functions- logarithmic functions- trigonometric summation of series.

**References:**

1. M. D. Raisinghania, 1998. **Vector Calculus**, S.Chand Company Limited.
2. Narayanan and Manichavasagam Pillai, 2002. **Vector algebra and analysis**, M. S. Viswanathan Private Limited.
3. Dipak chatterjee, 2003. **Vector Analysis**, New Delhi: Prentice Hall of India.
4. Narayanan and Manichavasagam Pillai, 2002. **Trigonometry**, M. S. Viswanathan Private Limited.
5. Arumugam and Thangapandi Issac, 2003. **Trigonometry**, New Gamma Publication.
6. A.Chandra Babu and C.R. Seshan, 2006. **New Engineering Mathematics, Volume – II**, Chennai: Narosa Publishing House.

**MAS 2412****STATISTICS - II****4hr/ 4cr****Objective:**

This is the second segment of a sequential course as a tool for solving problems in real life.

The aim of this course is to enable the students to understand statistics. The course deals with analysis of variance- analysis of time series and statistical quality control.

**Unit I:**

Sampling and Large sample tests.

**Unit II:**

Small sampling tests using t- F- and Chi-square distributions.

**Unit III:**

Index numbers – fixed and chain base indices – cost of living index – consumer price index – ideal index number

**Unit IV:**

Analysis of time series – components of time series – measurement of trend – seasonal variations.

**Unit V:**

Analysis of variance – one way- two way classification -Latin square design.

**References:**

1. SC. Gupta and V.K. Kapoor, 2001. **Mathematical Statistics**, Sultan Chand & Sons.
2. S. Arumugam and A. Thangapandian Isaac, 2003. **Statistics**, New Gamma Publications Private Limited.
3. S.P. Gupta, 2001. **Statistical Methods**, Sultan Chand and Sons.
4. Manmohan Gupta, 2001. **Statistics**, Sultan Chand & Sons.

**Supportive: (For BIT Students)****MAS 2431****OPERATIONS RESEARCH****5hr/4cr****Objective:**

To introduce to the students some of the quantitative techniques which are essential for Information technology.

The course enables the students to develop mathematical models for real life problems and get solutions using techniques in operation research.

**Unit I:**

Introduction to Operations research - Linear programming problem(L.P.P) – Mathematical formulation – Graphical solution– Solution to L.P.P by simplex method.

**Unit II:**

Transportation problem – Mathematical formulation – Finding initial basic feasible solution – Northwest corner rule, least cost method and Vogel's approximation method – Moving towards optimality – Unbalanced transportation problem.

**Unit III:**

Assignment problem: Introduction – Mathematical Formulation – Hungarian Assignment Algorithm – variations of the Assignment problem.

**Unit IV:**

Game theory – Introduction – Two person zero sum games – Maxmin principle - minimax principle – Saddle points – Games without saddle points – Solution of 2x2 games – Graphical method – Dominance property.

**Unit V:**

PERT/CPM – Introduction – Networking – Critical path analysis – Probability considerations in PERT.

**References:**

1. Taha, H.A. 2007. "**Operations Research - An Introduction**", Prentice Hall,(8th Edition).
2. Kantiswarup, Gupta and ManMohan, 2011.**Operations Research**, Sultan Chand and Sons.
3. V.K.Kapoor,1997.**Operations Research**, Sultan chand and sons.
4. P.K.Gupta and ManMohan, 2007.**Problems in Operations Research**, Sultan Chand and Sons.
5. Paneerselvam, 2007.**Operations Research**, Prentice Hall.

(For CME Students)

**MAS2433**

**BUSINESS STATISTICS**

**5hr/4cr**

**Objective:**

To enable the students to use the tools in statistic solve the problems in business studies and commerce.

This course deals with measures of central tendency, correlation, regression, probability theory, and sampling theory.

**Unit I:**

Measures of central tendency – measures of dispersion.

**Unit II:**

Correlation – correlation coefficients – rank correlation – regression – regression coefficients.

**Unit III:**

Probability function – addition and multiplication theorems on probability – conditional probability – Baye's formula and theorem.

**Unit IV:**

Type of sampling- parameters & statistic – statistical hypothesis – null and alternative hypothesis – types of errors- large samples based on normal area table – test of significance of small samples – t-test and, F-test and Chi-square test for population variance and goodness of fit.

**Unit V:**

Analysis of variance – one way and two way classification – Latin square design.

**References:**

1. S.C Gupta & V.K. Kapoor, 1995. **Elements of Mathematical Statistics**, Sultan Chand Company.
2. S.Arumugam & A.Thangapandian Issac, 2004. **Statistics**, New Gamma publishing House.

(For CMC Students)

**MAS 2435**

**BUSINESS STATISTICS**

**5hr/4cr**

**Objective:**

The purpose of this course is to develop the numerical and analytical ability with statistical tools. This course equips the students with various statistical tools which can be used in business environment.

**Unit I:**

Meaning- Scope- Importance and Limitations of Statistics- Statistically Investigation: Planning of Statistical Investigation- Census and collection of primary and secondary data- Statistical errors and approximation- Classification and Tabulation of data- Frequency distribution.

**Unit II:**

Statistical Average: Arithmetic- geometric and Harmonic means- Mode- median- Quartiles and Percentiles- Simple and Weighted averages- Uses of different averages.

**Unit III:**

Dispersion: Range- Quartile deviation- mean Deviation and their Coefficients- standards Deviation- coefficient of variation.

**Unit IV:**

Correlation: Karl person's coefficient of correlation- Spearman's Rank correlation- Concurrent deviation method- Regression equations.

**Unit V:**

Index Numbers: Utility of index numbers- problems in the construction of index numbers- simple and weighted index number- Base shifting Fishers ideal index number and tests of Reversibility.

**References:**

1. S.P.Gupta, 2007. **Fundamentals of Statistics**, Sultan Chand Publishers, New Delhi.
2. D.N. Elhance, 2011. **Fundamentals of Statistics**, New Century Book House.
3. S.C.Gupta, V. K. Kapoor, 2001. **Mathematical Statistics**, Sultan Chand & Sons.
4. S.P.Gupta, 2001.**Statistical Methods**, Sultan Chand & Sons.
5. S. Arumugam, & A. Thangapandian Issac, **Statistics** , 2001.New Gamma Publication House.
6. Dr. P. R. Vittal, 2002.**Mathematical Statistics**, MARGHAM Publications.

**(For CIT Students)****MAS 2437****BUSINESS STATISTICS****5hr/4hr****Objective:**

The purpose of this course is to develop the numerical and analytical ability with statistical tools. This course equips the students with various statistical tools which can be used in business environment.

**Unit I:**

Meaning- Scope- Importance and Limitations of Statistics- Statistically Investigation: Planning of Statistical Investigation- Census and collection of primary and secondary data- Statistical errors and approximation- Classification and Tabulation of data- Frequency distribution.

**Unit II:**

Statistical Average: Arithmetic- geometric and Harmonic means- Mode- median- Quartiles and Percentiles- Simple and Weighted averages- Uses and Limitations of different averages.

**Unit III:**

Dispersion: Range- Quartile deviation- mean Deviation and their Coefficients- standards Deviation- coefficient of variation.

**Unit IV:**

Correlation: Types of correlations- Karl person's coefficient of correlation- Spearman rank correlations- Regression- meaning- applications- equations.



**Unit V:**

Index Numbers: Utility of index numbers- problems in the construction of index numbers- simple and weighted index number- Fishers ideal index number -Time reversal test - Factor reversal test - Commodity reversal test.

**References:**

1. S.P.Gupta, 2007. **Fundamentals of Statistics**, Sultan Chand Publishers, New Delhi.
2. D.N. Elhance, 2011. **Fundamentals of Statistics**, New Century Book House.
3. S.C.Gupta, V. K. Kapoor, 2001. **Mathematical Statistics**, Sultan Chand & Sons.
4. S.P.Gupta, 2001. **Statistical Methods**, Sultan Chand & Sons.
5. S. Arumugam,& A. Thangapandian Issac, 2004. **Statistics** , New Gamma Publication House.
6. Dr. P. R. Vittal, 2002. **Mathematical Statistics**, MARGHAM Publications.

**(For BBA Students)**

**MAS 2439**

**QUANTITATIVE TECHNIQUES**

**5hr/4cr**

**Objective:**

This course aims to equip the students with the basic mathematical and quantitative techniques that would enhance their Decision making skills both as a manager and as an entrepreneur.

**Unit I:**

Basic concepts in Matrix Algebra – Determinant- Solving linear equations using Crammer’s rule , matrix inversion method – Introduction to Theory of Probability.

**Unit II:**

Concept of Linear Programming: Problem Formulation - Terminologies – Assumptions – Application and Limitations; LPP solution methods – Graphical method – Simplex method.

**Unit III:**

Transportation Problem: Mathematical formulation – Initial Basic Feasible solution methods : North West corner rule – Least coast method – Vogel’s Approximation method – Optimality checking – Stepping stone method.

**Unit IV:**

Assignment problem: Introduction – Mathematical Formulation – Hungarian Assignment Algorithm – variations of the Assignment problem.

**Unit V:**

Game Theory: Introduction - Basic Terminologies – Two person zero sum game – Games with saddle point – Games without saddle point mixed strategies – Dominance property of reducing the size of the game – solution methods.

**References:**

1. Kantiswarup and Manmohan, 2011. **Operations Research** , Sultan Chand and sons, New Delhi.
2. Natarajan , Balasubramani, Tamilarasi, 2007. **Operations Research** , Pearson Education.
3. Ramnath , Rohitashwa, 2010. **Quantitative Techniques for Managers**, Himalaya publications.
4. Paneerselvam, 2007. **Operations Research**, Prentice Hall .
5. M.L. Khanna, 2001. **Matrices**, Jai Prakash Nath& Co. Meerut.
6. Kothari, 2010. **Introduction to Operation Research** ,Vikas publishing House , New Delhi.
7. P.K.Gupta , Man Mohan , 2010. **Problems in Operation Research** , Sultan Chand and sons , New Delhi.
8. S. Arumugam & A. Thangapandian Issac, 2004. **Statistics** , New Gamma Publication House.

(For COS Students)

**MAS 2432**

**GRAPH THEORY AND O.R**

**5hr/4cr**

**Objective:**

To enable the student to learn certain techniques in operations research and graph theory and use them in computer science.

**Unit I:**

Definition of graph - Degree - Adjacency and incidence matrix – Walk, trail, path – Connected graph – Cycle – Bipartite graph – Weighted Graph – Shortest Path Problem - Dijkstra's algorithm .

**Unit II:**

Tree – cutedge – Cutvertex – Spanning tree – Kruskal's algorithm – Euler tours – Chinese postman problem – Fleury's algorithm – Hamiltonian Cycle – Closure of a graph – Travelling salesman problem.

**Unit III:**

Transportation problem – Introduction – Mathematical formulation – Finding initial basic feasible solution – Northwest corner rule, least cost method and vogel's approximation method – Moving towards optimality – Unbalanced transportation problem – Assignment problem – Mathematical formulation - Special cases.

**Unit IV:**

Game theory – Introduction – Two person zero sum games – Maximin,minimax principle – Saddle points – Games without saddle points – Solution of  $2 \times 2$  games – Graphical method – Dominance Property.

**Unit V:**

PERT/CPM – Introduction – Networking – Critical path analysis – Probability considerations in PERT.

**References:**

1. Narsingh Deo, 1989. **Graph theory with applications to enginnering and computer science**, Prentice Hall India, New Delhi.
2. Kantiswarup,Gupta and ManMohan, 1995. **Operation Research**, Sultan Chand and sons.
3. V.K.Kappor, 1997. **Operation Research**, Sultan Chand and sons
4. John Clarke & Derek Allan Holton, 1995. **A First look at Graph Theory**, World Scientific Publishing Co.Ltd.
5. M.Murugan, 2000. **Graph Theory**, Muthali Publications.

**(For CME Students)**

**MAS2434**

**BUSINESS MATHEMATICS**

**5hr/4cr**

**Objective:**

To introduce various concepts of mathematics required for commerce.

This course deals with differentiation, integration, matrices, transportation and assignment problem.

**Unit I:**

Differential calculus: idea of limit- continuity- average concept and marginal concept- differential coefficient- standard forms rules for differentiation- higher order derivatives – increasing and decreasing functions- criteria for maxima and minima applications.

**Unit II:**

Integral calculus: standard forms rules for integration- definite integral- integration by substitution – integration by parts- applications.

**Unit III:**

Matrices – types of matrix – consistency of a matrix – rank of matrix-solving system of Homogeneous and non- homogeneous equation.

**Unit IV:**

Transportation problems: methods of finding IBFS-u-v method-unbalanced problems - Assignment problems.

**Unit V:**

Game theory– pure and mixed strategies –solution of 2x2 games- dominance rule- graphical solution of 2xn and mx2 games.

**References:**

1. Jeyaram & Arumugam, 1986. **Mathematics an Introduction.**
2. V.Sundaresan and SD Jeyaseelan., 2003. **An introduction to Business Mathematics,** S.chand & co
3. M.L. Khanna, 2001. **Matrices,** Jai Prakash Nath & Co. Meerut.
4. S. Narayanan & T.K.Manickavachagom Pillay, 2002.**Calculus,** volume I & II, S.Viswanathan private limited.
5. **Differential equations with Applications,** 2008. S. Arumugam & A. Thangapandian Issac, New Gamma publishing house.

**(For CMC Students)**

**MAS2436**

**BUSINESS MATHEMATICS**

**5hr/4cr**

**Objective:**

This course is designed to explore the techniques in mathematics and statistics which can be used in environment and managerial skills.

**Unit I:**

Set theory: basic operations - universe of sets - functions - Venn diagrams.

**Unit II:**

Matrices and Determinants: Definition of a matrix, Types of matrices; Algebra of matrices; Properties of determinants; Calculation of values of determinants upto Third order, Adjoint of a matrix; elementary row or column operations; Finding inverse of a matrix

through Adjoint and elementary row and column operations; Solution of a system of linear equations (having unique solution and involving not more than three variables) using matrices, Input Output Analysis.

### **Unit III:**

Analysis of Time series: Causes of variation, components of a time series, Decomposition - additive & multiplicative models, determination of trend - Moving averages, least squares (Linear, Parabolic & Exponential trend), Seasonal Indices - simple averages - ratio to trend, link relative methods.

### **Unit IV:**

Theory of Probability: concepts, addition & multiplication laws of probability- Conditional probability- Baye's theorem.

### **Unit V:**

Theoretical distribution - Binomial, Poisson distribution. Test of significance - Chi-square test, T-tests.

### **References:**

1. Sanchetti Kapoor, 2009. **Business Mathematics**, Sultan Chand & Sons, New Delhi.
2. S.C. Gupta, V. K. Kapoor, 2001. **Mathematical Statistics**, Sultan Chand & Sons.
3. S P Gupta, 2001. **Statistical methods**, Sultan Chand & Sons.
4. S. Arumugam, & A. Thangapandian Isaac, 2004. **Statistics**, New Gamma Publication House.

**(For CIT Students)**

**MAS2438**

**BUSINESS MATHEMATICS**

**5hr/4cr**

### **Objective:**

This course is designed to explore the techniques in mathematics and statistics which can be used in environment and managerial skills.

### **Unit I:**

Set theory: basic operations - universe of sets - functions - Venn diagrams.

### **Unit II:**

Matrices and Determinants: Definition of a matrix, Types of matrices; Algebra of matrices; Properties of determinants; Calculation of values of determinants upto Third order, Adjoint of a matrix; elementary row or column operations; Finding inverse of a matrix through Adjoint and elementary row and column operations; Solution of a system of linear equations (having unique solution and involving not more than three variables) using matrices, Input Output Analysis.

**Unit III:**

Analysis of Time series: Causes of variation, components of a time series, Decomposition - additive & multiplicative models, determination of trend - Moving averages, least squares (Linear, Parabolic & Exponential trend), Seasonal Indices - simple averages - ratio to trend, link relative methods.

**Unit IV:**

Theory of Probability: concepts, addition & multiplication laws of probability, conditional probability, Baye's Theorem.

**Unit V:**

Theoretical distribution - Binomial, Poisson and Normal Distributions.

**References:**

1. Sanchetti Kapoor, 2009. **Business Mathematics**, Sultan Chand & Sons, New Delhi.
2. S.C. Gupta, V. K. Kapoor, 2001. **Mathematical Statistics**, Sultan Chand & Sons.
3. S P Gupta, 2001. **Statistical methods**, Sultan Chand & Sons.
4. S. Arumugam, & A. Thangapandian Isaac, 2004. **Statistics**, New Gamma Publication House.

(For BCA Students)

**MAS 2440**

**OPERATIONS RESEARCH**

**5hr/4cr**

**Objective:**

To introduce to certain quantitative techniques in operations research which will enhance the analytical ability of the students.

**Unit I:**

Linear programming problem(L.P.P) – Mathematical formulation – Graphical solution – General L.P.P – Standard form – Canonical form – Solution to L.P.P by simplex method.

**Unit II:**

Transportation problem – Mathematical formulation – Finding initial basic feasible solution – Northwest corner rule, least cost method and Vogel's approximation method – Moving towards optimality – Unbalanced transportation problem.

**Unit III:**

Assignment problem – Mathematical formulation – Hungarian algorithm – Unbalanced assignment problem – Special cases – Travelling salesman problem.

**Unit IV:**

Game theory – Introduction – Two person zero sum games – Maxmin, minimax principle – Saddle points – Games without saddle points – Solution of 2x2 games – Graphical method – Dominance property.

**Unit V:**

Networking – Network and Basic components – Rule of network construction – Time calculations – Float or slack values – Critical path – CPM & PERT.

**References:**

1. Kantiswarup, Gupta and ManMohan, 2011. **Operations Research**, Sultan Chand and Sons.
2. V.K.Kapoor, **Operations Research**, 1997. Sultan chand and sons.
3. P.K.Gupta and ManMohan, 2007. **Problems in Operation Research**, Sultan Chand and Sons.
4. S.Arumugam & A.Thangapandian Isaac, 2003. **Operations Research**, New Gamma Publishing house.

**(For MIC Students)**

**MAS2452**

**BIOSTATISTICS**

**5hr/4cr**

**Objective:**

To introduce to the students the basic techniques in statistics which will enhance their ability to validate their experimental results.

The course deals with the fundamentals of biostatistics, sampling methods, data types and presentation, measures of central tendencies and dispersion, distribution patterns and various tests of inferential statistics.

**Unit I:**

Definition of statistics- Characteristics of statistics- Uses of statistics in Biology- Data types- Collection of data- Classification- Tabulation- Diagrammatic representation.

**Unit II:**

Measures of central tendencies: Mean and its types- Arithmetic mean, Geometric mean, Harmonic mean. Median, Mode, Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Co-efficient of standard deviation, Standard error, Variance.

**Unit III:**

Correlation Analysis: Types of correlation- Karl Pearson's co-efficient of correlation- Rank correlation. Regression lines.

**Unit IV:**

Sampling: Types of sampling- Parameters and statistic- Null and alternate hypothesis- Test of significance of small samples-T-test, F-test and chi-square test for goodness of fit.

**Unit V:**

Analysis of variance- One-way and two way classification- Latin square design.

**References:**

1. S. Palanichamy & Manoharan, 1990. **Statistical Methods for Biologists**, Palani Paramount publications.
2. S. Arumugam & A.Thangapandian Issac, 2004. **Statistics**, New Gamma publishing House.
3. Gupta, **Statistical Methods**, 2001. S.Chand&co.
4. R.Subatra & Ms.R.Shrividya, 2006. **Probability and statistics**, Tech-Max publications.

**(For BCH Students)**

**MAS 2454**

**BIOSTATISTICS**

**5hr/4cr**

**Objective:**

The main objective of the course is to inculcate the students with statistical skills needed to deal with contemporary nature of biological and clinical experiments. It also acquaints students with basic concepts of data collection and sampling methods. Special emphasis was given to probability distribution and hypothesis testing which help the students to apply the methods of distribution in various experimental problems. To fulfill the research thrust of the students a unit on research methodology was added to the course.

**Unit I:**

Definition of statistics- Characteristics of statistics- Statistical Methods- Uses of statistics in Biology- Data types- Collection of data- Classification- Tabulation- Diagrammatic representation.



**Unit II:**

Statistical tools-measures of central tendency-mean, median and mode, Harmonic mean, Geometric mean-measures of dispersion-mean deviation-standard deviation-coefficient of variation .

**Unit III:**

Correlation: Types of correlation- Karl Pearson's co-efficient of correlation-Rank correlation- Regression lines.

**Unit IV:**

Probability: Introduction-Basic definitions –simple problems- theoretical distribution-binomial-Poisson-normal distributions and applications.

**Unit V:**

Sampling-Hypothesis- t-test- F-test-chi square test for goodness of fit-ANOVA-definition- classification-one criteria and two criteria - simple problems- overview of research methodology.

**References:**

1. S. Palanichamy & Manoharan, 1990. **Statistical Methods for Biologists**, Palani Paramount publications.
2. Gupta, S.C and Kapoor, V.K, 2006. **Fundamentals of Applied Statistics**, Sultan Chand and Sons, New Delhi.
3. Elhance,D.N and Agarwal, 2003. **Fundamentals of Statistics**, Kitab Mahal Ahamedabad.
4. Gupta,S.P, 2004. **Statistical Methods**, Sultan Chand and Sons, New Delhi.

**Undergraduate Department of Physics (SF)**  
**Programme for B.Sc Physics from 2015 series**

SEM	Part	Course No.	Course Title	Hours	Credits	Marks
1	I	TAM/FRE/HIN		3	2	30
1	II	ENS 1361	Conversational skill	3	2	30
1	IIIC	PHS1331	Physics Lab – I	3	3	45
1	IIIC	PHS1553	Mechanics	5	5	75
1	IIIC	PHS 1555	Geometrical Optics	5	5	75
1	IIIS	MAS1471	Mathematics – I	5	4	60
1	IVLS1	PHS 1231	Life Skill – I	3	2	30
1	IVNME1	PHS 1233	NME – I	3	2	30
<b>Total</b>				<b>30</b>	<b>25</b>	<b>375</b>
2	I	TAM/FRE/HIN		3	2	30
2	II	ENS1362	Reading & Writing skill	3	2	30
2	IIIC	PHS1332	Physics Lab – II	3	3	45
2	IIIC	PHS1554	Electricity & Magnetism	5	5	75
2	IIIC	PHS 1556	Analog Electronics	5	5	75
2	IIIS	MAS1472	Mathematics – II	5	4	60
	IVLS2	PHS 1232	Life Skill – II	3	2	30
2	IVNME2	PHS 1234	NME – II	3	2	30
2	V	XXXxxxx	Extension Activity(NSS/NCC,PED,SLP)	2	1+1	
<b>Total</b>				<b>30</b>	<b>25</b>	<b>375</b>
3	I	TAM/FRE/HIN		3	2	30
3	II	ENS2361	Studies Skill	3	2	30
3	IIIC	PHS2661	Physics Lab – III	6	6	90
3	IIIC	PHS2463	Thermodynamics& Statistical Physics	4	4	60
3	IIIC	PHS2445	Astrophysics& Relativity	4	4	60
3	IIIC	PHS 2547	Physical Optics	5	5	75
3	IIIS	CHE2471	Chemistry – I	5	4	60
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
4	I	TAM/FRE/HIN		3	2	30
4	II	ENS2362	Career Skill	3	2	30
4	IIIC	PHS2662	Physics Lab – IV	6	6	90
4	IIIC	PHS2464	Classical & Quantum Physics	4	4	60
4	IIIC	PHS2446	Digital Electronics	4	4	60
4	IIIC	PHS 2548	Mathematical Physics	5	5	75
4	IIIS	CHE2472	Chemistry – II	5	4	60
4	V	XXXxxxx	Extension Activity(NSS/NCC,PED,SLP)	2	1+1	
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

SEM	Part	Course No.	Course Title	Hours	Credits	Marks
5	IIIC	PHS3661	Physics Lab – V	6	6	90
5	IIIC	PHS3553	Atomic Physics and Spectroscopy	5	5	75
5	IIIC	PHS3445	Energy Physics	4	4	60
5	IIIC	PHS3447	Computational Physics	4	4	75
	IIIC	PHS3449	Medical Physics	4	4	60
5	IVLS3	PHS3231	Life Skill Course -III	3	2	30
5	IVVE	PHS 3200	Environmental Physics	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
6	IIIC	PHS3662	Physics Project	6	6	90
6	IIIC	PHS3554	Communication system and Microprocessor	5	5	75
6	IIIC	PHS3446	Nuclear Physics	4	4	60
6	III C	PHS3448	Solid State Physics	4	4	60
6	III C	PHS3450	Modern Optics	4	4	60
6	IVLS	PHS3232	Life Skill Course - IV	3	2	30
6	IVVE	HVS 3200	Value Education	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
<b>Grand Total for Semester I - VI</b>				<b>180</b>	<b>158</b>	<b>2370</b>

### Courses offered to Non-Major Students by the Department of PHYSICS

SEM	Course No.	Course Title	Hours	Credits	Marks
I	PHS1471	Physics for Mathematics – I	5	4	60
II	PHS1472	Physics for Mathematics – II	5	4	60
III	PHS 2473	Microcontroller and programming	5	4	60
III	PHS2471	Physics for Chemists – I	5	4	60
IV	PHS2472	Physics for Chemists – II	5	4	60
<b>Total</b>			<b>20</b>	<b>16</b>	<b>240</b>

### Part III Major Supportive Courses

### Part IVLS Life Skill Courses:

SEM	Course No.	Course Title	Hours	Credits	Marks
I	PHS1231	Maintenance of Home Appliances	3	2	30
II	PHS1232	FM Radio theory & practice	3	2	30
V	PHS3231	Medical Instrumentation	3	2	30
VI	PHS3232	Renewable Energy	3	2	30
<b>Total</b>			<b>12</b>	<b>8</b>	<b>120</b>

### Part IVE Non Major Elective Courses

SEM	Course No.	Course Title	Hours	Credits	Marks
I	PHS1233	Basic Electronics	3	2	30
II	PHS1234	Wonders of Sky	3	2	30
<b>Total</b>			<b>6</b>	<b>4</b>	<b>60</b>

## PHS 2661

## PHYSICS LAB III

6 hr / 6cr

**Preamble**

The study of light and the interaction of light with matter is termed optics. The refractive quality of lenses is frequently used to manipulate light in order to change the apparent size of images. Magnifying glasses, spectacles, contact lenses, microscopes and refracting telescopes are all examples of this manipulation. Electric currents and the magnetic moments of elementary particles give rise to a magnetic field, which acts on other currents and magnetic moments. The magnetic state (or magnetic phase) of a material depends on temperature and other variables such as pressure and the applied magnetic field.

**Objectives**

Enable the students

- To impart skills in measurement, design.
  - To plan experimental procedures and keep records.
  - To understand results to reach non-trivial conclusion about significance of results of the experiments.
- 1) Study the interference pattern formed by Young's Double slit experiment
  - 2) Study the Spherical aberration of different lenses
  - 3) Spectrometer: Determine the angle of emergence for various angles of incidence and to draw the (i-i') curve and also to find the refractive index of the prism using spectrometer.
  - 4) Spectrometer (plane transmission grating): Determine the number of lines per meter of the grating and to find the wavelength of spectral lines using Spectrometer.
  - 5) Spectrometer: Determine the refractive index of a small angled prism
  - 6) To determine the radii of curvature of a double convex lens by forming Newton's ring
  - 7) Interpret the I-V characteristics of the Solar Cell
  - 8) Determine the wavelength of the given source using Fresnel's Biprism
  - 9) To compare the emf of two primary cells using potentiometer.
  - 10) To Calibration of Low range voltmeter using potentiometer.
  - 11) Determination of  $M$  and  $B_H$  using Bar magnet
  - 12) Construct LCR series & parallel
  - 13) Determine the value of unknown inductor using Anderson Bridge
  - 14) Determine the specific heat capacity of liquid using Joule's Calorimeter
  - 15) To determine thermal conductivity of a bad conductor using Lee's disc
  - 16) Determine the  $B_H$  of the Magnet using Field Along the axis of a circular coil
  - 17) Study the Resolving power of telescope

A minimum of any **sixteen** experiments shall be carried out.

**PHS 2463 THERMODYNAMICS AND STATISTICAL PHYSICS 4 hr /4 cr****Preamble**

Thermo-dynamics is the subject of the relation of heat to forces acting between contiguous parts of bodies, and the relation of heat to electrical agency. The laws of thermodynamics are explained in terms of microscopic constituents by statistical mechanics. A common use of statistical mechanics is in explaining the thermodynamic behaviour of large systems.

**Objectives**

Enable the students

- To understand the fundamental concept of thermodynamics
- To aware the principles of partition function, transport phenomenon and its applications
- To gain knowledge in statistical Physics

**Unit 1 : Thermodynamic systems**

The Zeroth law of thermodynamics – thermodynamic equilibrium – Measurement of temperature - equation of state of an ideal gas and real gases – Expansivity and Compressibility - first law of thermodynamics – internal energy – Heat Capacity - Joule-Thomson effect - Carnot cycle – heat engine and refrigerator.

**Unit 2 : Second law of thermodynamics**

The second law of thermodynamics – Entropy – Tds equations – Entropy and Enthalpy of an ideal gas– Helmholtz function and Gibbs function – thermodynamic potentials – Maxwell Relations - phase transitions – Clausius-Clapeyron equation - third law of thermodynamics.

**Unit 3: Applications of thermodynamics and Kinetic theory**

Chemical potential – Gibbs Phase Rule - Black body radiation - Kinetic theory – principle of equipartition of energy – classical theory of specific heat capacity – Transport Phenomena: Viscosity, diffusion.

**Unit 4: Statistical physics**

Energy states and energy levels - macrostates and microstates – thermodynamic probability – Bose-Einstein statistics –Fermi-Dirac statistics – the Maxwell-Boltzmann statistics

**Unit 5: Applications of statistical physics**

BE, FD, and MB distribution functions – Comparison of distribution functions for indistinguishable particles - statistical interpretation of entropy – comparison of distribution functions for indistinguishable particles – partition function. Applications of statistical physics –distribution molecular velocities – experimental verification - ideal gas in gravitational field –quantized linear oscillator.

**Text Book:**

F. W. Sears and G. L. Salinger, Thermodynamics, Kinetic theory, and Statistical Thermodynamics, III<sup>rd</sup> ed., Narosa Publishing House(1998).

**References:**

1. David Halliday, Robert Resnick and Kenneth S. Krane. “*Physics Vol. II*”, V<sup>th</sup> ed., John Wiley , (2002)
2. R. P. Feynmann, Feynmann lectures on Physics Vol.I, Addison-Wesley Narosa Pub (1989).
3. H.C Verma , “Concepts of Physics”, Bharati Bhawan (P&D) (2015)

**PHS 2445****ASTROPHYSICS AND RELATIVITY****4hr/ 4 cr****Preamble**

Modern astronomical research often involves a substantial amount of work in the realms of theoretical and observational physics. Some areas of study for astrophysicists include their attempts to determine the properties of dark matter, dark energy, and black holes; whether or not time travel is possible, wormholes can form, or the multiverse exists; and the origin and ultimate fate of the universe. Concepts introduced by the theories of relativity include spacetime as a unified entity of space and time, gravitational time dilation, and length contraction.

**Objectives**

Enable the students

- To understand the concept of solar system, birth and evolution of a star
- To know the principles and working of detector instruments
- To earn knowledge in understanding galaxy, basis of origin of universe

**Unit 1: Positional Astronomy and Gravitation**

Birth of modern astronomy- Geocentric and heliocentric –Copernicus revolution – Kepler cosmology – Celestial sphere – coordinate systems: horizontal , equatorial systems – Kepler’s Laws – Newtonian gravitation – seasons – Eclipse – Solar, lunar - Tides and precession - solar family – inventor of solar systems – our moon – mariner and mars – Venus and mercury –Jovian planets.

**Unit 2: Stellar Objects**

Stellar distance- stellar spectra –the Hertzsprung- Russel diagram - magnitude of star light – evolutionary stages of stars – birth of stars – maturity and old age star clusters white dwarfs as dead stars – fate of stars.

**Unit 3: Observational Astronomy**

Astronomical observations – optical telescopes – Reflecting – refracting – telescope mount – electronic detector – spectroscopy – Radio telescope – resolving power of radio telescope – radio interferometry – UV-IR-X-ray telescopes.

**Unit 4: Galaxies & Cosmos**

Galaxy - types of galaxies- Cosmological principles –big bang the expanding universe- cosmological model – open, close universe – steady state universe – Hubble’s law – maximum age of universe - Evidence for Einstein’s gravitation.

**Unit 5: Relativity Theory**

Special Theory of Relativity - Lorentz transformation - Length contraction and time dilation - Conservation of mass and momentum - General Theory of Relativity - Relativistic Doppler shift and aberration of light - Elementary ideas about general theory of relativity with observational tests.

**Text Books :**

1. William Kaufmann “Astronomy: The Structure of the Universe”, McMillan Publishing Co.inc, New York(1999).
2. R.Alder, M.Bazrin and M.Schiffer, , ‘Introduction to General Theory of Relativity’, McGraw Hill Publications(1975) .

**References:**

1. George O.Abell, Exploration of the Universe, Tata McGraw Hill Publishing, New Delhi(1978) .
2. Frank H.Shu,The Physical Universe : An Introduction to Astronomy, , University Science Books(1982).

**PHS 2547****PHYSICAL OPTICS****5hr/ 5 Cr****Preamble**

Physical optics is an intermediate method between geometric optics, which ignores wave effects, and full wave electromagnetism, which is a precise theory. The concepts of physical optics is applied in electrical engineering and applied physics.

**Objectives**

Enable the Students

- To understand the nature and propagation of light waves
- To understand the basic principles of interference, diffraction and polarization of light
- To know the various experimental methods involving the above said properties of light

**UNIT 1: Interference**

Huygen’s principle - Young’s experiment – Interference fringes from a double source –Fresnel’s Biprism – Fresnel’s mirror – Lloyd’s mirror – Michelson interferometer – circular fringes and localized fringes – white light fringes – Newton’s rings – Fabry Perot interferometer

**UNIT 2: Diffraction - Fraunhofer**

Fraunhofer diffraction for single slit – rectangular aperture – circular aperture - resolving power - diffraction due to a double slit – effect of finite width of source slit - diffraction due to a grating – formation of spectra by grating

**UNIT 3: Diffraction - Fresnel**

Fresnel's diffraction – shadows – Fresnel's half period zones – circular aperture – zone plates – circular division of wave front – strip division of wave front – Cornu's spirals – Fresnel's integrals – diffraction by straight edge

**UNIT 4: Polarization**

Polarization by reflection – polarising angle and Brewster's law – pile of plates – law of Malus – Dichoric crystal – double refraction – Nicol prism – refraction by calcite crystals – optical activity by scattering

**UNIT 5: Lasers and Applications**

Stimulated emission – Einstein's quantum theory of radiation – Basic principles of Laser – Characteristics , three level and four level Laser system, pumping rate equation, threshold condition –Solid state Laser – Semiconductor laser – Gas laser - applications

**Text Books:**

1. Jenkins and White, Fundamentals of optics, 3<sup>rd</sup> Edn, Mc Graw Hills, International Editions, New Delhi, (2000).
2. Ajoy Ghatak, Optics, 3<sup>rd</sup> edn, Tata McGraw Hill Limited, New Delhi, (2005).
3. Ghatak and Thygarajan, Lasers, Theory and applications, Macmillan India Ltd., New Delhi, (1984).

**References:**

1. B.B.Laud, Lasers and Non linear Optics, 2<sup>nd</sup> edition, New Age International(o) Ltd, Publishers, New Delhi (1987).
2. Frank L.Pedrotti & Leno S.Pedrotti, Introduction to Optics, Prentice – Hall Int. Inc. New Jersey(1992).
3. Halliday, Resnick and Krane, Physics, Part II 5<sup>th</sup>edn, Wiley, NY(2003).
4. K.K.Sharma, Optics-principle and application, Elsevier, New Delhi, (2006).



**PHS 2471                      PHYSICS FOR CHEMISTS-I                      (3 + 2) hr / (3 + 1)cr****(Theory cum Lab course) (3 Hrs Theory & 2 Hrs Lab)****Preamble**

Physics intersects with many interdisciplinary areas of research, such as biophysics, biochemistry and quantum chemistry and the boundaries of physics are not rigidly defined. New ideas in physics often explain the fundamental mechanisms of other sciences while opening new avenues of research in areas such as mathematics and philosophy.

**Objectives:**

Enable the Students

- to understand the physical nature of light
- to gain knowledge of electronic components and semiconductor devices.
- to understand the basic laws of electric and Magnetic fields.

**UNIT 1: Wave Optics**

Huygens's wave theory- reflection and refraction of light waves- Interference- Interference in thin films-diffraction –Single slit diffraction-diffraction at circular aperture –

**UNIT 2 : Optical instruments**

Dispersion of light waves through Prism- resolving power of Prism, telescopes - polarization – double refraction- circular polarization -speed of lenses- - Magnifiers-Types of Magnifiers.

**UNIT 3: Electricity**

Coulomb's law-electric dipole-electric field lines-Flux- Gauss's law- Applications of Gauss law- Electric Potential- Potential of continuous charge distribution-Capacitors-parallel plate capacitors-Capacitors with dielectrics- Electric current-Resistors in series and parallel.

**UNIT 4: Magnetism**

Magnetic flux -Biot-Savart's law-Ampere's law- Laws of electromagnetic induction -Magnetization-Magnetic materials- Alternating current-single loop LCR circuit-Transformer.

**UNIT 5: Solid State Electronics**

Semiconductors-Intrinsic and extrinsic semiconductors, N and P type-P-N junction diode-Diode as rectifier- Zener diode-characteristics-voltage regulation--Transistors and its uses- Oscillators- Transducers- Introduction to OP-AMP- Characteristics- Adder-subtractor –Integrator and Differentiator-Boolean algebra- Logic gates – NAND, NOR as Universal building blocks.

## LABORATORY COMPONENTS

1. Small distance measurement using screw gauge and vernier calliper
2. Error analysis
3. Determine the radius of capillary tube Travelling Microscope
4. Find the Resolving power of the Prism using spectrometer
5. Familiarisation of Multimeter and CRO
6. Verify the Ohm's Law using Potential dividing circuits
7. Verifying Truth tables using Logic gates.
8. Verify the Arithmetic operation using OP-AMP
9. Verify the transverse laws of vibration using Sonometer
10. Determine the wavelength of the given source using Young's double Slit experiments
11. Determine the resonance frequency using LCR parallel Circuit
12. Determine the  $B_H$  of the bar magnet using Field along the axis

A minimum of any **Ten** experiments shall be carried out.

### Text Books:

1. Resnick, Halliday&Krane , Physics, Part – I, 5<sup>th</sup>edn, Wiley, (2004)
2. Resnick, Halliday&Krane ,Physics, Part – II, 5<sup>th</sup>edn, Wiley,( 2002).
3. Jenkins & White,Fundamentals of Optics, 4<sup>th</sup>edn, Mcgraw Hill pub, (1976).
4. B.L.Theraja, Basic electronics, S. Chand & Company(1989) .

### References:

1. Jerold Touger,Introductory Physics, Wiley Student Edition, New Delhi, ( 2006).
2. Serway&Faughner, College Physics, 6<sup>th</sup>edn, Thomson Brooks/Cole, (2005)
3. Hugh D. Youg& Roger A. Freedman,, University Physics, 11<sup>th</sup>edn, sears and Zemansky's, India, ( 2005)

**PHS 2473                      Microcontroller and programming                      (3+ 2) hrs / (3 + 1)cr**  
**(Theory cum Lab course)                      (3 Hrs Theory& 2 Hrs Lab)**

### Preamble

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices. Microcontrollers make it economical to digitally control even more devices and processes.

**Objectives:**

Enable the Students

- To learn the architecture and programming of a microcontroller.
- To understand the use of peripheral devices ,
- To study the interfacing with microcontroller to design a digital system.

**Unit 1: Introduction to Microcontrollers**

Different types of microcontrollers – processor architectures – microcontroller memory types – control storage – variable area – program counter stack – hardware interface register – microcontroller features – 8051 microcontroller

**Unit 2: 8051 Processor architecture**

The CPU – addressing modes – external addressing – interrupts -8051 instruction executions

**Unit 3: 8051 Instruction Set**

Data movement instructions – arithmetic instruction – bit operators – execution change operators.

**Unit 4: 8051 Hardware Features**

Device packaging - Power consideration – reset – system clock – parallel input /output – timer – interrupt – serial I/O.

**Unit 5: 8051 programming and software**

8051 programming – Development tool/environments –assembly language – 8051 assembly programming styles – interpreter.

**Text Book:**

- 1) MykePredko, Programming and customizing the 8051 microcontroller, Tata McGraw – Hill Edition (1999).

**References:**

- 1) Kenneth J. Ayala, The 8051 Microcontroller, Cengage Learning, (2004).
- 2) Muhammad Ali Mazidi, Janice Mazidi, Janice Gillispie Mazidi, ,The 8051 Microcontroller and Embedded Systems, by Prentice Hall (1999).

**Lab–**

1. Write a program to multiplication and division using MUL and DIV instructions.
2. Write a program to transfer a block of data from internal memory to external memory.
3. Write a program to find the sum of two numbers in decimal

4. Write a program to convert decimal number to hexadecimal.
5. Write program to find the largest from a set of n numbers.
6. Write a program to sort a set of numbers in ascending order
7. Write a program to sort a set of numbers in descending order
8. Write an assembly language program for generating a triangular wave
9. Write a program to exchange two set of eight byte data.
10. Write program for sorting the given set of numbers.

A minimum of any **eight** experiments shall be carried out.

## PHS 2662

## PHYSICS LAB IV

6 hr / 6Cr

### Preamble

Analog electronics describes the proportional relationship between a signal and a voltage or current that represents the signal. Electrical signals may represent information by changing their voltage, current, frequency, or total charge. Information is converted from some physical form (such as sound, light, temperature, pressure, position) to an electrical signal. Digital techniques are useful because it is easier to get an electronic device to switch into one of a number of known states than to accurately reproduce a continuous range of values. Digital electronic circuits are usually made from large assemblies of logic gates, simple electronic representations of Boolean logic functions.

### Objectives

Enable the students

- To impart skills in measurement, design
  - To plan experimental procedures and keep records.
  - To understand results to reach non-trivial conclusion about significance of results of the experiments.
1. Construction of Dual power supply
  2. Verify the Network Theorems
  3. Determine the Zener- Diode Characteristics and Voltage regulator
  4. Construct the Wave shaping circuits using diode
  5. Determine the input and output Characteristics of a Transistor
  6. Construct a Single stage amplifier using Transistor
  7. Determine the characteristics of FET amplifier
  8. Construct a Hartley Oscillators using Transistor
  9. Designing of Push pull amplifier using transistor
  10. Op-amp as Integrator and differentiator
  11. NAND /NOR as Universal gate
  12. Transistor as inverter
  13. Multivibrators using IC 555 timer
  14. Implement of Boolean expressions
  15. JK – Flip Flop as a counter

16. Half Adder ,Full Adder and Subtractor
17. Designing of Encoder and Decoder
18. Construction of Arithmetic and Logic Unit
19. Construction of Multiplexer and Demultiplexers
20. OP-Amp as Active filter
21. Op-Amp as sine wave, square Wave form Generation

A minimum of any **sixteen** experiments shall be carried out.

## **PHS 2464                      CLASSICAL AND QUANTUM MECHANICS                      4 hr /4 cr**

### **Preamble**

Classical mechanics and quantum mechanics are the two major sub-fields of mechanics. Classical mechanics is concerned with the set of physical laws describing the motion of bodies under the influence of a system of forces. Quantum mechanics including quantum field theory, is a fundamental branch of physics concerned with processes involving , atoms and photons. Important applications of quantum mechanical theory include superconducting magnets, light-emitting diodes and laser, transistor and semiconductors.

### **Objectives:**

Enable the Students

- To understand the basic concepts and application of Lagrangian dynamics, Hamiltonian dynamics, small oscillations, rigid body, nonlinear dynamics.
- To understand the concepts of operator and postulates of quantum mechanics
- To solve the physical problems using the above concepts.

### **Unit 1: Lagrangian and Hamiltonian Dynamics**

Lagrange's equation for conservative and Non- conservative System- Applications of Lagrange's equation- Hamilton's principle- Lagrange's Equation from Hamilton's Principle – Lagrange's equation from variational principles –Advantages- conservation theorem -Hamilton equations of motion –Cyclic coordinates and Conservation theorems- Hamilton equations from variational Principle-The principle of Least action.

### **Unit 2: The Two body Central Force Problem**

Conservative central forces-Classification of Orbits- The Virial Theorem- The Kepler problem; Inverse Square law of Forces– Rutherford scatterings -Scattering in a central force field

### **Unit 3: Particle properties of waves**

Planck's blackbody radiation - de Broglie waves – photoelectric effect – Compton Effect - Wave properties of particles: particle diffraction – Davison and Germer experiment – Heisenberg's uncertainty principle - wave packet - phase and group velocities.

#### Unit 4: Operator and Postulates of Quantum Mechanics

The wave function – probability density – probability stream (current) density - dynamical operators – linear and hermitian operators – commuting and non-commuting operators – Hamiltonian – angular momentum operators-The Schrodinger's wave equation – time dependent form – linearity and superposition – Schrodinger equation: steady state form - eigenvalues and eigenfunctions.

#### Unit 5: Exactly solvable problems

Free states: electron beam in a field-free space – step potential – barrier potential – quantum tunneling – square well free states.

Bound states: infinite potential well – particle in a box – degeneracy –quantized states – normalized wave functions – expectation values - Harmonic oscillator – energy eigenvalues and eigenfunctions – zero point energy. Schrodinger equation for a one-electron atom – separation of variables – radial and angular part of Schrodinger equation.

#### Text Books:

- 1) C.Upadaya, “Classical Mechanics” , Himalayan Publishing House, New Delhi(1989).
- 2) Arthur Baiser ,Shobit Mahajan, S.RaiChoudhury,” concept of Modern Physics” 6<sup>th</sup> Edn, Mc Graw Hill Education (India) Pvt Ltd, New Delhi(2009).

#### References;

- 1) P.M.Mathews & K.VengatesanA Text Book of Quantum Mechanics, Tata McGraw Hill, New York ,(Reprint 2002).
- 2) J.J.Sakurai, Modern Quantum Mechanics, Addition Wisle (1999).
- 3) S R.Shankar, Principles of Quantum Mechanics, II ed, Springer(2007),

**PHS 2446**

**DIGITAL ELECTRONICS**

**4hr / 4 Cr**

#### Preamble

Digital electronics that handles digital signals, discrete bands of analog levels rather than by continuous ranges. Digital techniques are useful because it is easier to get an electronic device to switch into one of a number of known states than to accurately reproduce a continuous range of values. Digital electronic circuits are usually made from large assemblies of logic gates, simple electronic representations of Boolean logic functions.

#### Objectives

Enable the Students

- To acquire a knowledge in number system and Boolean algebra
- To learn the concept of digital electronics and their designs
- To understand with the basic building blocks required for digital devices and equipments.

**Unit 1: Number Systems**

Decimal – binary – octal and hexadecimal – their representation, inter-conversion, addition and subtraction, negative Numbers. Codes: Weighed binary codes: 8421, 2421, 5211, excess–3 code. Gray code and ASCII code. Binary to gray conversion and vice versa. Error detection and correction. Parity checking

**Unit 2: Boolean axioms and theorems**

sum of products – product of sums – their conversion – Simplification of Boolean expressions - K-Map – min terms – max terms -(2, 3 and 4 variables). Concept of sequential logic circuit design -positive and negative logic. Basic and derived gates – Universal gates. R-S, Clocked R-S, D, edge triggered, J-K, J-K master slave flip flops.

**Unit 3: Decoders and Multiplexer**

Basic binary decoder – 2 to 4, 3 to 8 decoders – BCD to seven segment decoder. Encoders: Octal to binary, decimal to binary – priority encoder. Multiplexer- design of 2:1 and 4:1, 8 to 1 and 16 to 1 multiplexer – demultiplexer: 1 to 4 demux and applications. Arithmetic circuits: Half and full adder, Half and full subtractor.

**Unit 4: Counters and Registers**

Asynchronous and synchronous counter – 2-bit, 3-bit asynchronous binary counter – decade counter. Up-down counter – cascading MOD-counters. Shift registers – semiconductor memory- flash memory. 555 timer: Astable, mono-stable and bi-stable modes – Display multiplexing - Frequency and Time measurement.

**Unit 5: Memory Devices**

General Memory Operation, CPU-Memory connection, Read only memories, ROM architecture, ROM timing, and types of ROMs, Flash memory, and ROM applications. Semiconductor RAMs, RAM architectures, static RAM, Dynamic RAM

**Text Book:**

1. Floyd, Digital fundamentals , 8<sup>th</sup> edition Pearson education (2006)

**References:**

1. Malvino, leach and saha,Digital principles and applications ,6<sup>th</sup> edition, McGraw Hill (2006).
2. Modern digital electronics – R.P.Jain, Tata McGraw Hill ,3rd Edition(2003).

**PHS 2548****MATHEMATICAL PHYSICS****5hr - 5 cr****Preambles**

Mathematical physics refers to development of mathematical methods for application to problems in physics. Mathematical physics covers a very broad academic realm distinguished only by the blending of pure mathematics and physics. The effort to put physical theories on a mathematically rigorous footing has inspired many mathematical developments. The mathematical study of quantum mechanics, quantum field theory and quantum statistical mechanics has motivated results in operator algebras.

**Objectives**

Enable the students

- To understand the concepts of complex numbers, matrices and special functions.
- To give training in using mathematical tools in solving problems in various branches of Physics.
- To impart mathematical skills to analyze Physical phenomenon.

**Unit 1: Complex variables**

Function of a complex number-analytical function-transfer function- Cauchy-Riemann equation- C-R in polar form-Cauchy integral theorem-Cauchy's Inequality: Taylor series-Laurent's series.

**Unit 2: Matrices**

Addition, multiplication of matrices-Null-Diagonal, scalar and unit matrices- Upper triangular and lower triangular matrices- Transpose of a matrix- Symmetric and Skew-Symmetric Matrices- Conjugate of a Matrix- Hermitian and Skew-Hermitian Matrices- Singular and Non-Singular matrices. Adjoint of a matrix-Inverse of a Matrix by Adjoint method-Similarity Transformations-Orthogonal and Unitary Matrices-Trace of a Matrix-Eigen-values and Eigen vectors. Cayley- Hamilton theorem.

**Unit 3: Vector Calculus**

Vector differentiation-Gradient-divergence-Curl- vector integrals: line, surface and volume-Gauss- divergence-Stokes and Green's theorem.

**Unit 4: Fourier series and Transformation**

Fourier series- Dirichlet's theorem and Dirichlet's conditions- properties of Fourier series- Fourier transform- sine and cosine transforms – convolution theorem - simple applications of Fourier transform.

**Unit 5: Differential equations and special functions**

Linear and non linear differential equations- solution of linear differential equation of first order and second order – Beta and Gamma functions- evaluation of beta function- evaluation of gamma function.



**Text Books:**

1. Arfkan, Mathematical Physics, 6<sup>th</sup> edn , ,Sultan Chand & sons,( 2012).
2. Erwin Kreyszig Advanced Engineering Mathematics , Wiley Custom Learning Solutions,( 2011).

**References:**

1. B.D.Gupta , Mathematical Physics , Vikas Publishing house PVT LTD, (2004).
2. Murray R. Spiegel , Schaum's Outline series of theory and problems of Vector Analysis and an introduction to tensor , Schaum's Outlines ( 2009).

**PHS 2472****PHYSICS FOR CHEMISTS-II (3 + 2) hr / (3 + 1)cr****(Theory cum Lab course)****(3 Hrs Theory & 2 Hrs Lab)****Preamble**

Physics intersects with many interdisciplinary areas of research, such as biophysics and quantum chemistry, and the boundaries of physics are not rigidly defined. New ideas in physics often explain the fundamental mechanisms of other sciences while opening new avenues of research in areas such as mathematics and philosophy. This course deals with the aspects of thermodynamics, molecular spectroscopy and their application in chemistry. It also explains the basics ideas of classical and quantum mechanical

**Objectives:**

Enable the Students

- To understand the laws of thermodynamics
- To know the principles of laser and spectroscopy.
- To know the basics of classical mechanics and quantum mechanics

**Unit 1: Thermodynamics**

Laws of thermodynamics-Heat capacity and Specific heats- Heat capacity of an ideal gas-Applications of I law-Entropy-Second law of thermodynamics-Carnot engine- efficiency of Carnot engine- entropy and the performance of refrigerators- engines-efficiencies of real engine.

**Unit 2: Molecular Spectroscopy**

Molecules-Molecular energy- Vibrational and Rotational energy levels-energy levels-electronic spectra of molecules-Infra red spectroscopy – Raman effect-Fraunhofer lines.

**Unit 3: Laser**

Laser and Laser light-stimulated emission- The Ruby Laser-Helium-Neon gas laser-CO<sub>2</sub> laser-coherence length-frequency doubling-laser safety-Laser Applications

**Unit 4: Classical Mechanics**

Failure of classical mechanics –Thermal radiation -Planck's radiation law- - Photoelectric effect-characteristics of photoelectron –laws of photoelectric emission- Einstein's photo electric equations- Compton effect-matter waves-De-Broglie Hypothesis

**Unit 5: Quantum Mechanics**

Heisenberg's uncertainty principle-Schrödinger's equation- particle in a box - electron trapped in a potential well –Barrier tunnelling.

**LABORATORY COMPONENTS**

1. Determination of the Coefficient of Viscosity of a given liquid using Burette method
2. Determination of the Young Modulus by Cantilever method
3. Determine the Thermo emf of a Thermo Couple
4. Determination of the Surface Tension of a given liquid by Drop Weight Method
5. Determine the Thermal Conductivity of Poor Conductivity using Lee's Disk method
6. Determine the Specific Heat Capacity of a Solid using calorimetric method
7. Determine the resonance frequency using LCRseries Circuit
8. Determine the rigidity modulus using Torsion Pendulum
9. Determination of Spring constant using static and dynamic method
10. Determine the Linear coefficient of Thermal expansion
11. Determine the AC frequency using Melde's apparatus
12. Determine the V I character of a Solar cell

A minimum of any **Ten** experiments shall be carried out.

**Text Books:**

1. David Halliday, Robert Resnick and Kenneth S. Krane. "*Physics Vol. II*", V<sup>th</sup> ed., John Wiley (2002).
2. Arthur Beiser, Concepts of Modern Physics, 6<sup>th</sup> edn., Tata McGraw-Hill Education, (2003).
3. Donald P Leach & Albert Paul Malvino, Digital Principles and Applications, 6<sup>th</sup> edn, McGraw-Hill Education, (2007).
4. C.C.Ouseph,U.J.Rao,V.Vijayendran , Practical Physics and Electronics-, S.VisvanathanPvt.Ltd. (2007 ).

**References:**

1. Jerold Touger, Introductory Physics, Wiley Student Edition, New Delhi, (2006)
2. Serway&Faughner, College Physics, 6<sup>th</sup> edn, Thomson Brooks/Cole,( 2005).
3. Hugh D. Young& Roger A. Freedman,University Physics, 11<sup>th</sup> edn, sears andZemansky's, India( 2005).

## PROGRAM / COURSE FRAME

## U.G. DEPARTMENT OF CHEMISTRY (SF)

Program for Choice Based Credit System - 2015 – 2016

SEM	Part	Course No.	Course Title	Hours	Credits	Marks
3	I	<b>TAM/FRE/HIN</b>		3	2	30
3	II	<b>ENS 2201</b>	Study Skills	3	2	30
3	IIIC	<b>CHS 2511</b>	Organic Chemistry – II	5	5	75
3	IIIC	<b>CHS 2513</b>	Inorganic Chemistry – III	5	5	75
3	IIIC	<b>CHS 2515</b>	Physical Chemistry – II	5	5	75
3	IIIC	<b>CHS 2431</b>	Inorganic Qualitative Analysis	4	4	60
3	IIIS	<b>PHS 2471</b>	Physics for Chemists - I	5	4	60
3	V		NSS/NCN/NCC/PED/SLP			
			<b>Total</b>	30	27	435
4	I	<b>TAM/FRE/HIN</b>		3	2	30
4	II	<b>ENS 2202</b>	Career Skills	3	2	30
4	IIIC	<b>CHS 2512</b>	Organic Chemistry – III	5	5	75
4	IIIC	<b>CHS 2514</b>	Inorganic Chemistry – IV	5	5	75
4	IIIC	<b>CHS 2516</b>	Physical Chemistry – III	5	5	75
4	IIIC	<b>CHS 2432</b>	Organic Estimation & Gravimetric Analysis	4	4	60
4	IIIS	<b>PHS 2472</b>	Physics for Chemists - II	5	4	60
4	V		NSS/NCN/NCC/PED/SLP			
			<b>Total</b>	30	27	435

**CHS 2511****Organic Chemistry–II****5 hr/5 cr**

This course will enable the students to learn and understand the concepts of aromaticity and basic nature of arenes, polynuclear hydrocarbons and halogen containing compounds. They will be able to comprehend the reactivity and physical nature of functional groups like alcohols, ethers, thiols, thioethers, epoxides and phenols.

**UNIT I: Aromaticity and Arenes**

Structure of benzene–Resonance model–MO picture–concept of aromaticity–Huckel’s rule, non-aromatic, antiaromatic

Arenes–Nomenclature of benzene derivatives–General methods of preparation–physical properties–chemical properties–orientation effect of substitution on electrophilic aromatic substitution–activating group, deactivating group, orientation and o/p ratio, energy profile diagram–free radical substitution–addition reaction–oxidation reaction–Birch reduction. Biphenyl–preparation and reactions.

**UNIT II: Polynuclear hydrocarbons**

Naphthalene–isomerism–orbital picture–synthesis–physical properties–chemical properties–electrophilic aromatic substitution–orientation of disubstitution–addition reaction–uses–naphthol and naphthylamine.

Anthracene–nomenclature and isomerism–synthesis–physical properties–chemical properties–reduction, electrophilic substitution reaction, oxidation, electrophilic addition reaction–anthraquinone.

Phenanthrene–synthesis–structure–properties.

**UNIT III: Haloalkanes and Haloarenes**

Classification and nomenclature of alkyl halides–Physical properties–Preparation and reactions of alkyl halides–Nucleophilic aliphatic substitution– $S_N^1$  and  $S_N^2$  mechanism and kinetics with energy profile– $E_1$  and  $E_2$  elimination–orientation–vinyl and allyl halide–preparation and property–Poly halogen compounds (chloroform, carbon tetrachloride, freons)–Preparation and reactions of aryl halides–nuclear and side chain reactions–Reactivity and orientation in aromatic substitution reactions–Benzyne mechanism–Relative reactivity of alkyl vs allyl, vinyl and aryl halides–Synthesis and uses of DDT, BHC

**UNIT IV: Alcohols, Thiols, Ethers, Thioethers and Epoxide**

Classification and Nomenclature–Monohydric alcohol–physical properties–synthesis of alcohols from alkenes via oxymercuration and demercuration, hydroboration, oxidation, reduction–Reactions of alcohols–distinction between  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols–hydrogen bonding–acidic nature of alcohols

Dihydric alcohol–physical properties–method of formation–chemical reaction–oxidative cleavage via lead tetraacetate and periodic acid–pinacol–pinacolone rearrangement.

Trihydric alcohol–method of formation–chemical reaction–glycerol, dynamite, cordite–Estimation of number of hydroxyl groups

Thiols–Preparation and chemical reactions of thiols–comparison with alcohols–mustard gas.

Ethers–Structure and nomenclature of ethers–physical properties–preparation–Williamson’s synthesis–Alkoxymercuration and demercuration–chemical reactions–cleavage and auto oxidation–analysis of ether–Ziesel’s method–crown ethers (brief introduction).

Thioethers–Preparation and chemical reactions.

Epoxides–synthesis–reactions–acid and base catalyzed ring opening of epoxides–orientation of cleavage of epoxide–reaction with Grignard and organolithium reagents.

**UNIT V: Phenols**

Classification and nomenclature of monohydric, dihydric and trihydric phenols–preparation of phenol–physical properties of phenol–acidic nature–comparison with alcohols–resonance stabilization of phenoxide ion–reactions of phenol as acid, reaction pertaining to -OH group and benzene ring of phenol–electrophilic aromatic substitution–Mechanism of Fries, Claisen rearrangement, Gattermann synthesis, Houben-Hoesch reaction, Lederer-Manasse reaction, Libermann Nitroso reaction, Kolbe reaction, Reimer-Tiemann reaction, phthalein reaction–Analysis of phenol.

**Textbook:**

1. Jain. M.K. and Sharma. S.C., Textbook of Organic Chemistry, Vishal publishing Co, 4<sup>th</sup> edition, 2014.

**References:**

1. Morrison and Boyd., Organic Chemistry, Pearson publication, 7<sup>th</sup> edition, 2003.
2. Mehta. B. and Mehta.M., Organic Chemistry, Prentice–Hall of India Private limited, 2007.
3. Soni. P.L. and Chawla. H.M., Textbook of Organic Chemistry, Sultan Chand and Sons, 28<sup>th</sup> edition, 2007.

**CHS 2513****Inorganic Chemistry-III****5 hr/5 cr**

This is a course intended to impart knowledge about the solid state, metallic bond and chemistry of nitrogen, chalcogen and halogen groups. This course also deals with the theory behind the laboratory course and aims at enriching student's analytical learning and skill.

**UNIT I: Solid state**

Crystalline and amorphous solids–characteristics of solid–symmetry in crystals–laws of crystallography–unit cell–space lattice–basic crystal systems–Bravais lattices–number of atoms per unit cell–interplanar spacing in a crystal system–Miller indices–X ray diffraction–Bragg equation, experimental methods  
Metallic Bond–Free electron and band theory–electrical properties of solids–super conductivity (elementary ideas only)

**UNIT II: Group V**

General characteristics–unique features of nitrogen–a comparative study of hydrides–preparations, properties and uses of  $N_2H_4$ ,  $NH_2OH$ ,  $HN_3$ –oxo acids of nitrogen–nitric acid–oxidising properties–structures of oxides and oxoacids of phosphorus and nitrogen–halides of phosphorus–phosphazines.

**UNIT III: Group VI**

Gradient in properties–oxidation state–differences between oxygen and other elements–chemistry of ozone and  $H_2O_2$ –oxides of sulphur–thionyl and sulphuryl chlorides–oxoacids of sulphur–sulphuric, permono, perdisulphuric acid– $SF_6$ ,  $SCl_2$ ,  $S_2Cl_2$ –preparation, properties and structures.

**UNIT IV: Group VII**

General characteristics–bond energies in  $X_2$  molecules–oxidising power–reaction with water–reactivity of elements–peculiarities of fluorine–hydrogen halides–properties–energy cycle showing their acid strength–oxides of halogens–structures–oxyacids of chlorine– strength of oxyacids of halogen–interhalogen compounds–poly halides–basic properties of halogens–pseudohalogens and pseudohalides.

**UNIT V: Analytical Chemistry-II**

Gravimetric method of analysis–principle–mechanism and desirable properties of precipitates–common ion effect–solubility and ionic product–gravimetric factor–particle size, purity of precipitate–types of precipitate–surface adsorption–occlusion–coprecipitation–post precipitation–precipitation from homogeneous solution–digestion–filtration–washing– drying and incineration–organic and inorganic precipitants–applications.

Evaluation of analytical data–Significant figures–types of error–sources and minimisation of errors–precision and accuracy– methods of expression–confidence limits– rejection of a result–Q test.

**Textbook:**

1. Puri. B.R., Sharma. L.R. and Kalia. K.C., Principles of Inorganic Chemistry, Milestone Publishers, 2012.

**References:**

1. Lee. J.D., Concise Inorganic Chemistry, Chapman & Hall, 5<sup>th</sup> edition, 2000.
2. Soni. P.L., Mohan Katyal, A Textbook of Inorganic Chemistry, Sultan Chand & Sons, 12<sup>th</sup> edition, 2006.
3. Day. R.A. Jr, Underwood. A.L., Quantitative analysis, Prentice Hall of India, New Delhi, 6<sup>th</sup> edition, 2006.
4. Mendham. J., Denney. R.C., Barnes. J. D., Thomas. M.J.K., Vogel's Textbook of Quantitative Chemical Analysis, Pearson Edu. Ltd, Singapore, 6<sup>th</sup> edition, 2000.

**CHS 2515****Physical Chemistry-II****5 hr/5 cr**

This course deals with the concepts and applications of thermodynamics. Properties of non-electrolytes along with colligative properties will be discussed.

**UNIT I: First law of Thermodynamics and Thermochemistry**

Terminologies–thermodynamic equilibria–extensive and intensive properties–heat and work–first law–internal energy–state functions–cyclic rules–reciprocal relation–enthalpy–heat capacity– $C_p$  and  $C_v$ –expansion of an ideal gas–isothermal expansion–adiabatic expansion–reversible and irreversible expansion–Joule Thomson effect– $\mu_{JT}$ –ideal gas coefficient–real gas coefficient–Zeroeth law of thermodynamics–absolute temperature scale.

Change of internal energy in a reaction–heat of reaction– $q_p$  and  $q_v$ –standard enthalpy change–Kirchoff's equation–flame and explosion temperature–Hess's law and its applications–Bomb calorimeter–bond energies.

**UNIT II: Second law of Thermodynamics**

Limitations of I law–spontaneous process–cyclic process–Carnot cycle–entropy–second law of thermodynamics–entropy change in isothermal expansion of an ideal gas–entropy change in reversible and irreversible processes–phase change–calculation of entropy changes of an ideal gas with change in P, V and T–entropy of mixing–standard entropy–physical significance of entropy–work and free energy functions–variation of T and P–Maxwell's relationship–criteria for reversible and irreversible process, Gibbs-Helmholtz equation, Open system–partial molar properties, Gibbs-Duhem equation, Clapeyron–Clausius equation, Fugacity and activity–activity coefficient, standard states.

**UNIT III: Third law of Thermodynamics and Chemical equilibrium**

Nernst heat theorem–third law of thermodynamics–determination of absolute entropy–experimental verification of III law–entropies of real gases–entropy change in a chemical reaction–Boltzmann equation–residual entropy.

Spontaneous reactions–standard free energy changes–Chemical equilibrium–law of mass action–van't Hoff reaction isotherm– $K_p$  and  $K_c$ –Homogeneous equilibria–temperature dependence–van't Hoff equation–Heterogeneous equilibria–Le-Chatelier principle.

**UNIT IV: Solutions of Non-Electrolytes**

Solutions of liquids in liquids–Raoult's law–vapour pressure of ideal solution–temperature-dependence of vapour pressure of a solution–volume change of mixing for an ideal solution–entropy change of mixing–vapour pressure of real (non-ideal) solution–binary solutions–fractional distillation–Azeotropic mixture–Lever rule and fractional distillation–immiscible liquids–steam distillation–partially miscible liquids–critical solution temperature–phenol-water system–aniline-hexane system–Nicotine-water system–Solutions of gases in liquids–factors influencing solubility of a gas–Henry's law.

**UNIT V: Colligative property and Nernst Distribution law**

Colligative properties–vapour pressure lowering–osmotic pressure–theories of semi permeability–elevation of boiling point–depression of freezing point–abnormal results and van't Hoff factor–Nernst distribution law–application of Nernst distribution law–solvent extraction.

**Textbook:**

1. Puri. B.R., Sharma. L.R. and Pathania. M.S., Principles of Physical Chemistry, Vishal Publishing Co., 2014.

**References:**

1. Castellan. G.W., Physical Chemistry, Addison-Wesley, 3<sup>rd</sup> edition, 1983.
2. Atkins. P.W. and De Paula. J., Physical Chemistry, Oxford University press, 8<sup>th</sup> edition, 2008.
3. Glasstone. S., A Textbook of Physical Chemistry, Macmillan(India) Ltd, 1976.
4. McQuarrie. D.A., Simon. J.D., Physical Chemistry, University Science Books, 1996.

**CHS 2431****Inorganic Qualitative Analysis****4 hr/4 cr**

This is a laboratory course designed to improve the analytical skill of the students in the identification of the cations and anions in the mixture of inorganic salts.

A mixture of inorganic salts which contains two cations and two anions will be given. Among them, one of the anion must be an interfering ion.

**CHS 2411****Chemistry For Physicists-I****5(3+2) hr/4(3+1)cr**

There will be two components in this course. Theory component deals with atomic structure, properties, chemical bonding, elementary aspects of organic chemistry, basics of energetic, chemistry of solutions and fundamentals of titrimetry and chromatography. Lab component is to train the students to estimate volumetrically metal ions like iron, Manganese, magnesium, zinc.

**THEORY COMPONENT****(3hrs / week)****UNIT I: Atomic structure, Periodic properties and Chemical bonding**

Shapes of s, p and d orbitals–electronic configuration up to 30 elements–periodic properties–atomic size, ionization energy, electron affinity and electro negativity–Ionic bond–lattice energy–Born-Haber cycle–covalent bond–VSEPR model– $\text{BCl}_3$ ,  $\text{CH}_4$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ –atomic orbit overlap concept–hybridization– $\text{sp}^3$ ,  $\text{sp}^2$ ,  $\text{sp}$ –MO theory–MO diagram for  $\text{H}_2$ ,  $\text{He}_2$ ,  $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{F}_2$ .

**UNIT II: Basics of Organic Chemistry**

Tetravalent carbon–aliphatic and aromatic compounds–structure–functional groups–nomenclature–types of organic reactions–substitution, addition, elimination, oxidation, reduction, rearrangement reactions–reactive intermediates–carbocations, carbanions, free radicals–generations and their stability–hydrogen bond–types–consequences of hydrogen bonding.

**UNIT III: Energetics**

Spontaneous and non-spontaneous changes–criterion for spontaneity–Entropy–Second law of thermodynamics–measurement of entropy–free energy and chemical equilibrium–law of mass action–entropy change in phase transformation–Le-Chatelier principle–application of thermodynamics to biological systems.

**UNIT IV: Solution Chemistry**

Aqueous solution–acid-base equilibria– $\text{pK}_a$ ,  $\text{pK}_b$  and pH–Buffer solutions– Henderson equation–Solubility and  $K_{sp}$ –Types of solutions based on nature and amount of solvent/solute–determination of concentration of solutions expressed in various scales–percentage–molarity–molality and normality–diffusion in solutions–osmosis and osmotic pressure–measurement of osmotic pressure–isotonic solutions–reverse osmosis–significance of osmosis in biological systems.



**UNIT V: Analytical Chemistry**

Titrimetry–basic requirement for a titration–acid-base titrations–theory of acid-base indicators–redox titrations–complex metric titrations involving EDTA–metallochromic indicators.

Chromatography–introduction–classification of chromatographic techniques–paper chromatography–thin layer chromatography–column chromatography–principle and applications.

**LAB COMPONENT:****(2 hours / week)**

This course is intended for students to quantitatively estimate metal ions like iron, manganese, calcium, zinc etc.

1. Preparation of solutions
2. Estimation of Sodium Carbonate
3. Estimation of acetic acid in vinegar
4. Estimation of Manganese dioxide in pyrolusite
5. Estimation of Fe(II)-Permanganometry
6. Estimation of Fe(II)-Dichrometry/Internal indicator
7. Estimation of Fe(II)-Dichrometry/External indicator
8. Estimation of Zn (II)-Complexometry
9. Estimation of Ca (II)-Complexometry
10. Estimation of Hardness of water

**References:**

1. Chang. R., Chemistry, Tata-McGraw Hill, 1<sup>st</sup> Indian Edition, 2007.
2. Gopalan. R., and Sundaram. S., Fundamentals of Chemistry, Sultan Chand and Sons, 1988
3. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Inorganic Chemistry, Shobanlal Nagin Chand and Co, 1995.
4. Gopalan. R., and Sundaram. S., Allied Chemistry, Sultan Chand and Sons, 1993.
5. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Physical Chemistry, Vishal Publications, 1998.
6. Soni. P. L., Textbook of Organic Chemistry, Sultan Chand & Sons, 1998.

**CHS 2512****Organic Chemistry–III****5 hr/5 cr**

This course is aimed at giving ample information on structure, reactivity, and properties of aldehydes, ketones, carboxylic acids, amines, nitro compounds and heterocyclic compounds. After the completion of this course, the students will be able to appreciate the mechanism and reactivity of these functional groups.

**UNIT I: Aldehydes and Ketones**

Structure and nomenclature (aliphatic and aromatic)–synthesis–aldehydes and ketones–with particular reference to the synthesis from acid chloride, nitriles, ozone, Grignard reagent, alkyne, carboxylic acids–relative reactivities of aldehyde and ketone–Reactions–mechanism of nucleophilic addition to carbonyl group with particular emphasis on condensation reactions–Benzoin, Aldol, Crossed Aldol (with special reference to acetaldehyde, crotonaldehyde, cinnamaldehyde), Perkin, Claisen-Schmidt, Knoevenagel reaction–condensation with ammonia and its derivatives, nitriles, nitroalkanes, alcohols–Wittig and Mannich reaction.

Oxidation of aldehyde–Baeyer-Villiger oxidation of ketones, Cannizzaro reaction–Reduction–Meerwein-Ponndorf-Verley, Clemmensen, Wolff-Kishner,  $\text{LiAlH}_4$ ,  $\text{NaBH}_4$ –Halogenation of enolizable ketones–Haloform reactions–introduction to  $\alpha,\beta$ -unsaturated aldehyde and ketones–Distinction between aldehyde/ketone and aliphatic/aromatic aldehyde (*mechanism not required for all the reactions*)

### UNIT II: Carboxylic acids and derivatives

Structure, bonding and nomenclature (aliphatic and aromatic) –physical properties–acid strength and effect of substitution on acid strength–preparation and reactions of carboxylic acids–Hell-Volhard-Zelinsky reaction–reduction and decarboxylation–nucleophilic substitution at acyl carbon.

Preparation and chemical reactions of hydroxy acids–malic acid, tartaric acid, citric acid. Acid derivatives–structure and nomenclature of acid chloride, ester, amides, acid anhydrides–relative strength of acyl derivatives–physical properties–Interconversion of acid derivatives by nucleophilic acyl substitution–preparation and chemical reactions of acid derivatives–Mechanism of esterification and hydrolysis(acid and base catalyzed).

### UNIT III: Amines and diazonium compounds

Structure and nomenclature of amines–physical properties–separation of 1°, 2° and 3° amines–basicity of amines–preparation of alkyl and aryl amines–reduction of nitro, nitrile, reductive amination of aldehyde and ketonic compounds, Hofmann, Curtius, Lossen, Schmidt, Wolff rearrangement, Gabriel phthalimide reaction, Hofmann-bromamide reaction–Reactions of amines–alkylation, Schiff's reaction, electrophilic aromatic substitution in aryl amines, Schotten-Bauman reaction, reactions of amines with nitrous acid.

Synthesis and chemical reaction of aryl diazonium salts–Sandmeyer reaction, Gattermann reaction, Balz-Schiemann reaction, Gomberg reaction, azo coupling.

### UNIT IV: Nitro compounds and nitriles

Nomenclature–acidity of nitroalkanes–preparation of nitroalkanes and nitroarenes–chemical reactions of nitroalkanes, nitroarenes and their reduction in acid, neutral and alkaline media–Picric acid.

Nomenclature- Preparation of alkane nitriles and iso-nitriles–chemical properties.

### UNIT V: Heterocyclic compounds

Nomenclature–aromaticity of five and six membered heterocyclics–furan, pyrrole, thiophene, pyridine, piperidine–methods of synthesis- chemical reactions with special emphasis on mechanism of electrophilic and nucleophilic substitutions–comparison of basicity of pyridine, piperidine and pyrrole–condensed five and six membered heterocyclics- indole, quinoline, isoquinoline–synthesis with special reference to Fischer-indole, Skraup, Beilstein-Napieralski synthesis–mechanism of electrophilic substitution reaction of the above.

### Textbook:

1. Jain. M.K. and Sharma. S.C., Textbook of Organic Chemistry, Vishal publishing Co, 4<sup>th</sup> edition, 2014.

**References:**

1. Morrison and Boyd., Organic Chemistry, Pearson publication, 7<sup>th</sup> edition, 2003.
2. Mehta. B. and Mehta.M., Organic Chemistry, Prentice–Hall of India Private limited, 2007.
3. Soni. P.L. and Chawla. H.M., Textbook of Organic Chemistry , Sultan Chand and Sons, 28<sup>th</sup> edition, 2007.
1. Finar. I.L., Organic Chemistry, ELBS publication, 7<sup>th</sup> edition, 1998.

**CHS 2514****Inorganic Chemistry- IV****5 hr/5 cr**

The objective of the course is to provide an in-depth knowledge of transition elements. This will enable the students to understand the details of bonding, reactivity, applications of coordination compounds and inorganic polymers.

**UNIT I: d-Block elements**

An introduction to the transition elements–electronic configuration–metallic character–variable valency–oxidation states–size of atoms–density–melting point–boiling point–reactivity–ionization energy–magnetic properties–color–catalytic properties–differences between first, second and third row transition elements–metallurgy of Cr, Fe, Ni and Au.

**UNIT II: Coordination chemistry-I**

Double salts–coordination compounds–coordination number and geometries–nomenclature–Werner’s theory–physical methods in the study of complexes–stability of complex ions–step-wise and overall stability constants–chelate effect–isomerism in coordination compounds–application of complexes.

**UNIT III: Coordination chemistry-II**

Bonding in complexes–Valence bond theory–shortcomings–Crystal field theory as applied to octahedral and tetrahedral complexes–CFT and magnetic properties–factors affecting CFSE–spectrochemical series–application of CFT- drawbacks–Jahn-Teller effect–term symbols–Orgel diagrams and electronic spectra of  $d^1$  and  $d^9$  ions.

**UNIT IV: Chemistry of transition metal compounds**

Titanium tetrachloride- vanadium pentoxide–chromous acetate–peroxo compounds of chromium–potassium dichromate–tungsten bronzes–tungsten blues–potassium permanganate–potassium ferrocyanide–Prussian blue–sodium nitroprusside–nickel-dmg complex–halides of silver–forms of Pt and Au–verdigris–mercurous compounds–Nessler’s reagent–alloys of Cu and Ni.

**UNIT V: Inorganic polymers**

Definition–special characteristics–glass transition temperature–solubility–classification–preparation, properties and uses of–boron nitride–silicones– polymeric sulphur nitride, chalcogenic glasses–polyphosphazene–borophosphate glass–coordination polymers– volan, quilon, metallophthalocyanine–factors affecting the formation of coordination polymers.

**Textbook:**

1. Puri. B.R., Sharma. L.R. and Kalia. K.C., Principles of Inorganic Chemistry, Milestone Publishers, 2012.

**References:**

1. Lee. J.D., Concise Inorganic Chemistry, Chapman & Hall, 5<sup>th</sup> edition, 2000.
2. Cotton. F.A., Wilkinson. G. and Paul. L.G., Basic Inorganic Chemistry, John Wiley and Sons, Singapore, 3<sup>rd</sup> edition, 2004.
3. James. E. Huheey, Keiter. E.A., Keiter. R.L., Inorganic Chemistry, Pearson Education (Singapore), Delhi, 4<sup>th</sup> edition, 2005.
4. Gopalan. R. and Ramalingam. V., Concise Coordination Chemistry, Vikas Publishing House, 2010.
5. Bhagi. A.K. and Chatwal. G.R., Inorganic Polymers, Himalaya Publishing House, Mumbai, 1<sup>st</sup> edition, 2001.

**CHS 2516****Physical Chemistry–III****5 hr/5 cr**

This course deals with electro chemistry, chemical kinetics, catalysis and ionic equilibrium. It also provides the student an overview of fuel cells.

**UNIT I: Electro Chemistry-I**

Electronic and electrical conductance–Faraday’s laws of electrolysis–conductance–cell constant– specific conductance–equivalent conductance–ionic mobility–Hittorf’s theory–transport number–and its determination–Kohlrausch’s law and its application–applications of conductance measurements–Debye-Huckel theory of strong electrolytes–Onsager equation(no derivation)–Debye-Falkenhagen effect and Wein effect–Activity and activity coefficient– ionic strength–Debye-Huckel Limiting Law (no derivation).

**UNIT II: Electro Chemistry–II**

Reversible and irreversible cells–EMF measurements–change in free energy and EMF–other thermodynamic parameters from EMF data–standard electrode potential–electrochemical series–various types of electrodes–metal, metal insoluble salts, gas and redox electrodes–chemical and concentration cells with and without transference–liquid junction potential and its determination–applications of EMF measurements–fuel cells and its construction and applications–overvoltage–determination of overvoltage–corrosion and passivity of metals–commercial cells and their principles.

**UNIT III: Chemical Kinetics–I**

Order and molecularity of a reaction–rate constant–factors influencing rate of a reaction–experimental determination of reaction rates–first order, second order, third order and zero order reactions–half-life periods–methods of determining order of a reaction– equilibrium and steady state approximation– effect of temperature on reaction rates–activation energy and its determinations–Arrhenius equation–theories of reaction rates–collision theory and its importance– evaluation of thermodynamic parameters.

**UNIT IV: Chemical Kinetics–II and Catalysis**

Lindemann theory of unimolecular reaction–consecutive and opposing reactions–chain reactions–Bronsted-Bjerrum equation–fast reactions–stop flow method–catalysis–types of catalysis–homogeneous and heterogeneous catalysis–characteristics of catalytic reactions–promoters–catalytic poisoning–negative catalysis–auto catalysis–activation energy and catalysis–theories of catalysis–generalized acid–base catalysis–enzyme catalysis–characteristics of enzyme catalysis.

**UNIT V: Ionic Equilibrium**

Various concepts of acid and bases–dissociation of polybasic acids–pH scale– common ion effect–buffer solution–buffer capacity–Henderson’s equation–hydrolysis of salts–relationship between  $K_b$ ,  $K_a$  and  $K_w$ –degree of hydrolysis–acid-base indicators–theory of indicators– solubility–solubility product and its applications.

**Textbook:**

1. Puri. B.R., Sharma. L.R. and Pathania. M.S., Principles of Physical Chemistry, Vishal Publishing Co., 2014.

**References:**

1. Castellan. G.W., Physical Chemistry, Addison-Wesley, 3<sup>rd</sup> edition, 1983.
2. Atkins. P.W. and De Paula. J., Physical Chemistry, Oxford University press, 8<sup>th</sup> edition, 2008.
3. Glasstone. S., A Textbook of Physical Chemistry, Macmillan(India) Ltd, 1976.
4. McQuarrie. D.A., Simon. J.D., Physical Chemistry, University Science Books, 1996.
5. Laidler. K.J., Chemical Kinetics, Harper and Row, 3<sup>rd</sup> edn, 1987.
6. Bockris. J.O.M. and Reddy. A.K.N., Modern Electrochemistry, Plenum, 2<sup>nd</sup> edn, 1998.

**CHS 2432****Organic Estimation And Gravimetric Analysis****4 hr/4 cr**

In this course students will be trained in the quantitative estimation of organic compounds like glucose, phenol, aniline, amino acids and formaldehyde and the gravimetric estimation of cations. This course also includes purification techniques of organic compounds.

**I–ESTIMATION OF ORGANIC COMPOUNDS**

- Aniline/ Phenol
- Glucose
- Glycine
- Formaldehyde

**II–PREPARATION OF ORGANIC COMPOUNDS**

- Benzoic Acid
- Oxime

**III–GRAVIMETRIC ESTIMATION OF CATIONS**

- $Ba^{2+}$  as barium chromate
- $Pb^{2+}$  as lead chromate
- $Ca^{2+}$  as calcium oxalate
- $Ni^{2+}$  as Ni-DMG
- $Cu^{2+}$  as copper thiocyanate

**CHS 2412****Chemistry For Physicists–II****5(3+2) hr/4(3+1)cr**

There will be two components in this course. Theory component deals with chemical kinetics, thermo-chemistry, basic concepts of coordination chemistry, stereochemistry and elementary ideas on carbohydrates, amino acids and proteins. Lab component is to train the students in the qualitative analysis of inorganic salts.

**THEORY COMPONENT****(3hrs / week)****UNIT I: Chemical Kinetics and Catalysis**

Rate, order and molecularity of a reaction–rate constant–rate equations–First, second and zero order reactions–half life time of a reaction–methods of determining order of a reaction–effect of temperature on reaction rate–activation energy–Arrhenius equation–Catalysis–enzyme catalysis–Michaelis-Menten hypothesis and its applications.

**UNIT II: Thermochemistry**

Internal energy changes in a chemical reaction–Changes of enthalpy in a chemical reaction–enthalpy of reaction at constant volume and at constant pressure–enthalpy of combustion, neutralization, dissociation, formation–Kirchoff's equation–Hess's law and its applications–Bomb Calorimeter.

**UNIT III: Co-ordination Chemistry**

Coordination compounds–shapes of d-orbitals–Werner's theory–coordination number–important ligands–nomenclature–concept of EAN–Pauling's theory–CFT–CFSE–crystal field splitting in Octahedral field–spectrochemical series–chelation–application of complexes in qualitative–volumetric and gravimetric analysis.

**UNIT IV: Stereochemistry**

Stereochemistry and stereoisomerism–tetrahedral carbon–optical activity–plane polarized light–polarimeter–specific rotation–chiral centres–enantiomers and optical activity–specification of R and S configurations–diastereomers–meso structures–racemic modification–resolution–Geometrical isomers–E/Z nomenclature.

**UNIT V: Carbohydrates, Amino acids and Proteins**

Classification of carbohydrates–Monosaccharide–Glucose, fructose–preparation, properties and structure (no structure elucidation)–mutarotation–Disaccharide–sucrose–properties, preparation and structure–General study of polysaccharides–Starch and cellulose. Classification and preparation of amino acids–general reactions–Dipeptides–synthesis–structure and types of proteins.

**LAB COMPONENT****(2 hours / week)**

This course is intended for students to qualitatively analyze the simple salts containing the following cations and anions.

Cations: Pb(II), Cu(II), Cd(II), Bi(III), Fe(II), Mn(II), Ni(II), Co(II), Zn(II), Mg(II) and  $\text{NH}_4^+$

Interfering Anions: Oxalate, tartrate, borate, fluoride, and phosphate.

**References:**

1. Chang. R., Chemistry, Tata-McGraw Hill, 1<sup>st</sup> Indian Edition, 2007.
2. Gopalan. R., and Sundaram. S., Fundamentals of Chemistry, Sultan Chand and Sons, 1988
3. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Inorganic Chemistry, Shobanlal Nagin Chand and Co, 1995.
4. Gopalan. R., and Sundaram. S., Allied Chemistry, Sultan Chand and Sons, 1993.
5. Puri. B. R., Sharma. L. R. and Kalia. K. C., Principles of Physical Chemistry, Vishal Publications, 1998.
6. Soni. P. L., Textbook of Organic Chemistry, Sultan Chand & Sons, 1998.

**Department of Biochemistry**  
**B.Sc. Biochemistry**  
**Frame work – 2015**

Course Code	Course	Hours	Credit	Course Code	Course	Hours	Credit
<b>I Semester</b>				<b>II Semester</b>			
XXXX	Part – I - TAM/FRE/HIN	3	3	XXXX	Part – I - TAM/FRE/HIN	3	3
XXXX	Part – II - ENGLISH	3	3	XXXX	Part – II – ENGLISH	3	3
	Part – III - Core				Part – III – Core		
BCH 1431	Fundamentals of Biochemistry	4	4	BCH 1432	Cell Biology & Genetics	4	4
BCH 1533	Biomolecules	5	5	BCH 1534	Human Physiology	5	5
BCH 1435	Biomolecules Lab	4	4	BCH 1436	Cell Biology, Genetics & Human Physiology Lab	4	4
	Part – III - Supportive				Part – III – Supportive		
BCH 1441	Biochemistry - I	5	4	BCH 1442	Biochemistry - II	5	4
	Part – IV - Non – Major Elective				Part – IV - Non – Major Elective		
BCH 1237	Wonders of Human Body	3	2	BCH 1238	Medical Fitness and Health	3	2
	Part – IV – Life Skill 1				Part – IV - Life Skill 2		
BCH 1239	Food Technology	3	2	BCH 1240	First Aid	3	2
	Part – V – PED/NSS/SLP				Part – V – PED/NSS/SLP		
<b>III Semester</b>				<b>IV Semester</b>			
XXXX	Part – I - TAM/FRE/HIN	3	3	XXXX	Part – I - TAM/FRE/HIN	3	3
XXXX	Part – II - ENGLISH	3	3	XXXX	Part – II - ENGLISH	3	3
	Part – III - Core				Part – III - Core		
BCH 2631	Metabolism	6	6	BCH 2632	Medical Microbiology	6	6
BCH 2633	Enzymology	6	6	BCH 2634	Clinical Biochemistry	6	6
BCH 2335	Nutritional Biochemistry	3	3	BCH 2336	Cancer Biology	3	3
BCH 2437	Metabolism ,Enzymology & Nutritional Biochemistry Lab	4	4	BCH 2438	Medical Microbiology & Clinical Biochemistry Lab	4	4
	Part – III - Supportive				Part – III - Supportive		
BCH 2439	Immunology	5	4	MAS 2454	Biostatistics	5	4
	Part – V – PED/NSS/SLP				Part – V – PED/NSS/SLP		
<b>V Semester</b>				<b>VI Semester</b>			
	Part – III - Core				Part – III - Core		
BCH 3631	Molecular Biology & Genetic Engineering	6	6	BCH 3632	Plant Biochemistry	6	6
BCH 3633	Analytical Techniques	6	6	BCH 3634	Protein Chemistry & Proteomics	6	6
BCH 3635	Pharmacology & Toxicology	6	6	BCH 3642	Hormones & Human Behaviour	6	6
BCH 3537	Molecular Biology & Analytical Techniques Lab	5	5	BCH 3538	Project	5	5
	Part – IV - Life Skill				Part – IV - Life Skill		
BCH 3239	Forensic Science	3	2	BCH 3240	Clinical Diagnostics	3	2
BCH 3241	Part – V – Environmental Studies	4	2	VAL	Part – IV - VAL	4	2



**DEPARTMENT OF BIOCHEMISTRY**  
**B.Sc. Biochemistry UG Programme**

Sem	Part		Course No.	Course Title	Hr/wk	Credit	Marks
1	I		XXXX	TAM/FRE/HIN	3	2	60
	II		XXXX	English	3	2	60
	III	Core	BCH 1431	Fundamentals of Biochemistry	4	4	100
			BCH 1533	Biomolecules	5	5	100
			BCH 1435	Biomolecules Lab	4	4	100
		Supportive	<b>BCH 1441</b>	<b>Biochemistry – I</b>	<b>5</b>	<b>4</b>	<b>100</b>
	IV	Non-Major Elective -1	BCH 1237	Wonders of Human Body	3	2	60
		Life skill-1	BCH 1239	Food Technology	3	2	60
	V	NSS/PED		Extension	-	-	-
<b>Total</b>					<b>30</b>	<b>25</b>	<b>640</b>

Sem	Part		Course No.	Course Title	Hr/wk	Credit	Marks
2	I		XXXX	TAM/FRE/HIN	3	2	60
	II		XXXX	English	3	2	60
	III	Core	BCH 1432	Cell Biology & Genetics	4	4	100
			BCH 1534	Human Physiology	5	5	100
			BCH 1436	Cell Biology, Genetics & Human Physiology Lab	4	4	100
		Supportive	<b>BCH 1442</b>	<b>Biochemistry – II</b>	<b>5</b>	<b>4</b>	<b>100</b>
	IV	Non-Major Elective -2	BCH 1238	Medical Fitness and Health	3	2	60
		Life skill-2	BCH 1240	First Aid	3	2	60
	V	NSS/PED		Extension	-	-	-
<b>Total</b>					<b>30</b>	<b>25</b>	<b>640</b>

Sem	Part		Course No.	Course Title	Hr/wk	Credit	Marks
3	I		XXXX	TAM/FRE/HIN	3	2	60
	II		XXXX	English	3	2	60
	III	Core	BCH 2631	Metabolism	6	6	100
			BCH 2633	Enzymology	6	6	100
			BCH 2335	Nutritional Biochemistry	3	3	100
			BCH 2437	Metabolism, Enzymology & Nutritional Biochemistry Lab	4	4	100
		Supportive	BCH 2439	Immunology	5	4	100
	V	NSS/PED		Extension	-	-	-
<b>Total</b>					<b>30</b>	<b>27</b>	<b>620</b>

Sem	Part		Course No.	Course Title	Hr/wk	Credit	Marks
4	I		XXXX	TAM/FRE/HIN	3	2	60
	II		XXXX	English	3	2	60
	III	Core	BCH 2632	Medical Microbiology	6	6	100
			BCH 2634	Clinical Biochemistry	6	6	100
			BCH 2336	Cancer Biology	3	3	100
			BCH 2438	Medical Microbiology & Clinical Biochemistry Lab	4	4	100
			Supportive	MAS2454	Biostatistics	5	4
	V	NSS/PED		Extension	-	-	-
Total					30	27	620

Sem	Part		Course No.	Course Title	Hr/wk	Credit	Marks
5	III	Core	BCH 3631	Molecular Biology & Genetic Engineering	6	6	100
			BCH 3633	Analytical Techniques	6	6	100
			BCH 3635	Pharmacology & Toxicology	6	6	100
			BCH 3537	Molecular Biology & Analytical Techniques Lab	5	5	100
	IV	Life skill-3	BCH 3239	Forensic Science	3	2	60
		EVS	BCH 3241	Environmental Studies	4	2	60
<b>Total</b>					<b>30</b>	<b>27</b>	<b>520</b>

Sem	Part		Course No.	Course Title	Hr/wk	Credit	Marks
6	III	Core	BCH 3632	Plant Biochemistry	6	6	100
			BCH 3634	Protein Chemistry & Proteomics	6	6	100
			<b>BCH 3642</b>	<b>Hormones and Human Behaviour</b>	<b>6</b>	<b>6</b>	<b>100</b>
			BCH 3538	Project	5	5	100
	IV	Life skill-4	BCH 3240	Clinical Diagnostics	3	2	60
		VAL	VALxxxx		4	2	60
<b>Total</b>					<b>30</b>	<b>27</b>	<b>520</b>
<b>Grand Total</b>					<b>180</b>	<b>158</b>	<b>3560</b>

**Part-III-Supportive****Courses offered by Department of Biochemistry**

Sem	Part	Course No.	Course Title	Hr/wk	Credit	Marks	Target Department
1	III	BCH 1441	Biochemistry - I	5	4	100	Chemistry
2	III	BCH 1442	Biochemistry - I	5	4	100	
3	III	BCH 2439	Immunology	5	4	100	Biochemistry
<b>Total</b>				<b>15</b>	<b>12</b>	<b>300</b>	

**Courses offered by other Departments**

Sem	Part	Course No.	Course Title	Hr/wk	Credit	Marks	Target Department
1	III	CHS 1425	Chemistry for Biochemist – I	5	4	100	Biochemistry
2	III	CHS 1426	Chemistry for Biochemist – II	5	4	100	
4	III	MAS 2454	Biostatistics	5	4	100	
<b>Total</b>				<b>15</b>	<b>12</b>	<b>300</b>	

**Part-IV-Non-Major Elective**

Sem	Part	Course No.	Course Title	Hr/wk	Credit	Marks
1	IV	BCH 1237	Wonders of Human Body	3	2	60
2	IV	BCH 1238	Medical Fitness and Health	3	2	60
<b>Total</b>				<b>6</b>	<b>4</b>	<b>120</b>

**Part-IV Life Skill Courses**

Sem	Part	Course No.	Course Title	Hr/wk	Credit	Marks
1	IV	BCH 1239	Food Technology	3	2	60
2	IV	BCH 1240	First Aid	3	2	60
5	IV	BCH 3239	Forensic Science	3	2	60
6	IV	BCH 3240	Clinical Diagnostics	3	2	60
<b>Total</b>				<b>24</b>	<b>12</b>	<b>240</b>

**BCH 1441****Biochemistry I  
(Supportive for Chemistry-SF)****5Hrs/4Cr**

The course will provide the basic knowledge on general metabolism of the chief biomolecules that take place in the human body at cellular level and their relationship with enzymes.

**Unit I- Protein & Amino acid Metabolism**

Introduction – anabolism and catabolism of amino acids – sequence, reactions – tyrosine, tryptophan, phenyl alanine, cysteine, glutamic acid, histidine – urea cycle.

**Unit II- Enzymes**

Introduction – nomenclature – classification - active site, isoenzymes, monomeric and oligomeric enzymes, substrate, product, holoenzyme, apoenzyme, cofactor, coenzyme, prosthetic group, Lock & key – induced fit theory, enzyme activity unit, turn over number – Michaeli's – Menten equation,  $V_{max}$ ,  $K_m$  and its significance, LB plot – Immobilized enzymes.

**Unit III- Carbohydrate Metabolism**

Introduction, sequence of reactions, energetics – glycolysis – aerobic and anaerobic – Alligators and Coelacanth, Pyruvate dehydrogenase complex, Kreb's cycle, Cori's cycle, gluconeogenesis, glycogen metabolism, HMP shunt pathway.

**Unit IV- Lipid Metabolism**

Introduction, sequence, reactions, energetics – biosynthesis of fatty acids – oxidation of even chain and odd chain fatty acids – functions of lipoproteins – metabolism of ketone bodies.

**Unit V- Vitamins and Minerals**

Introduction, classification – fat soluble and water soluble vitamins – daily requirements, structure, source, functions – Macro minerals and micro minerals/trace elements – daily requirements, sources and physiological role.

**Learning outcome:**

The students will be well versed with major metabolic pathways, the energy producing and consuming pathways.

**References:**

1. Lehninger A.L, David L. Nelson and Michael M. Cox (2008), Principles of Biochemistry 5<sup>th</sup> edition, W.H. Freeman Publishers, New York, ISBN: 0-716-7710-8.
2. Chatterjee MN and Rana Shinde, (2012), Textbook of Medical Biochemistry, 8<sup>th</sup> edition Jaypee Brothers Medical Publishers, New Delhi.
3. Satyanarayana U (2007), Biochemistry 3<sup>rd</sup> edition. Book and Allied (P) Ltd. Kolkata. ISBN: 81-87134-80-1.
4. Lubert Stryer (1997), Biochemistry. 4<sup>th</sup> edition, W. H. Freeman and Company, New York
5. Dr. P. Asokan (2003), Enzymes, 1<sup>st</sup> edition Chinna Publications, Vellore.

**LAB**

The lab course provides the estimation processes of biomolecules from the food materials and daily usage materials.

1. Estimation of amino acid by ninhydrin method.
2. Estimation of Lactose from milk by Benedict's quantitative method.
3. Assay of salivary amylase.
4. Isolation of Lecithin from egg yolk.
5. Estimation of Iron by Wong's method.
6. Estimation of Ascorbic acid from lemon by 2, 4 – dichlorophenol indophenol method.
7. Estimation of Riboflavin by Fluorometric method.
8. Estimation of Lycopene by spectrophotometric method.

**Learning outcome:**

The students know to estimate the food components from food sources.

**References:**

1. Jayaraman J. (2011), Laboratory Manual in Biochemistry, 5<sup>th</sup> edition, New Age International Publishers (P) Ltd., New Delhi. ISBN: 978-8122430493.
2. Sadasivam S, Manickam A, (1996), Biochemical Methods 2<sup>nd</sup> edition. New Age International Publishers, (P) Ltd., New Delhi. ISBN: 81-224-0976-8.
3. Harold Varley (2006), Practical Clinical Biochemistry, 6<sup>th</sup> edition. CBS Publishers. New Delhi.
4. David T Plummer (1988), An introduction to Practical Biochemistry, 3<sup>rd</sup> edition. Tata Mc Graw Hill Publishing Company Limited, ISBN: 978-0-07-099487-4.
5. Keith Wilson and John Walker, (2010), Principles and Techniques of Biochemistry and Molecular Biology. 7<sup>th</sup> edition. Cambridge University Press, UK, ISBN: 978-0-521-51635-8.

**BCH 1442**

**Biochemistry II**  
**(Supportive for Chemistry-SF)**

**5Hrs/4Cr**

The course deals with basic functions of hormones and the metabolic disorders of important metabolism pathways of the major biomolecules.

**Unit I: Hormones**

Endocrine system – definition – overview - glands – hypothalamus, pineal, thyroid, pancreas, adrenal, testes, ovaries - hormonal secretion and functions.

**Unit II: Carbohydrate and Lipid metabolic disorders**

Carbohydrate metabolic disorders – hypo & hyperglycemia, diabetes mellitus – glycosuria – fructosuria – GSD – Lipid metabolic disorders – fatty liver – obesity – cirrhosis – lipoproteinemia – atherosclerosis – myocardial infarction – Inborn errors of metabolism.

**Unit III: Protein/Amino acid metabolic disorders**

Protein/amino acid metabolic disorders – cystinuria, albinism, Maple syrup urine disease, Hartnup diseases – jaundice – urea cycle disorders - Inborn errors of metabolism

**Unit IV: Nucleic acid metabolic disorders**

Brief introduction – salvage pathway of purine & pyrimidine – metabolism – disorders of nucleic acids – Inborn errors of metabolism - gout – Lesch Nyhan syndrome – xanthinuria – orotic aciduria – Adenosine Deaminase(ADA) deficiency.

**Unit V: Vitamin and mineral deficiency**

Xerophthalmia, Scurvy, Rickets, Beriberi, Pellagra, Anemic disorders, goitre, fluorosis, hepatomegaly, osteomalacia, osteoporosis.

**Learning Outcome:**

The students will acquire knowledge on the metabolic disorders of biomolecules and their clinical significance.

**References:**

1. Satyanarayana U (2007), Biochemistry 3<sup>rd</sup> edition. Book and Allied (P) Ltd. Kolkata. 81-87134-80-1
2. MN Chatterjee, Rana Shinde (2002), Textbook of Medical Biochemistry, 5<sup>th</sup> edition, Jaypee Brothers medical publishers, New Delhi, ISBN -81-7179-991-4.
3. Thomas M. Devlin (2005), Textbook of Biochemistry with Clinical Correlations, 6<sup>th</sup> edition, Wiley – Liss publications, New York, ISBN13: 9780471678083.
4. Vasudevan DM, Sreekumari S, Kannan Vaidyanathan, (2013), Textbook of Biochemistry for Medical Students, 7<sup>th</sup> edition, Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi. ISBN: 9789350905302.
5. Carl Burtis, Edward R. Ashwood (1999), Tietz Textbook of Clinical Chemistry (1999) 3<sup>rd</sup> edition W. B. Saunders Company, Philadelphia, ISBN -0-8089-2138-X.

**LAB**

The lab course provides the estimation processes of biomolecules from the urine and blood.

1. Qualitative analysis of normal & abnormal constituents of urine
2. Estimation of serum cholesterol – Zak's method
3. Estimation of serum creatinine by Jaffe's method
4. Estimation of blood glucose by Phenol sulphuric acid method
5. Estimation of serum bilirubin by Malloy and Evelyn method
6. Estimation of blood urea by DAM – TSC method
7. Estimation of serum uric acid by Caraway method
8. Estimation of Serum Protein – Lowry's method

**Learning outcome:**

The students know to estimate quantitatively and qualitatively the biochemical parameters from urine and blood.

**References:**

1. Jayaraman J. – Laboratory Manual in Biochemistry (2011). 5<sup>th</sup> edition. New Age International Publishers P Ltd., New Delhi. ISBN: 978-8122430493.
2. David T Plummer – An introduction to practical Biochemistry. (1988) 3<sup>rd</sup> edition. Tata Mc Graw Hill Publishing Company Limited. ISBN: 978-0-07-099487-4.
3. Keith Wilson and John Walker (editors) – Principles and Techniques of Biochemistry and Molecular Biology. (2010) 7<sup>th</sup> edition. Cambridge University Press. ISBN 978-0-521-51635-8.
4. Sadasivam S, Manickam A – Biochemical Methods (1996). Revised 2<sup>nd</sup> edition. New Age International Publishers, P Ltd. New Delhi. ISBN: 81-224-0976-8.
5. Harold Varley. Practical Clinical Biochemistry (2006) 6<sup>th</sup> edition. CBS Publishers. New Delhi.

**BCH 3642****Hormones and Human Behaviour****6 Hrs/6Cr**

This course is designed with a specific intention for the students to acquire biochemical understanding of various behavioural exhibits and to assess their own chemistry. The course content explains the endocrine system and the ways in which hormones can influence brain structure and functions, specific behaviours including sexual, parental, social/aggression and cognition. Expect to generate students acquired with better understanding about their own chemistry and thereby to excel as a best citizen with cutting edges in the contemporary society.

**Unit I – Basics of Behavioural Endocrinology**

Behavioural endocrinology – definition, historical background – experimental studies – John Hunter's – Adolf Berthold's experiment – hormone – definition – structure – synthesis of amine, peptide, steroid hormones – transport in blood – mechanism of hormone action – signal transduction.

**Unit II – Endocrine System-Behaviour Relationships**

Endocrine system – definition – overview - glands and hormonal secretion – hypothalamus, pineal, thyroid, pancreas, adrenal, testes, ovaries – metabolism and excretion – candidate hormones – Behaviour – definition - hormone-behaviour relationship – testing by; removal – orchiectomy/oophorectomy, replacement/implantation, correlation – differentiation in human brain – size/weight – cerebral asymmetry.

**Unit III - Reproductive Behaviour**

Human psychosexual differentiation – role of GnRH, LH, FSH – sex drive/libido – gender identity – gender role – sexual differentiation at puberty; body shape – bone metabolism – voice modulation – male sexual behaviours – testosterone – replacement – hypogonadal males – elderly males - female sexual behaviours – testosterone, estrogen, progesterone – attractivity, proceptivity and receptivity – menarche – premenstrual syndrome – menopause and hormonal replacement – transgenders – Klinefelters syndrome – Turner's syndrome – gender identity and behaviour.

**Unit IV - Parental and Social Behaviour**

Offspring-parent attachments – behaviour in human – maternal, paternal – role of estradiol – testosterone – aggression – influences – types – ‘The challenge hypothesis’ evidence – human aggression – relation with testosterone levels – hormonal correlation with circadian rhythm – importance of biological clock.

**Unit V – Sex Steroids and Cognition**

Cognitive processing – meaning – testosterone-cognitive relationships in males – menstrual cycle – LH surge and ovulation – cognitive performance fluctuations – postpartum depression.

**Learning Outcome:**

After successful completion of this course students know to interpret the importance of hormones and their behavioral influences for an optimal functioning of the organism. They will be able to discern and interpret the importance to the correct use of the scientific terminology in the field of behaviour and endocrinology.

**References:**

1. Randy J. Nelson (2011), An Introduction to Behavioural Endocrinology, 4<sup>th</sup> edition, Sinauer Associates Inc. Publishers ISBN 13: 9780878936205.
2. Arthur J. Vander, James H. Sherman and Dorothy S. Luciano (1994), Human Physiology, 6<sup>th</sup> edition, McGraw-Hill, Inc. USA, ISBN: 0-07-066992-9
3. Nick Neave (2008), Hormones and Behaviour – A Psychological Approach, Cambridge University Press, UK, ISBN: 978-0-521-87145-7
4. Arthur C. Guyton and John E. Hall (2006), A Textbook of Medical Physiology, 11<sup>th</sup> edition, Elsevier Saunders Inc. ISBN: 0-7216-0240-1.
5. Donald Voet & Judith G. Voet (2011), Biochemistry 4<sup>th</sup> edition, John Wiley & Sons. New York. ISBN 13: 978-0470-91745-9.



**Undergraduate Department of Microbiology (SF)**  
**Programme for B.Sc Microbiology from 2015 series**

SEM	PART	COURSE NO	COURSE TITLE	HRS	CREDITS	MARKS
I	I	XXX 0000	Tamil/French/Hindi	3	2	30
I	II	ENG 0000	Functional English I	3	2	30
I	III-C	MIC 1531	General Microbiology	5	5	75
I	III-C	MIC 1433	Lab in General Microbiology	4	4	60
I	III-C	MIC 1435	Microbial Taxonomy and Diversity	4	4	60
I	III-S	MIC 1401	Biochemistry	5	4	60
I	IV-E	XXX 0000	Non Major Elective -I	3	2	30
I	IV-LS	XXX 0000	Life Skill -I	3	2	30
I	V	XXX 0000	Extension Activity (NSS/PED)	-	-	-
<b>Total</b>				<b>30</b>	<b>25</b>	<b>375</b>

SEM	PART	COURSE NO	COURSE TITLE	HRS	CREDITS	MARKS
II	I	XXX 0000	Tamil/French/Hindi	3	2	30
II	II	ENG 0000	Functional English II	3	2	30
II	III-C	MIC 1532	Food and Dairy Microbiology	5	5	75
II	III-C	MIC 1434	Lab in Food and Dairy Microbiology	4	4	60
II	III-C	MIC 1436	Microbial Genetics	4	4	60
II	III-S	MIC 1402	Microbial Physiology and Metabolism	5	4	60
II	IV-E	XXX 0000	Non Major Elective -II	3	2	30
II	IV-LS	XXX 0000	Life Skill -II	3	2	30
II	V	XXX 0000	Extension Activity - NSS/PED	-	<b>1</b>	<b>15</b>
<b>Total</b>				<b>30</b>	<b>25+1</b>	<b>375/390</b>

SEM	PART	COURSE NO	COURSE TITLE	HRS	CREDITS	MARKS
III	I	XXX 0000	Tamil/French/Hindi	3	2	30
III	II	ENG 0000	Functional English II	3	2	30
III	III-C	MIC 2531	Clinical Bacteriology and Mycology	5	5	75
III	III-C	MIC 2433	Lab in Clinical Microbiology	4	4	60
III	III-C	MIC 2535	Molecular Biology	5	5	75
III	III-C	MIC 2537	Bioinstrumentation	5	5	75
III	III-S	MIC 2403	Fundamentals of Pharmacology	5	4	60
III	V	XXX 0000	Extension Activity - NSS/PED	-	-	-
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

SEM	PART	COURSE NO	COURSE TITLE	HRS	CREDITS	MARKS
IV	I	XXX 0000	Tamil/French/Hindi	3	2	30
IV	II	ENG 0000	Functional English II	3	2	30
IV	III-C	MIC 2532	Immunology	5	5	75
IV	III-C	MIC 2434	Lab in Immunology	4	4	60
IV	III-C	MIC 2536	Industrial Microbiology	5	5	75
IV	III-C	MIC 2538	Clinical Virology and Parasitology	5	5	75
IV	III-S	MAS XXXX	Biostatistics	5	4	60
IV	V	XXX 0000	Extension Activity - NSS/PED	-	<b>1</b>	<b>15</b>
<b>Total</b>				<b>30</b>	<b>27+1</b>	<b>405/420</b>

SEM	PART	COURSE NO	COURSE TITLE	HRS	CREDITS	MARKS
V	III-C	MIC 3731	Genetic Engineering	7	7	105
V	III-C	MIC 3533	Lab in Genetic Engineering	5	5	75
V	III-C	MIC 3635	Plant and Animal Cell Culture	6	6	90
V	III-C	MIC 3537	Lab in Plant and Animal Cell Culture	5	5	75
V	IV-LS	XXX 0000	Life Skill -III	3	2	30
V	ES	MIC 3200	Environmental Studies	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>

SEM	PART	COURSE NO	COURSE TITLE	HRS	CREDITS	MARKS
VI	III-C	MIC 3732	Environmental and Agricultural Microbiology	7	7	105
VI	III-C	MIC 3534	Lab in Environmental and Agricultural Microbiology	5	5	75
VI	III-C	MIC 3636	Medical Laboratory Technology	6	6	90
VI	III-C	MIC 3538	Lab in Medical Laboratory Technology	5	5	75
VI	IV-LS	XXX 0000	Life Skill - IV	3	2	30
VI	VE	XXX 0000	Value Education	4	2	30
<b>Total</b>				<b>30</b>	<b>27</b>	<b>405</b>
<b>GRAND TOTAL</b>				<b>180</b>	<b>158+2</b>	<b>2370/2400</b>

**C-Core Courses**      **NME - Non - Major Elective**  
**S – Supportive Courses**      **VE- Value Education**

**LS-Life Skill**  
**ES- Environmental Studies**

**SUPPORTIVE COURSES (5 Hrs/Wk- 4 Cr)**

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>NAME OF THE COURSES</b>
I	MIC 1401	1. Biochemistry
II	MIC 1402	2. Microbial Physiology and Metabolism
III	MIC 2403	3. Fundamentals of Pharmacology
IV	MAS XXXX	4. Biostatistics

**LIFE SKILL COURSES (3 Hrs/Wk- 2Cr)**

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>NAME OF THE COURSES</b>
I	MIC 1241	1. Infectious Diseases
II	MIC 1242	2. Health Awareness
V	MIC 3243	3. Bioinformatics
VI	MIC 3244	4. Pollution and Waste Management

**NON MAJOR ELECTIVE COURSES (3 Hrs/Wk- 2Cr)**

<b>SEMESTER</b>	<b>COURSE CODE</b>	<b>NAME OF THE COURSES</b>
I	MIC 1231	1. Health and Hygiene
II	MIC 1232	2. Nutritive Value of Food

**MIC 2531 CLINICAL BACTERIOLOGY AND MYCOLOGY 5Hrs/Wk – 5Cr**

The course aims to provide students with the foundations in Clinical Bacteriology and Mycology and enhance their understanding about the importance of epidemiology, concept of normal flora and its importance, mechanisms for transmission, virulence and pathogenicity of microorganism of medical importance. (Bacteria & Fungi) It also emphasizes prophylactic and therapeutic strategies.

**Specific Learning Outcome (SLO):**

Upon Successful completion of this course, student will be able to,

- Understand the importance of Medical epidemiology.
- Describe the concepts of normal microflora and its importance in human health.
- Acquire knowledge on mechanism of pathogenesis (Bacteria & Fungi) with medical importance.
- Learn about the Modern laboratory diagnosis.
- Able to explore the Significance of prophylaxis and therapeutic management.

**UNIT - I Concepts of pathogenicity** Epidemiology- scope and applications , Normal Microbial flora of human body .Infection- stages and transmission . Factors predisposing to microbial pathogenicity- mechanism of adhesion, colonization and invasion of mucous membranes. Nosocomial infection.

**UNIT-II Bacterial Pathogens I:** Study of Morphology, cultural characteristics, pathogenesis/disease caused & laboratory diagnosis , Prophylaxis and Chemotherapy for *Staphylococcus*, *Streptococcus*, *Neisseria gonorrhoea*, *Corynebacterium diphtheriae*, *Mycobacterium*.

**UNIT -III Bacterial Pathogens II:** Study of Morphology, cultural characteristics, pathogenesis & lab diagnosis, Prophylaxis and Chemotherapy for *E. coli*, *Salmonella*, *Vibrio*, *Mycoplasma* & *Spirochaetes*.

**UNIT-IV Fungal Pathogens I:** General characteristics, Tissue reactions to fungi, pathogenicity, Laboratory diagnosis, prophylaxis and chemotherapy Cutaneous, Sub cutaneous, superficial and Systemic Mycosis, Opportunistic fungal infections and yeast like fungi including *Candida*, *Cryptococcus* and *Malassezia*.

**UNIT -V Fungal pathogens II:** Pathogenicity, Pathogenesis, Laboratory diagnosis, Prophylaxis and Chemotherapy of Mycelial fungi including *Aspergillus*, *Fusarium*, & Dimorphic fungi - *Histoplasma*, *Blastomyces*.

**TEXT BOOK**

Ananthanarayanan and Jayaram Panikkar (1922) Text book of Medical Microbiology, 4<sup>th</sup> edn, Orient Longman Ltd. Madras.

**REFERENCES**

1. Cruickshank (1975) Medical Microbiology, Vol II ELBS, Churchill Livingstone Pub.
2. Jawetz E Melnick J. L and Adelberg E. A (1998), Review of Medical Microbiology Lange Medical Publications, USA.
3. Pelczar M. J, Chan E. C. S., Kreig N. R (1986) Microbiology, McGraw Hill, New Delhi.

**MIC 2433                      LAB IN CLINICAL MICROBIOLOGY                      4Hrs/Wk – 4Cr**

Exercises will be on the methods of collecting body fluids, culture and identification of clinical specimens of anaerobic, food poisoning and fastidious bacteria. Efficacy of disinfectants and antibiotic sensitivity tests, will also be covered.

**Specific Learning Outcome (SLO)**

Upon Successful completion of this course, student will be able to

- An understanding of the common pathogens and the disease they cause.
- Understand the methods of sample collection and transport of biological specimen
- Promote technical ability in culturing of microbes of medical importance
- Demonstrate isolation and microscopic examination of Fungi

**Laboratory exercises include,**

1. Screening of normal flora in human body.
2. Screening of blood borne pathogens.
3. Nosocomial infection – isolation screening and characterization
4. Determination of susceptibility to dental caries.
5. Screening for Ocular Infection
6. Screening of upper respiratory tract infection.
7. Screening and identification of urine samples.
8. Screening of Dermatophytic infection
9. Microscopic screening of fungal pathogens
10. Antagonistic and synergistic effects of drugs.
11. Anti-microbial activity of body fluids.

**REFERENCES:**

1. Cappucino R. (2001) Microbiology – A Laboratory Manual 6<sup>th</sup> edn. Benjamin/Cummin Pub Co. California.
2. Gunasekaran P (1995) Laboratory Manual in Microbiology New Age International Pvt. Ltd, Madras.
3. Collins C. H., Patricia M. Lyne (2001) Microbiological Methods, 7<sup>th</sup> edn. London, Co Published in USA.

**MIC 2535                      MOLECULAR BIOLOGY                      5Hrs/Wk-5Cr**

This course deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. It provides insights on molecular mechanisms of DNA replication, repair, transcription, splicing, protein synthesis, and gene regulation in different organisms. Emphasis given on prokaryotic and eukaryotic gene regulation studies.

**Specific Learning Outcomes (SLO)**

Upon successful completion of this course, the student will be able to:

- Understand the connection between genes and DNA
- Explain how DNA replicates by its enzymatic machinery
- Articulate the flow of genetic information from DNA to RNA
- Elaborate the mechanism of protein synthesis
- Illustrate how genes are being regulated

**UNIT I Molecular Biology of the Gene:** Introduction to gene structure and function. Nucleic acids-structure-DNA double helix and alternative forms- denaturation and melting curves-renaturation. RNA- types- structure. Genetic code and Wobble hypothesis

**UNIT II DNA Replication:** DNA the central dogma-models of replication –semi conservative, conservative and dispersive. Modes of replication - bidirectional and unidirectional. Molecular mechanism and enzymatic apparatus for DNA replication in prokaryotes and eukaryotes. DNA damage and repair mechanism.

**UNIT III Transcription:** Transcription in prokaryotes–RNA Polymerase-initiation, elongation and termination. Eukaryotic RNA polymerases – general transcriptional factors of eukaryotes – initiation, elongation and termination. Post transcriptional modifications– RNA editing.

**UNIT IV Translation:** Protein synthesis in prokaryotes and eukaryotes – initiation, elongation and termination– post translational modifications of proteins.

**UNIT-V: Regulation of gene expression:** Gene regulation in prokaryotes– Operon concept-inducible and repressible operon. Gene regulation in eukaryotes-Britten-Davidson model–homeobox in gene regulation.

### TEXTBOOKS

Freifelder D (2007), Molecular Biology, 2<sup>nd</sup> Edn. Narosa Pub, New Delhi. India.

Watson JD, Hopkins NK, Roberts JW, Stertz JA and Weiner AM (1994), Molecular Biology of the Gene. Benjamin and Cummings Pub. Co., California, USA.

### REFERENCES

1. Alberts B, Wilson J, Hunt T, (2008) Molecular biology of the cell . 5 Edn , Garland Science, New York ,USA.
2. Lodish H, Berk H, Zipursky S L, Matsudaira P, Baltimore D, and James Darnell (2000) Molecular Cell Biology, 4th edition. W. H. Freeman, New York, USA.

**MIC 2537**

**BIOINSTRUMENTATION**

**5Hrs/Wk-5Cr**

This course will introduce the students with the basic principles of techniques that are used routinely in modern biochemistry and molecular biology. The course focuses on separation techniques includes electrophoresis, chromatography and centrifugation. It deals with measurement of light absorption of colored substances in solutions using colorimeter and spectrophotometer. The last section is to provide knowledge on radioactivity and their applications in modern research field.

### Specific learning outcomes (SLO):

At the completion of the course, the student will be able to,

- Explain the separation of molecule using electrophoresis and chromatography.
- To gain knowledge on centrifugation.
- Acquire knowledge on colorimeter and spectrophotometer.
- Understanding the radioisotope techniques and application in modern research.

**UNIT-I Chromatographic techniques:** General principles- Types- Paper, Adsorption, TLC, gel filtration, Ion-exchange, GC-MS, GLC and HPLC- Applications.

**UNIT-II Centrifugation techniques:** Basic principles of sedimentation-relative centrifugal force-conversion of G to rpm- rotors -types of centrifuges (clinical, high speed, refrigerated and ultra)- - Applications.

**UNIT-III Colorimetry-** Beer-Lambert's law- complementary color- standard graph preparation.Spectrophotometer- UV and Visible- IR, X-ray crystallography and atomic absorption spectrophotometry- applications.

**UNIT-IV Electrophoretic techniques:** General principles- types of electrophoresis- AGE, PAGE, 2-D, Iso-electric focusing, and immunoelectrophoresis.

**UNIT-V Radio isotopic techniques:** Radioactive substance- radioactivity- Detection and measurement of radioactivity- GM counter, Scintillation counter, Autoradiography- Applications- safety aspects.

### TEXT BOOKS

Wilson.K and J. Walker, (1994) Practical Biochemistry – Principles and Techniques, Cambridge Press, New York.

Palanivelu.P (2001) Analytical Biochemistry and Separation Techniques.A Laboratory Manual 2<sup>nd</sup> edn. Published by Tulsi Book Centre, Madurai, Tamil Nadu.

### REFERENCES

1. Voet D and G Voet (1995) Biochemistry II edn. John Wiley and sons, New York.
2. John G. Webster (2004) Bioinstrumentation, Student Edition. John Wiley & Sons Ltd.

### MIC 2403

### FUNDAMENTALS OF PHARMACOLOGY

5Hrs/Wk-4Cr

This course will familiarize students with general concepts of drugs and drug action in man at the level of molecules, cells, and tissues. It provides ample understanding about the battle against diseases at the cellular and molecular level. The students will explore the pharmacological effect of drugs, the specific biochemical processes with which they affect the molecular target and interactions. Emphasis will also given to the Pharmaceutical regulations, clinical trials, marketing and patenting. This would help the students with an awareness of the wide scope of applications of microorganisms in industry; the applications of fermentation technology and potentials for future development.

### Specific Learning Outcomes (SLO)

Upon successful completion of this course, the student will be able to:

- Understand the fundamentals of pharmacology.
- Integrate and evaluate the properties of drugs.
- Know the competency of drugs and their action
- Explore on pharmacopoeial standards.
- Discover the use of microorganisms in production of useful products.

**UNIT I Introduction to Pharmacology:** History and scope of pharmacology- Drug and Classification, sources of drugs-plant, animal, microbial and synthetic drugs. Discovery of drugs, Drugs and Diseases- control measures.



**UNIT II Drug targets:** Introduction-structure, function, and cellular location of ligand-gated channels, enzymes, nuclear hormone receptors, Carrier Proteins, Structural proteins, G-protein receptors, Nucleic Acids, Lipids and Carbohydrates. Agonists, Antagonists and partial agonists.

**UNIT III Pharmacodynamics and Pharmacokinetics:** Drug absorption, distribution, metabolism-biotransformation of drugs, Drug excretion-. Drug dosage-Routes of drug Administration- Mechanism of drug action- drug assay- Drug toxicity and side effects.

**UNIT IV Pharmacology and Pharmaceutical Regulations:** Drug Formulations- Dosage Preparation, Drug load- Stability. Clinical trials- phases; Regulatory bodies- FDA, IDA, NDA, Fast Tracking, Orphan Drugs, Labeling; Scientific code regulations- GLP and GMP. Marketing- Patenting of drugs.

**UNIT V Microbial Aspects of Pharmaceutical Processing:** Ecology of microorganisms in pharmaceutical industry-Sterile pharmaceutical products-Production of antibiotics, immunological products- Quality control-Bioassays.

### TEXT BOOK

Patrick, G (2002), Medicinal Chemistry, First Edition, Viva Books Private Limited, (ISBN-81-7649-271-X).

### REFERENCES

1. Stephen P. Denyer, Norman A. Hodge and Sean P. Gorman (2004), Hugo and Russell's Pharmaceutical Microbiology, Seventh Edition, Black Well Publishers, UK.
2. Prescott L.M, Cecil G. Dunn (2004) Industrial Microbiology, 4<sup>th</sup> edn, CBS Publishers & Distributors, New Delhi.
3. Vyas, S.P., (2002) Pharmaceutical Biotechnology CBS Publishers & Distributors, New Delhi.

**MIC 2532**

**IMMUNOLOGY**

**5Hrs/Wk -5Cr**

This course attempts to provide a basic understanding in Immunology. The course covers cells and organs of the immune system, antigens, antibody structure, antibody diversity, antigen-antibody interactions, cell mediated and humoral immune response and complement. In the section on disorders of immune system, autoimmunity, hypersensitivity reactions, immunodeficiency disorders that include AIDS are dealt.

### Specific Learning Outcome (SLO):

Upon successful completion of this course, student will be able to

- Understand basic concepts in Immunology such as cells, organs of immune system.
- Antigen & antibody and their interactions and humoral & cell mediated immunity.
- Regulation of immune response and disorders of the immune system.

**UNIT – I Cells and organs of the immune system:** Introduction –historical perspectives – innate (non-specific) and acquired (specific) immunity – cells involved – primary & secondary lymphoid organs – tertiary lymphoid tissues.

**UNIT – II Antigen, antibody and their interactions:** Epitopes, haptens – immunogenicity-adjuvants - antibody structure-Deducing- structure of IgG, IgM & IgA. Biological properties of various Ig classes. Primary interactions-affinity and avidity-secondary interaction-agglutination-precipitation

**UNIT – III Antibody diversity and humoral response:** Multigene organization of Ig genes – generation of antibody diversity- Role of T<sub>H</sub> cells in humoral response-primary and secondary response-affinity maturation-class switching-generation of plasma cells and memory cells.

**UNIT – IV Cell mediated immunity:** Structure and functions of MHC- Antigen processing and presentation- Activation of cytotoxic T cells-NK cells-antibody dependent cell mediated cytotoxicity (ADCC) – delayed type hypersensitivity (DTH).

**UNIT – V Regulation of immune response, complement and disorders of immune system:** Immune tolerance-regulation of immune response-complement. Classical and alternative pathways – biological properties of complement components. Auto-immunity-hypersensitivity reactions- Immunodeficiency disorders – AIDS.

#### TEXTBOOK

Goldsby RA *et al.*, (2000). Kuby, Immunology, WH Freeman and Co, New York, 4<sup>th</sup> edn.

#### REFERENCES

1. Coico R, Sunshine G (2009). Immunology – a short course, Wiley Blackwell, New York, 6<sup>th</sup> edn.
2. Roitt IM, Brostoff J, Male D (2001). Immunology, 6<sup>th</sup> edn, Mosby, London.

#### MIC 2434

#### LAB IN IMMUNOLOGY

4Hrs/Wk 4Cr

The laboratory component includes identification and enumeration of blood cells, location of lymphoid organs in selected vertebrates, preparation of antigens. Immunization techniques, methods of raising polyclonal antibodies, repetitive bleeding methods, antibody titration, complement mediated hemolysis, ELISA test for AIDS and skin test for allergy reactions.

#### Specific Learning Outcome (SLO):

Upon successful completion of this course, student will be able to

- Steps involved in raising polyclonal antibodies
- Diagnostic tests based on antigen-antibody interactions
- Immunology of ABO blood grouping and skin test for allergy reactions.

#### The Laboratory component includes exercises as follows:

1. Total and differential count of blood cells
2. Lymphoid organs in vertebrates I – fish and amphibians
3. Lymphoid organs in vertebrates II-reptiles, birds and mammals
4. Raising polyclonal antibodies I-preparation of antigens
5. Raising polyclonal antibodies II-routes of immunization
6. Raising polyclonal antibodies III- bleeding techniques and separation of serum
7. Raising polyclonal antibodies IV-antibody titration
8. Complement mediated hemolysis

9. Ouchterlony double immunodiffusion (ODI)
10. Mancini's single radial immunodiffusion (SRID)
11. Immunology of ABO blood grouping
12. ELISA test for AIDS
13. Skin test for allergy reactions

#### REFERENCES:

1. Garvey JS, Cremer NE and Sussdorf DH (1977). Methods in Immunology, The Benjamin Cummings Pub co., Massachusetts, pp 345, 3<sup>rd</sup> edn.
2. Hudson L and Hay F (1989). Practical Immunology, Blackwell Sci Pub, Oxford, PP 507, 3<sup>rd</sup> edn.

#### MIC 2536

#### INDUSTRIAL MICROBIOLOGY

5 Hrs/Wk – 5 Cr

This course deals with the development of industrial Microbiology and role of Microbiologist in industries. This course also explains the screening, development and preservation of industrially important strains and also emphasizes the formulation of media. The other part elucidates the types of fermentations, bioreactors, downstream process and the production of various fermented products.

#### Specific Learning Outcome (SLO):

Upon successful completion of this course, student will be able to

- understand the source for microorganisms of industrial importance from the environment
- Manipulate the microorganisms to produce more of these useful products
- understand the types of fermentation and bioreactors
- summarize the recovery of products
- know that microorganisms are important in the production of many useful products

**UNIT – I History and Scope:** Development – Contributions of Louis Pasteur and fermentation – discovery of antibiotics – growth of industrial fermentations – Applied branches of Industrial Microbiology and role of Microbiologist in industries.

**UNIT – II Screening and development of strains:** Isolation – crowded plate, auxanography and other methods – development and improvement – Mutation and Genetic engineering techniques. Preservation of cultures – Storage – agar slants, lyophilization and liquid nitrogen.

**UNIT – III Formulation of media:** Preparation of media – source and components – Agricultural and industrial waste – saccharide, starch, cellulose, nitrogen, enhancers and precursors - Medium sterilization.

**UNIT – IV Fermentation and Bioreactors:** Fermentation process - surface, solid state, submerged, batch and continuous fermentation – Fermentors – components of basic fermentor – pH, temperature, foam controlling device – shaft, baffle, impeller and sparger – Types of fermentors – batch and continuous fermentors, aerated and agitated fermenters and air lift fermenter.

**UNIT – V Downstream processing and fermented products:** Recovery of intracellular and extracellular products – removal of insoluble components – product isolation – purification – polishing. Fermented products – production of alcohol – beverages – industrially important enzymes – foods – organic acids – antibiotics and other medically important products.

### TEXT BOOK

Patel A. H., (2012) Industrial Microbiology, 1<sup>st</sup> Edition, Macmillan Publishers, India.

Crueger, W., Crueger, A., and Brock, T. D. (2005) Biotechnology: A Textbook of Industrial Microbiology, 3<sup>rd</sup> Edn, Panima Publishing Corporation, New Delhi.

El – Mansi E.M.T and C.F.A. Bryce (2005) Fermentation Microbiology and Biotechnology, Replika Press Pvt. Limited, India.

### REFERENCES

1. Peter F. Stanbury, Allan Whitaker, Stephen J. (2009) Principles of Fermentation Technology, 2<sup>nd</sup> Edition Hall Elsevier Science Ltd.
2. Prescott L.M, Reed G. Dunn (2004) Industrial Microbiology, 4<sup>th</sup> Edition, CBS Publishers & Distributors, New Delhi.

### MIC 2538

### CLINICAL VIROLOGY AND PARASITOLOGY 5Hrs/Wk-5Cr

This course aims to provide students about general properties of viruses and parasites their mechanism of pathogenesis, clinical conditions and therapeutic management. Emphasis also given on specimen collection, identification, prophylaxis and treatment.

### Specific Learning Outcomes (SLO):

Upon successful completion of this course, student will able to

- Explain the general characteristics and pathogenesis of viruses
- Understand the challenges faced by DNA and RNA viruses during their replication in the host cell and causing diseases.
- Ensure an understanding of the general and specific life cycles of the medically important parasites.
- Understand the diagnosis and treatment.

**UNIT - I Characteristic of virus:**History- General Properties - Classification and replications of viruses - Epidemiology and Pathogenesis of viral infections.

**UNIT - II DNA viruses & RNA viruses:**Properties- life cycle and pathogenesis of Pox virus- Herpes virus - Papilloma virus- Hepatitis B. Polio- Rabies – Influenza – Ebola – Dengue - Human Immunodeficiency Virus.

**UNIT - III Protozoan parasites:** Introduction to medical parasitology – morphology, classification, life cycle and pathogenesis of Protozoa – Entamoeba- Plasmodium, Leishmania - Trypanosoma – Giardia – Trichomonas.

**UNIT - IV Helminths parasites:** Properties - life cycle and pathogenesis of Platyhelminthes – Taenia–Schistosoma and Nematelminthes – Ascaris – Trichuris – Wuchereria.

**UNIT - V Laboratory diagnosis & Treatment:** Isolation & identification of viruses - Cultivation of viruses - Serological diagnosis of virus infections. Examination of faeces for ova and cysts – concentration methods. Blood smear examination for parasites. Vaccines and interferon - Antiviral - antiparasitic agents.

### TEXT BOOK

Flint SJ, Enquist LW, Krug RM, Racaniello VR and AM Skalka (2000) Principles of Virology, ASM Press, USA.

Cheng C.G (2006). General parasitology, 2<sup>nd</sup> edn, Academic press (An imprint in Elsevier).

### REFERENCES

1. Cruickshank (1975) Medical Microbiology, Vol II ELBS, Churchill Livingstone Pub.
2. Ananthanarayanan and Panikkar J (1922). Text book of Medical Microbiology, 4<sup>th</sup> edition, Orient Longman Ltd. Madras.

### MIC 3731

### GENETIC ENGINEERING

7Hrs/Wk-7Cr

This course aims to acquaint the students to versatile tools and techniques employed in genetic engineering and recombinant DNA technology. It provides theoretical basis to DNA modifying enzymes, cloning vector types, host genotype specificities for selection and screening of recombinants. Current experimentation and progress in these fields as well as ethical considerations of this research will be discussed.

#### Specific Learning Outcomes (SLO):

Upon successful completion of this course, the student will be able to:

- Describe the function of most common enzymes used in molecular biology
- Recognize the importance of cloning vectors
- Understand and articulate different libraries
- Illustrate creative use of modern tools and techniques and when they could be applied
- Explore the principle behind gene therapy

**UNIT I Tools for Genetic Engineering:** Principles and techniques– historical development in gene technology – Restriction endonucleases and DNA modifying enzymes used in cloning. Preparation and purification of DNA from living cells.

**UNIT II Vectors for gene cloning:** –Cloning vectors for *E.coli*- plasmids- properties- pBR322- Bacteriophage vectors-cosmids, phagemids, insertion and replacement vectors. Yeast plasmid vectors- Artificial chromosome vectors -BAC, YAC– vectors for cloning in higher plants– vectors for animal cells. Expression vectors and properties. Introduction of

DNA into living cells- transformation- transfection and *in vitro* packaging- Alternative DNA delivery systems.

**UNIT III Gene cloning Strategies and techniques:** Cloning from DNA, mRNA-Genomic libraries, cDNA libraries. Techniques used in genetic engineering: nucleic acid hybridization, blotting techniques, Polymerase chain reaction, Methods of DNA sequencing

**UNIT IV Selection and Screening of recombinants:** Direct selection through marker rescue- methods of screening – genetic methods, immunological methods, plus and minus screening, HRT and HART.

**UNIT V Applications of genetic engineering:** Production of recombinant pharmaceuticals – recombinant insulin, human growth hormone- somatotropin, Recombinant vaccines-DNA vaccines. Disease diagnosis and gene therapy. Production of transgenic plants, animals – methods involved - limitations and obstacles and its applications. Recombinant DNA debate and Bioethics

### TEXT BOOK

Brown TA, (2001) Gene cloning and DNA analysis- an Introduction 4<sup>th</sup> edn. Blackwell, Oxford.

### REFERENCES

1. Old, R.S. and Primrose, S.B. (1995) Principles of Gene manipulation. An Introduction to genetic Engineering. 5th Edition. Blackwell Scientific Publication, London.
2. Glick BR and Pasternak JJ (1996) Molecular Biotechnology – Principles and Applications of Recombinant DNA, Panima Publishing Co, New Delhi.
3. Desmond S.T. Nicholl (1994) An Introduction to Genetic Engineering, Cambridge University, Oxford.

**MIC 3533**

**LAB IN GENETIC ENGINEERING**

**5Hrs/Wk – 5Cr**

This laboratory course is focused on genetic engineering methods and their underlying molecular biology.

### Specific Learning Outcomes (SLO):

Upon successful completion of this lab course, the student will be able to:

- Describe the principles and techniques of genetic engineering methods
- Explain which biological hosts are best choice for producing certain protein
- Translate their teaching and learning concepts in genetic engineering to their own research

### Laboratory exercises include,

1. Isolation of genomic DNA from bacteria.
2. Isolation of genomic DNA from plants.
3. Isolation of genomic DNA from animal tissue.
4. Isolation and purification of plasmid.
5. Estimation of DNA (Spectrophotometric method).
6. Analysis of DNA on Agarose Gel Electrophoresis.
7. Restriction digestion of genomic DNA.
8. Isolation of RNA from Mammalian tissue and yeast.

9. Estimation of molecular weight of proteins using SDS – PAGE.
10. Silver staining of protein gel.

## REFERENCES

1. Sambrook J and Russell D.W (2001) Molecular Cloning: A Laboratory Manual, Volume 1, CSHL Press.
2. Robertson D. Shore A. S. and Miller D. M (1997) Manipulation and Expression of Recombinant DNA – A Laboratory Manual, Academic Press, San Diego.
3. Scheppler J. A. Cassin P. E and Gambier R. M (2000) Biotechnology Explorations – Applying the fundamentals, ASM Press, Washington DC.

## MIC 3635

## PLANT AND ANIMAL CELL CULTURE

6Hrs/Wk-6Cr

This course provides students an overview of plant and animal cell culture. First section emphasizes on the basic requirements of plant tissue culture, callus culture, protoplast culture, and somatic hybridization. It also focuses on Micro propagation, organogenesis, embryogenesis and in-vitro conservation. Next section focuses on animal cell culture lab requirements, culture media, primary explants, and characterization of cultured cells. The last section provides insights on organotypic models, hybridoma technology and stem cells.

### Specific learning outcomes (SLO):

Upon successful completion of this course, student will be able to

- Gain knowledge on the requirement and techniques of plant cell & tissue culture.
- Understand the micro propagation and in-vitro conservation process.
- Explore basic concepts of animal cell culture and importance of serum free media.
- Demonstrate the techniques of primary explants, monolayer culture, and cell line characterization,
- Acquire knowledge on the wide applications of animal cell culture.

**UNIT I Basics of Plant tissue culture:** Historical perspective - containments –culture types – tissue culture media – callus culture initiation – cell culture – plant regeneration – scale up process –single cell isolation – protoplast culture – fusion – somatic hybridization – haploid plant production – diploidization.

**UNIT II Micro propagation and Germplasm conservation:** Somoclonal variants – isolation method –micro propagation – techniques – multiplication by axillary buds, apical and adventitious shoots – organogenesis –embryogenesis –embryo culture. Germplasm conservation – cryopreservation –genetically modified crops.

**UNIT III Basics of Animal Cell Culture:** History- types- scope- requirements- equipments- culture vessels – contamination – aseptic condition – sterilization –advantages and limitations – applications. Culture media – Physico-chemical properties – serum and serum free media.

**UNIT IV Primary cell culture & Characterization:** Primary culture – tissue isolation technique –primary explants – cell lines – selection and maintenance; subculture – monolayer and suspension – scale up process –culture system. Characterization of cultured cells – cell line identification – growth parameters – cell viability.

**UNIT V Organotypic models & Tissue engineering** – Organ culture techniques –histotypic – 3D culture – organotypic culture. Tissue engineering –Hybridoma technology –monoclonal antibody production. Stem cells - applications.

### TEXT BOOKS

Gambora O.L, and G.C. Phillips, (1995) Plant cell, tissue and organ culture – Fundamental methods, Narosa Publication.

Freshney I, (2005), Culture of Animal cells, A manual of Basic technique, 5<sup>th</sup> edition, A. John Wiley & Sons, INC, Publication.

### REFERENCES

1. Satyanarayana U, (2011) Biotechnology, Books & Allied publication Ltd.
2. Dubey C.R, (2006) Textbook of Biotechnology, 4<sup>th</sup> edition, S.Chand & Company Ltd.
3. S.M Bhatt (2011) Animal Cell Culture – Concepts and Applications, Narosa Publishing House Private Limited, New Delhi.

## MIC 3537 LAB IN PLANT AND ANIMAL CELL CULTURE 5Hrs/Wk-5Cr

This lab course is designed to provide students a technical skill on plant and animal cell culture. Students will familiarize in media preparation, development of shoot and root and preparation of synthetic seeds. Techniques like tissue explant preparation; monolayer culturing and cell viability test will be done.

### Specific Learning Outcomes (SLO):

Upon successful completion of this course, student will be able to

- Acquire knowledge in preparing plant and animal cell culture media,
- Establish, maintain and sub culturing of callus, shoot & root culture.
- Gain hands on practice in primary explants and cell culture preparation,
- Identify the monolayer & suspension culture and their viability.

### Laboratory exercises include,

#### Plant cell and tissue culture

1. Preparation of Tissue Culture Media.
2. Callus Induction.
3. Shoot and root induction.
4. Isolation of protoplasts.
5. Synthetic seed preparation.
6. Cell suspension culture.

#### Animal cell and tissue culture

7. Sterilization &Preparation of Tissue and Cell Culture Media.
8. Primary explants culture from chick embryo.
9. Disaggregation of tissue – Physical method.
10. Disaggregation of tissue – Enzymatic method.
11. Primary cell culture – Monolayer Cells.
12. Primary cell culture – Suspension Cells.
13. Sub culturing technique/Secondary cell culture method.
14. Cell counting and viability – Trypan blue dye exclusion test.



**TEXT BOOKS**

Aneja K R (1996) Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom production technology, New Age International Publications, India.  
 Freshney I, (2005), Culture of Animal cells, A manual of Basic technique, 5<sup>th</sup> edition, A. John Wiley & Sons, INC, Publication.

**REFERENCE**

Bhatt S.M (2011) Animal Cell Culture – Concepts and Applications, Narosa Publishing House Private Limited, New Delhi.

**MIC 3243****BIOINFORMATICS****3Hrs/Wk – 2Cr**

Generation of abundant molecular biological information, especially the genetic and protein sequences, would made the human mind to exhaust when if tried to compare and contrast so as to find out the links or homology between sequences. Fortunately, at this juncture a perfect blend of molecular biology and computer evolved the discipline bioinformatics making molecular biologists to explore extensively. In this course, data generation, biological databases, data storage, data retrieval, sequence alignment and application of bioinformatics were given emphasis.

**Specific Learning Outcomes (SLO):**

Upon successful completion of this course, the student will be able to:

- Understand and work with computational tools of bioinformatics
- Perform biological sequence (DNA, RNA, Protein) analytical studies
- Undertake phylogenetic relation analysis

**UNIT I Fundamentals of Computer: Introduction to Computers:** – Characteristics of Computers. Classification of Computers – Programming Languages: Machine Language – Assembly Language – Features of commonly used operating systems e.g. DOS, Windows, UNIX, and LINUX. Input Devices- Keyboard – Mouse - Trackball – Output Devices – Dot Matrix Printer – Inkjet – Laser Printer – LCD & LED Printers: Hard Disk – CD –DVD – primary memory, Introduction to Internet.

**UNIT II Basics of Internet Use and Search Engines:** Fundamentals of Internet, WWW, HTML, URLs Browsers, Netscape/Opera/Explorer Search Engines: Google, PUBMED, NCBI EMBL, GENBANK, Entrez, Unigene, PDB, SwissProt, And TrEMBL. Introduction to search; Indices, Boolean, Fuzzy and neighbouring search.

**Unit III Bio-informatics Basics:** Bio-informatics- Its Definitions, Introduction, History - Objectives, Applications, Its need, Scope, Opportunities in Bioinformatics. Emerging areas of Bioinformatics - Bioinformatics scenario in India and the rest of the world. Origin of Bioinformatics, Overview of available Bioinformatics resources on the web NCBI/EBI/EXPASY etc.

**UNIT IV Sequences used in Bioinformatics:** Central dogma - DNA, RNA, Protein. Dawn of sequencing. Features of the DNA, Protein, and RNA molecules.

**UNIT V Biological Databases:** Introduction to data types and Source. Population and sample, Classification and Presentation of Data. Quality of data, private and public data sources. General Introduction of Biological Databases; Types of Biological Databases, Nucleic acid databases (NCBI, GenBank, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB).

### TEXT BOOK

Lesk, A.M. (2002) Introduction to Bioinformatics. Oxford University Press.

Atwood T K, Parry Smith D J and Phukan S. Introduction to bioinformatics, Pearson Education, Ltd. & Dorling Kindersley Publishing Inc., 2013 - New Delhi, India.

### REFERENCES

1. Zoe Lacroix and Terence Critchlow (2003) Bioinformatics – Managing Scientific Data, Morgan Kaufmann Publishers, New Delhi.
2. Andreas D. Baxevanis and Francis B. F. Francis Ouellette (2006) Bioinformatics – A Practical Guide to the Analysis of Genes and Proteins, Wiley – Interscience, Inc, Publications, USA.
3. Setubal, J. and Meidanis, J. (1996) Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.

### MIC 3200

### ENVIRONMENTAL STUDIES

4Hrs/Wk-2Cr

This course is designed to introduce students the importance, scope and problems in environment. It focuses on the natural resources, energy flow and types of ecosystems. Values of biodiversity, hotspots, endangered species and conservation are emphasized. It also highlights the social issues and population explosion in the environment.

### Specific Learning Outcomes (SLO):

Upon successful completion of this course, student will be able to

- Explore the values of renewable and non-renewable resources.
- Understand the concepts, function and types of ecosystem.
- Acquire knowledge on values, location and conservation of biodiversity.
- Demonstrate different types of pollution and waste management.
- Critically analyse impact of technology development and population on environment.

**UNIT I Natural Resources:** Ecology –scope – importance- components –awareness – renewable resources – forest, water, mineral, food, land and energy resources – renewable and non-renewable energy –conservation.

**UNIT II Ecosystems:** Concepts –structure and function – food chain & web and ecological pyramids –energy flow in the ecosystem –ecological niche –ecological succession. Types of ecosystems - Forest, grassland, desert and aquatic ecosystems.

**UNIT III Biodiversity:** Introduction – levels – values of biodiversity – Global, National and local biodiversity – hotspots – major threats –endangered species. Conservation of biodiversity –*In situ* and *Ex situ* conservation.

**UNIT IV Environmental pollution:** Definition – source, types, effects and control measures of air, water, soil, marine, noise, thermal pollution – nuclear hazards – solid waste management –disaster management.

**UNIT V Social issues and population:** Sustainable development –water conservation - environmental ethics – global climate change problem –role of environmental legislation (acts). Human population growth – population explosion –human rights –value education.

### TEXTBOOK

Kaushik A and C.P.Kaushik (2014), Perspectives in Environmental Studies, 4<sup>th</sup> multicolour edition, New Age International (P) Limited Publishers.

### REFERENCES

1. Bharucha E (2013), Textbook of Environmental studies for Undergraduate courses, 2<sup>nd</sup> edition, Universities press (India) Private Ltd.
2. Thatheyus A.J (2011) Textbook of Environmental Studies, Narosa Publishing House, New Delhi.

## MIC 3732 ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY 7Hrs/Wk-7Cr

The main objective of this course is to make the students familiar with microorganisms without which human could not survive as these microbes occur in large number in most natural environment and bring about many desirable and undesirable changes. Beside their role in evolution of life on this planet, the microbial activity is linked directly with processing and removal of dead bodies and sewage. Thus, their role as scavengers is encourageable. The study of this course will help the students to develop the sustainable environment.

### Student learning outcomes (SLO):

At the conclusion of the course, the student will be able to,

- Recognize the basic concepts of ecosystem.
- Familiarize with the positive and negative roles of organisms.
- Understand the interactions between organisms and environment.
- Explore the basic needs in the field of agriculture.
- Summarize the traditional agricultural practice to be followed.

**UNIT I Microbiology of Air & Water:** Atmospheric dispersal of microbes- Microbial diversity of thermophiles-Mesophiles-Psychrophiles - deep sea- hyper saline habitats and metal-contaminated environments. -Air-borne diseases-control of bio- aerosols- air sanitation. Microbial communities in pelagic & benthic habitats- biological analysis of water sampling - Microbial processes in waste water treatment.

**UNIT II Microbial Interactions:** Microbe–microbe Interactions – Mutualism, Commensalism, and Amensalism, Microbe–plant interactions – Phylloplane- Phyllosphere-Rhizosphere and Mycorrhizae.

**UNIT IV Soil microbiology:** Soil - general properties -soil microflora-microbes in soil surface and different zones of soil – role of microbes in soil fertility – soil and environmental influence on microbes - decomposition of plant and animal residues by microorganisms in soil.

**UNIT IV Bioremediation & Biodegradation:** Bioremediation and its types- Principles and application of Bioaccumulation- Xenobiotics- Microbial degradation of hydrocarbons. Biodegradation of pesticides.

**UNIT V Role of microbes in sustainable agriculture:** Traditional agricultural practice and organic farming. Applications of microbes in agriculture. Bio fertilizers- symbiotic and non-symbiotic microorganisms – vermicomposting - bio pesticides- bacterial, fungal and viral.

### TEXT BOOKS

Atlas R and Bartha R (1998) Microbial Ecology 4th edn. Benjamin/Cummings Publishing Co, Inc. California.

Subba Rao NS (2000) Soil Microbiology 4th edn. Oxford & IBH, New Delhi.

### REFERENCES

1. Alexander M (1977) Introduction to Soil Microbiology. Wiley, New York.
2. Rheinheimer G (1980) Aquatic Microbiology 2nd edn. Wiley New York.
3. Mitchell R (1992) Environmental Microbiology Wiley-John Wiley Sons, Inc Publications, New York.

## MIC 3534 LAB IN ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

**5Hrs/Wk - 5Cr**

In this laboratory course, students will be trained on isolation and identification of various microorganisms from soil, techniques to assess physico-chemical parameters of various organisms. It also helps them to identify eco-friendly organisms of our environment

### Student learning outcomes (SLO):

At the conclusion of the course, the student will be able to,

- Identify beneficial organisms from our environment.
- Improve their skill based techniques in agricultural field.
- Recognize the importance of bio fertilizers.
- Implement new technologies for the betterment of our environment.

### Laboratory exercises include,

#### Environmental Microbiology

1. Enumeration of bacteria present in different types of soil.
2. Isolation of rhizobium from leguminous plant.
3. Isolation and identification of Azotobacter.
4. Isolation and identification of Phosphobacter.
5. Isolation and Enumeration of fungi from soil.

#### Agricultural Microbiology

6. Isolation and enumeration of major groups of microorganisms from rhizosphere and Non-rhizosphere soil.
7. Isolation and identification of microorganisms from phylloplane region.
8. Isolation and identification of microorganisms from phyllosphere region.
9. Isolation of microflora from different industrial effluents.
10. Determination of BOD and COD.
11. Vermicomposting.
12. Cultivation of plants using biofertilizers – Pot culture technique.

## REFERENCES

1. Cappucino R (2001) Microbiology - A laboratory manual 6th edn. Benjamin/Cummings, California.
2. Gunasekaran P (1995) Lab manual in Microbiology, New Age International Pvt Ltd. Madras.
3. Motsana MR, Bhattacharya and BeenaSrivastava (1995) Biofertilizers Technology, Marketing and usage. Publication Division, Ministry of Agriculture, New Delhi.

## MIC 3636 MEDICAL LABORATORY TECHNOLOGY

6Hr/Wk-6Cr

This course is meant for developing the knowledge and technical skills necessary to perform basic laboratory tests. Emphasis is given on use and maintenance of laboratory equipment, quality control and biosafety techniques. Collection of samples inclinal biochemistry, clinical pathology, haematology and blood banking analysis and interpretation of results will be dealt with.

### Specific Learning Outcomes (SLO):

Upon successful completion of this course, student will able to

- understand the infrastructure of the laboratory
- perform the biochemical tests
- perform the haematological tests
- explain the preparation of biopsy slides
- understand the diagnosis of body fluids

**UNIT IOrganization of the laboratory:** Safety precautions in laboratory - personal cleanliness and care with regard to infected materials and chemical burns — Maintenance and applications of biomedical instruments – haemocytometer, Gluco meter, [Sphygmomanometer](#) - Disposal of bio-medical wastes.

**UNITIIClinical Biochemistry:** Disorders and diagnosis of carbohydrate metabolism – diabetes mellitus, lipids metabolism – [hypercholesterolemia](#) , Protein metabolism – phenylketonuriaand tyrosinemia.

**UNITIIIClinical Pathology:** Types of clinical specimens: urine, feces, sputum, CSF, Semen. Methods of collection –transportation- handling. Physical – chemical - microscopical and microbiological examination of clinical specimen.

**UNIT IVHaematology:** Laboratory preparation – Blood components, Collection of blood, Determination of Haemoglobin, blood cell count, bleeding time - clotting time – Prothrombin time, Estimation of ESR, Anemia and its types, Leukemia, blood banking.

**UNIT VHistopathology:** Preparation of specimen, paraffin section, embedding- frozen section, fixation, microtome –types, decalcification, deparaffinization, staining.

## TEXT BOOK

Godkar, P. B. Godkar D. P (2002). A Text Book for Medical Lab Technology, 2<sup>nd</sup> edition, Bhalami Publishing House, Mumbai.

**REFERENCES**

1. Mukherjee, K.L (1989). Medical Laboratory Technology (Vol –I to III) Tata McGraw Hill, New Delhi.
2. Sood, R (1996). Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi

**MIC 3538      LAB IN MEDICAL LABORATORY TECHNOLOGY      5Hr/Wk-5Cr**

This laboratory course focuses on the techniques in the examination various body fluids. The student is trained to analysis physical and chemical properties of biological fluids as well as microscopic examination.

**Specific Learning Outcomes (SLO):**

Upon successful completion of this course, student will able to

- collect the clinical samples
- Perform basic haematological investigation
- demonstrate the biochemical tests

**Laboratory exercises include,**

1. Sample collection, preservation and transportation of various clinical samples.
2. Determination of E.S.R., Packed cell volume in blood.
3. Estimation of Haemoglobin.
4. Bleeding Time, Clotting Time and Platelet count in Blood
5. Determination of Differential blood count.
6. Biochemical estimation of serum- total protein, albumin, globulin, sugar.
7. Biochemical estimation of serum - cholesterol, urea, Creatinine.
8. Biochemical estimation of Urine - urea, Uric acid and Creatinine.
9. Microscopic and macroscopic examination of urine.
10. Microscopic examination of Pus and Stool.
11. Visit to Hospital laboratory

**TEXT BOOK**

Mukherjee, K.L (1989). Medical Laboratory Technology (Vol –I to III) Tata McGraw Hill, New Delhi.

**REFERENCES**

1. Godkar, P. B. Godkar D. P (2002). A Text Book for Medical Lab Technology, 2<sup>nd</sup> edition, Bhalami Publishing House, Mumbai.
2. Sood, R (1996). Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi

**MIC 3244                      POLLUTION & WASTE MANAGEMENT                      3Hrs/Wk-2Cr**

Environmental management is actively moving toward strategies of reduction and prevention of pollution and waste management. Planning for pollution prevention is recognized as a vital component of this process. The purpose of this course is to introduce students the basic aspects of air, soil water and soil pollution, its effects and preventive measures. In the last two units they will gain knowledge on waste and disaster management.

**Student learning outcomes (SLO):**

At the conclusion of the course, the student will be able to,

- Learn about the causes and types of pollution.
- Get familiarized with global environmental issues.
- Acquire knowledge regarding the control measures against pollution.
- Recognize the various types of wastes in existence.
- Implement the pollution and waste management technologies in action.

**UNIT I Air and Soil Pollution:** Definition-causes –sources-- air pollutants - particulates and gaseous pollutants - harmful Effects –prevention & control technologies of Air Pollution. Soil pollution-causes -sources –industrial waste effluents – heavy metals - degradation of soil quality- remediation of Contaminated Soil

**UNIT II Water and Noise Pollution:** Water Pollutants and their sources; Pollution of stream, lakes -Eutrophication- waste water treatments systems -water quality standards-prevention & control measures. Noise pollution-causes-sources-Decibel scale-noise instrumentation and monitoring procedure- impacts of noise pollution-control and preventive measures.

**UNIT III Control of Environment Pollution:** Monitoring of air and water quality parameters - methods, equipments, standards- control of soil pollution. Role of individuals in prevention of pollution - pollution case studies. Global and regional perspectives of environmental pollution.

**UNIT IV Solid Wastes:** Causes, sources and types-**Municipal solid waste- organic waste-commercial wastes-Toxic waste-Recyclable-Soiled-Hazardous wastes- Biomedical wastes-Animal wastes- Sewage Wastes- Urban and industrial wastes.**

**UNIT V Solid Waste & Disaster management:** Basic aspects of solid waste management; Current practices in India; Volume and strength reduction – Recycle, reuse and by-product recovery – Applications. Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal. Disaster management- Floods, Earthquake, Cyclone and landslides.

**TEXT BOOKS**

Atlas R. and Bartha .M (1988) Microbiology Fundamentals & Applications.2<sup>nd</sup>edn.Maxwell Macmillan International edn. UK.

Mitchell R (1992) Environmental Microbiology, Wiley – John Wiley Sons, Inc Publications, New York.

**REFERENCES**

1. Dave P. K. Gupta S. Parmar N. K, Kant S. (2007) Emergency Medical Services and Disaster Management: A Holistic Approach. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
2. Kumar A (2006) Disaster Management – Recent Approaches, Anmol Publications, New Delhi.
3. Eugene P. Odum (1990) Ecology – A Bridge between Science and Society.

**DEPARTMENT OF VISUAL COMMUNICATION**  
**Program for B.Sc. Visual Communication (SF) – CBCS – 2015-2016**

Sem	Part	Course Code	Course Title	Hr/Wk	Cr.	Mar ks
1	I	XXX xxxx	TAM/FRE/HIN	3	2	30
1	II	ENS 1201	Conversational Skills	3	2	30
1	III C	BVC 1521	Introduction to Visual Communication (T)	5	5	75
1	III C	BVC 1421	Visual Literacy (T)	4	4	60
1	III C	BVC 1423	Drawing (P)	4	4	60
1	III S	BVC 1425	Advertising and Public Relations (T)	5	4	60
1	IV NME	BVC 1221	New Media (T)	3	2	30
1	IV LS I	BVC 1223	Life Skills - I	3	2	30
			<b>Total</b>	<b>30</b>	<b>25</b>	<b>375</b>
2	I	XXX xxxx	TAM/FRE/HIN	3	2	30
2	II	ENS 1202	Reading & Writing Skills	3	2	30
2	III C	BVC 1522	Media, Culture and Society (T)	5	5	75
2	III C	BVC 1422	Graphic Design - I (T)	4	4	60
2	III C	BVC 1424	Graphic Design –II (P)	4	4	60
2	III S	BVC 1426	Media Management (T)	5	4	60
2	IV NME	BVC 1222	Media Education (T)	3	2	30
2	IV LS II	BVC 1224	Life Skills - II	3	2	30
2	V	XXX xxxx	Ext. Activity NSS/NCC/PED/SLP		1	15
			<b>Total</b>	<b>30</b>	<b>25+1</b>	<b>390</b>
3	I	XXX xxxx	TAM/FRE/HIN	3	2	30
3	II	ENS 2201	Study Skills	3	2	30
3	III C	BVC 2521	Fundamentals of Photography (T)	5	5	75
3	III C	BVC 2523	Theatre and Cinema (T)	5	5	75
3	III C	BVC 2525	Film Language (T)	5	5	75
3	III C	BVC2427	Practical Photography (P)	4	4	60
3	III S	BVC 2429	Visual Analysis (T)	5	4	60
			<b>Total</b>	<b>30</b>	<b>27</b>	<b>405</b>
4	I	XXX xxxx	TAM/FRE/HIN	3	2	30
4	II	ENS 2202	Career Skills	3	2	30
4	III C	BVC 2522	Sound and Image (T)	5	5	75
4	III C	BVC 2428	Theories of Communication (T)	4	4	60
4	III C	BVC 2524	Screen Writing (P)	5	5	75
4	III C	BVC 2526	2 D Animation (P)	5	5	75
4	III S	BVC 2430	Media Budgeting and Financing	5	4	60
4	V	XXX xxxx	Ext. Activity NSS/NCC/PED/SLP		1	15
			<b>Total</b>	<b>30</b>	<b>27+1</b>	<b>420</b>



Sem	Part	Course Code	Course Title	Hr/Wk	Cr.	Marks
5	III C	BVC 3621	Television Production (T)	6	6	90
5	III C	BVC 3531	Media Laws and Ethics (T)	5	5	75
5	III C	BVC 3623	3 D Animation (P)	6	6	90
5	III C	BVC 3625	Media Production I (P)	6	6	90
5	IV LS III	BVC 3225	Practical Theatre	3	2	30
5	IV	BVC 3200	Environmental studies (T)	4	2	30
			<b>Total</b>	<b>30</b>	<b>27</b>	<b>405</b>
6	III C	BVC 3622	Fiction and Film (T)	6	6	90
6	III C	BVC 3624	Development Communication (T)	6	6	90
6	III C	BVC 3532	Internship( P)	5	5	75
6	III C	BVC 3626	Media Production II (P)	6	6	90
6	IV	HVS 3200	Human Value Development(T)	4	2	30
6	IV LS IV	BVC 3226	Art From Anything	3	2	30
			<b>Total</b>	<b>30</b>	<b>27</b>	<b>405</b>

Courses offered to Non – Major students by the Department of Visual Communication (UG)

#### Supportive

Sem	Part	Course Code	Course Title	Hr/Wk	Cr.	Marks
1	III	BVC 1425	Advertising and Public Relations (T)	5	4	60
2	III	BVC 1428	Media Management (T)	5	4	60
3	III	BVC 2429	Visual Analysis (T)	5	4	60
4	III	BVC / CIT 2430	Media Budgeting and Financing	5	4	60
		BVC / CIT 2430 (2017 Onwards)	Visual Ad	5	4	60

Courses offered to Non – Major students by the Department of Visual Communication (UG)

#### Non-Major Elective

Sem	Part	Course Code	Course Title	Hr/Wk	Cr.	Marks
1	IV NME	BVC 1221	New Media (T)	3	2	30
2	IV NME	BVC 1222	Media Education (T)	3	2	30

#### Life Skill Courses

Sem	Part	Course Code	Course Title	Hr/Wk	Cr.	Marks
1	IV LS I	BVC 1223	Font making and crafting (P)	3	2	30
2	IV LS II	BVC 1224	*Digital Photography (P)	3	2	30
5	IV LS III	BVC 3225	Practical Theatre (P)	3	2	30
6	IV LS IV	BVC 3226	*Art from Anything (P)	3	2	30

**BVC 1521****Introduction to Visual Communication****5Hours/5Credits****Course Objectives:**

Enable the students

- To trace the Origin and evolution of visual communication
- To be familiar with the various theories of visual communication
- To gain knowledge of the visual culture

**Learning outcome:**

- The learner can explain the origin, status and trends of visual communication
- The learner can analyze the models of communication
- The learner can adopt visual culture for better understanding of the subjects

**Unit I**

Definition – Origin and Development –Importance of Communication – Essentials of communication - Types of communication– Functions and Barriers of Communication

**Unit II**

Visual Communication – Definition – Origin and Development – Advantages and disadvantages – Scope of visual communication – Elements of visual communication

**Unit III**

Communication models and Body language – Various models of communication, SMCR Model, Lasswell model, Shannon and Weaver Model, Wilbur Schramm model, Osgood Model, Helical Dances model, Aristotle model, George Gerbner Model – Verbal and Non verbal Communication- Body language and its main aspects – Various approaches to body language.

**Unit IV**

Sensation and perception – Learning and thinking – Human intelligence – Aptitude and personality – Motivation and creativity – Application of psychological concepts of visual communication

**Unit V**

Visual culture – Visualizing – Visual power – Visual pleasure, Picture, Semiotics, Signs of symbols

**Evaluation Pattern:**

End of semester exams will be conducted for 100 marks.

**Reference Books:**

Paul Martin Lestner Visual Communication, Images with messages, Third Edition, Thomson Wadsworth, 2003, California.

Seema Hasan Mass Communication, Principles and concepts, second edition,

**BVC 1421****Visual Literacy****4Hours/ 4Credits****Course Objectives:**

Enable the students

- To gain knowledge of the Visual elements and Principles
- To Learn through Visual
- To Communicate through visual

**Learning Outcome:**

- The Learner can think Visually
- The Learner can understand the elements of Visual
- The Learner can analyze different kinds of perspective

**Unit I**

Visual Literacy: elements of visual –dot-line-shape-form-colour-texture. Principles of Visual: Harmony, Balance – Rhythm – Proportion

**Unit II**

Perspective: one point – two point- three points – Aerial – Curve Linear. Colour theory

**Unit III**

Reading the Image: Perception - Light and Shade – Composition

**Unit IV**

Medium used in Drawing: Charcoal – water colour – poster colour – oil Colour – acrylic colour – mixed media

**Unit V**

Human Anatomy: Heads – Hands- body- legs- feet – structures and postures – facial expression – movement in drawing - Cartoon Drawing

**Evaluation Pattern:**

End of semester exams will be conducted for 100 marks.

**Reference Books:**

Pran Nath Mago, Contemporary art in India, National Book Trust, India, 2000

Elizabeth Cumming & Wendy Kaplan, The Arts and Crafts Movement, Thames and Hudson Ltd, 2002

Brandon Taylor, Art Today, Laurence King Publishing, 2005

**BVC 1422****Drawing (Practical)****4Hours/ 4 Credits****Course Objectives:**

Enable the students

- To understand the visual elements and principles.
- Classification of colors and their applications.
- To learn the applications of various medium of colors

**Learning Outcome:**

- The Learner can draw pictures using Visual Vocabulary
  - The Learner can use various medium for Drawing
  - The Learner can draw the picture creatively
1. Dot, line, shape, form, texture
  2. Perspective – One point, Two Point, Three Point
  3. Colour – Primary-Secondary – Tertiary – Warm –Cool – Colour Wheel
  4. Still Life
  5. Landscape
  6. Water Colour
  7. Oil Colour
  8. Acrylic Colour
  9. Mixed Media
  10. Creative Composition

Visit to Museum, Art Gallery, Historical Places and Outdoor study are compulsory

**Evaluation pattern:**

Students need to maintain two records. Class work and Homework separately for Continuous Internal Assessment.

**Reference Books:**

1. Sayre Henry M. (2010) World of Art New Jersey: Pearson Education Inc.
2. Hanks Kurt.(2006) Rapid Viz., Boston: Thomson Course Technology
3. Barber, Barrington.( 2006 )The Fundamentals of Drawing in Colour, London: Archturus Publishing Limited

**BVC 1423****Advertising and Public Relations****5 Hours/ 4Credits****Course Objectives:**

Enable the students

- To learn about the nature, history and development of advertising.
- To get trained in the visual codes of advertisement
- To create effective advertisements on various products

**Learning outcome:**

- The learner can describe the products on the basis of their features
- The learner can create advertisements as per requirements
- The learner can rate the roles of public relations

**Unit I**

Advertising – definition – History and development of advertising – functions of advertising – types of advertising – various criticisms on advertising – elements of advertising: slogan, Headline, sub headline, illustration, copy, product, Trademark – advertising as a tool of communication - Layout

**Unit II**

Product – definition – classification – product life cycle – types of product – target audience – types of audience – branding – brand image – brand positioning market segmentation – appeals – sales promotion

**Unit III**

Advertising budget – media strategy – media vehicle – definition – types of media vehicle – selection of media, planning and classification – ad agency – types of ad agency, structure and function of ad agency – Children and advertising – Women and advertising

**Unit IV**

Public Relations – role and meaning of PR – History of PR- Qualities of PRO – How to conduct PR Campaign – Importance of PR – codes of Ethics for PR – Role of photography in PR

**Unit V**

Principles of Public Relations – Methods of Public Relations (Tools) – Press Release – Press Conferences – Public Relations in Government sector – Public Relations in Private sector – Public Opinion – Basis of public opinion – Propaganda - Publicity

**Evaluation Pattern:**

End of semester exams will be conducted for 100 marks

**Reference Books:**

Mass Communication, Principles and concepts, second edition, Seema Hasan  
Foundations of Advertising, Theory and Practice, S. A. Chunawalla, K.C. Sethia

**BVC 1221****New Media****3 Hours/ 2Credits****Course Objectives:**

Enable the students

- To acquire the knowledge on new media and its impacts
- To learn the basics of social networking, E-Publishing and mobile communication
- To learn the usage of new media in contemporary Era

**Learning Outcome:**

- The learner can adopt the various types of social networking
- The learner can understand the importance of socializing and digitalizing
- The learner can analyze the new facet of new media

**Unit I**

New media – Definition – Scope and characteristics of new media (Five C's – Communication, Collaboration, Community, Creativity and Convergence), Old Vs new perspectives - Importance of new media in contemporary era

**Unit II**

Socializing – Definition – Importance of socialization in digital age- Role of New media in socialization

**Unit III**

Social Networking – Definition – Types of social networking – Characteristics of social networking - Positive and negative factors of social networking – Social networking and its impact on youth

**Unit IV**

E publishing – E books – Traditional reading and online reading - Job opportunities in E publishing - Mobile communication

**Unit V**

Role of new media in Education, Entertainment, Politics and Journalism, New media technologies – Web Related communication technology – Blogs and Wikis

**Evaluation Pattern:**

End of the semester exams will be conducted for 60 marks in theory and for the remaining 40 marks the continuous internal assessment mark will be added.

**Reference Books:**

1. Mike Ward, Journalism Online, Focal Press, Oxford, 2002
2. Dennis P. Curtin, Kim Foley, Kunal sen and Cathleen Morin, Information Technology, the breaking wave, Mc Graw- Hill College, 1998
3. Electronic media (second edition), Then, now and later, Norman J. Medoff, Barbara K. Kaye

**BVC 1222****Typography (Practical)****3Hours/ 2Credits****Course Objectives:**

Enable the students

- To learn about the basic types and style of the letters
- To learn Stencil cutting of letters
- To learn calligraphy writing

**Learning Outcome:**

- The learner can do stencil cutting
- The learner can write calligraphy
- The learner can do visual composition

**Unit I** Type – size –style – various types - form

**Unit II** Calligraphy - practical

**Unit III** Dot - line – shape – form - color

**Unit IV** Harmony – Balance – Rhythm – Symmetry – Proportion

**Unit V** Stencil cutting of the letters

**Evaluation Pattern:**

End of the semester exams will be conducted for 60 marks in theory and for the remaining 40 marks the continuous internal assessment mark will be added.

**Reference Books:**

Annie Moring, Calligraphy stroke –by – storke, Quantm Books, 2006

Sarkar, N. (2008) Art and Print Production. New Delhi: Oxford University Press

**BVC 1522****Media, Culture and Society****5Hours/ 5Credits****Course Objective:**

Enable the students

- To understand the importance and media and its culture
- To make use of media for the development of the society

**Learning Outcome:**

- The learner can explain the origin, Characteristic and functions of Media
- The learner can analyze the role of culture in developing the society
- The learner can able to revive the traditional types of media

**Unit I**

Mass media and its characteristics – Functions of mass media – Effects of mass media on individual, society and culture – Power of mass media

**Unit II**

Culture – Functions and effects of culture – Elements of culture – Role of media in developing the culture – popular culture and its transformation, Hero worship

**Unit III**

Mass culture – Habermas, Mass Culture and the early Frankfurt School – Problems with Mass Culture, public sphere and public Broadcasting, Marxism and Liberalism

**Unit IV**

Audiences – Television audience, Feminism and Soap opera, cultural imperialism, Modern Technology and culture, Oral, print and Modern culture

**Unit V**

Media in Madurai – Traditional media and their usage in transforming culture in the society, Media clubs, Tamil tradition in popularizing the culture

**Evaluation Pattern:**

End of Semester will be conducted for 100 marks

**Reference Books:**

Media Culture and Society, Paul Hodkinson, Sage Publications 2011

Digital Diversions Youth Culture in the age of Multimedia, Julian Sefton – Green UCL Press  
Pensylvannia

**BVC 1424****Graphic Design – I (Theory)****4Hours/ 4 Credits****Course Objectives:**

Enable the students

- To know the fundamentals and principles of graphic design
- To be acquainted with the various applications in print and electronic media
- To learn the basics of colour theory

**Learning Outcome:**

- The learner can design the layout for Print and Electronic Media
- The learner can understand the usage of graphics in various media
- The learner can create new designs

**Unit I**

Design practices and process: Role of design in society- Graphic design process. Principles and Elements of graphic design: Sketching and Drawing – Colour theory

**Unit II**

Fundamentals of Visual Composition: Typography- Types of Letterforms-structure-design function-function of type composition

**Unit III**

Fundamentals of design: Principles of composition – elements of Composition – relational visual devices

**Unit IV**

Principles of Layout Design: Theme and content – types of layout – layout composition – colour in layout-design for publication-layout of a Newspaper – Layout for a magazine.

**Unit V**

Media and Design: Advertising Design: Media Planning – Print Media – Electronic Media – New Media .Integrated methods of Design: Kinds of events – Corporate Social Responsibility. Graphic Design for Interactive Media: Website Design- Gestalt for web design - Designing Navigation- Interactivity

**Evaluation Pattern:**

End of semester exams will be conducted for 100 marks.

**Reference Books:**

1. Publication Division, (2011) Towards a new age graphic design. New Delhi: NCERT.
2. Sayre Henry M.(2010) World of Art New Jersey: Pearson Education Inc.
3. Sarkar, N.(2008) Art and Print Production. New Delhi: Oxford University Press
4. Arntson, Amy E. (2007) Graphic Design Basics. California: Thomson Wadsworth.



**BVC 1425****Graphic Design- II (Practical)****4Hours/ 4 Credits****Course Objectives:**

Enable the students

- To gain knowledge of the basics of layout and design
- To create advertisements and web pages
- To understand the importance of image editing

**Learning Outcome:**

- The learner can create layout for print and Web media
- The learner can design posters and magazine
- The learner can create image editing

1. Background Design
2. Type
3. Image editing
4. Colour concept
5. Logo
6. Visiting Card
7. Invitation
8. Poster Layout
9. News Paper Layout
10. Magazine Layout
11. Advertisement Layout
12. Web Page Design

**Evaluation Pattern:**

Students should submit Practical Records for Class work (using Design Software) and Home work (Manual Design work using pencil, poster colour on paper separately)

**Reference Books:**

Hanks Kurt.(2006) Rapid Viz., Boston: Thomson Course Technology

Kress, Genther R.(2006) Reading Images: the grammar of Visual Design, New York: Rutledge

Dodson, Bert (2007) Keys to Drawing with Imagination, Cincinnati: North Light Books

Gavin Ambrose, Paul Harris, GRIDS, AVA Publishing, 2008, Singapore.

Gavin Ambrose, Paul Harris, Layout, AVA Publishing, 2005, Singapore.

**BVC 1426****Media Management****5Hours/ 4Credits****Course Objectives:**

Enable the students

- To gain knowledge of the growth and function of media in society
- To become familiar with the technical operations and the structure of the management
- To learn the production unit of Radio, advertising, television and internet

**Learning Outcome:**

- The learner can able to understand various types of media
- The learner can able to know about the functions of various Media Management
- The learner can understand the production and distribution unit of Mass Media

**Unit I**

Origin and growth of media –functions of media – impact of mass media – media audience – media and society – management – management vs. media – communication – a management tool

**Unit II**

Advertising management – role of advertising within the market program – advertising plan – marketing plan – message strategy – media strategy – advertising production process – social advertising

**Unit III**

Radio – Technical function programming and production – radio production and distribution – station structure – management: sales, programming, engineering, promotion

**Unit IV**

Television – operation – production – structure of typical station – cable –operation – management – sales and marketing distribution – studio vs. field production

**Unit V**

Internet Management – Internet – marketing – function of the internet – E- commerce, E-commerce components – E- commerce incentives – sales on internet direct marketing on internet – customer service and internet

**Evaluation Pattern:**

End of semester exams will be conducted for 100 marks.

**Reference books:**

Media and Communication Management, C.S. Rayudu, 1998

Advertising Management, Rajeev Batra, John G. Myers, David A. Aaker

Management communication today, Niraj Kumar, 1998

Integrated Advertising promotion and marketing communication, third edition, Kenneth E. Clow, Donald E. Baack, 2011

**BVC 1222****Media Education****3Hours/ 2 Credits****Course Objectives:**

Enable the students

- To gain knowledge of media and its impact on society
- To understand the role of media in educating the children, women and youth
- To understand the generation gap

**Learning outcome:**

- The learner can explain the media education and literacy
- The learner can compile the impacts of media on society
- The learner can utilize the new media with social responsibility

**Unit I**

Media Education – definition – Need for Media Education – Importance of media Education - Old and new agendas in media education – active and passive consumer

**Unit II**

Media Literacy – concepts of media literacy – traditional literacy – Media literacy define by MIC – Computer literacy – relationship among Traditional and computer literacy

**Unit III**

Mass media – Role of Mass media in media education – social responsibility of media towards educating the society – Media Violence

**Unit IV**

New Media - Impacts of new media in role of Media Education towards Adolescents and Children

**Unit V**

Media and Sexuality – Women and Media – Emotional Intelligence of women towards media - impacts of changing lifestyle among Youth

**Evaluation Pattern:**

End of the semester exams will be conducted for 60 marks in theory and for the remaining 40 marks the continuous internal assessment mark will be added.

**Reference Books:**

Media Education in Asia, Springer, 2009

Media Education: Literacy, learning and contemporary culture, wiley – Blackwell, David Buckingham, 2003

Media education: an introduction, BFI Pub, Manuel Alvarvdo, Oliver Boyd – Barett

**BVC 1224****Digital Photography****3Hours/ 2 Credits****Course Objectives:**

Enable the students:

- To learn the fundamentals of photography
- To understand the various camera and its maintenance
- To learn about the types of photography

**Learning Outcome**

- Learners can handle the compact digital camera
- Learners can compose the pictures pleasing to our eye
- Learners can do basic in camera editing for picture

1. Basics of camera handling
2. Composition
3. Camera Care and Maintenance
4. Landscape
5. Architecture
6. Function photo
7. Passport photo
8. Portrait
9. Sports or fast moving object photo
10. Photos in available light
11. Photos with flash
12. Red Eye Reduction
13. Close up (Macro) photo
14. In Camera edit
15. Photos using built in effects

**Evaluation Pattern:**

Students should submit digital photos for continuous internal assessment. Internal 75 marks  
External 25 marks

**Reference Books:**

Banek, Cora.(2013) Learning to Photograph Volume 1, California: Rocky nook Inc.  
Obermeier, Barbara. (2008) Digital Photography Just the steps for Dummies, Indiana: Wiley Publishing Inc.

**BVC 2521****FUNDAMENTALS OF PHOTOGRAPHY****5 Hours/5 Credits****Course Objective:**

To enable the learners to be acquainted with photography in contemporary field.

**Learning Outcome:**

- The learner knows the basics of photography
- The learner understands the components, types and features of camera and digital camera

**UNIT I**

Camera – Camera Vs Eye - Components of Camera – Types of Camera – Lens – Meaning – Types of lens – Prime lens - Normal lens – Wide angle lens – Telephoto Lens – Types of Special lens – Fish eye lens – perspective control lens – Micro lens – Macro lens.

**UNIT II**

Photography – Definition – image - Pixels – Resolution – Composition – Rule of Third – Camera Controls – White balance - shutter – aperture – light meter – depth of field –Depth of focus - Focal length – ISO – Colour in photography – RGB Colour – CMYK Colour

**UNIT III**

Lighting – types of lighting – Three-point Lighting – Exposure – under exposure – over exposure – Sources to control the exposure – Filters – usage of filters in camera – types of filters – polarizing filters – UV filters – ND Filters.

**UNIT IV**

Photography in various fields – Product photography – lighting for product Photography Landscape photography – Wild life photography - Photo journalism – Candid photography – Night light photography – street photography.

**UNIT V**

Digital photography – Imaging Technique - Photo Manipulation– Using Adobe Photoshop for editing and creating.

**Reference Books:**

1. Robert Hirsch, Light and Lens: Photography in the Digital Age, Focal Press, 2008.
2. Tom Grimm, The Basic Book of Photography: Fifth Editing, Penguin, USA, 2003.
3. Scott Kelby, The Digital Photography, Peachpit Press: 2<sup>nd</sup> Edition, USA, 2013.
4. Rick Sammons, Complete guide to Digital Photography, W.W. Norton & Company Inc., 2004.

**BVC 2523****THEATRE AND CINEMA****5 Hours / 5 Credits****Course Objective:**

To enable the learners to have knowledge in the field of theatre and cinema.

**Learning Outcome:**

- The learner knows the fundamentals of theatre and cinema.
- The learner understands the effects of theatre script and theatre craft.

**UNIT I**

Theatre – Definition– Elements of theatre – Theatre as an art and Performance – Cinema – definition – Elements of Cinema - Crossroads between theatre and Cinema – Types of theatre (Proscenium, Thrust and End) – Audience – an introduction – types of audience – Audience role in theatre performance.

**UNIT II**

History of Indian Theatre – Theatre in Ancient India – Theatre in Medieval India – Contemporary Indian Theatre – History of Indian cinema - Traditional theatre forms – Nautanki – Rasaleela – Tamasha – Koodiyattam – Yakshagana - Therukoothu – Forms of Theatre – Environmental theatre – Political theatre – absurd theatre – Globe Theatre (Shakespeare Theatre).

**UNIT III**

Theatre Script – Playwright – Theatre Crew members – their duties and responsibilities – Elements of playwright – Acting – Stanislavski approaches towards acting.

**UNIT IV**

Theatre craft – Set Design – introduction – costume Design – Types of Costumes - Lighting Design – Stage lighting – makeup and props – Sound Design.

**UNIT V**

Plays Production – choosing a play reading – pre rehearsal period – rehearsal period – run through grand rehearsal – performance.

**Reference Books:**

1. Aparna Bhargava Dharsadker, Theatres of Independence: Drama, Theory, and Urban performance in India since 1947, Oxford University Press, 2005.
2. Ramaswami Harindranath, Audience – citizens: The media, public knowledge and interpretive practice, Sage Publication, 2009.
3. David Allen, Stanislavski for beginners, Orient Longman Pvt Ltd., 1999.

**BVC 2525****FILM LANGUAGE****5 Hours/5Credits****Course Objective:**

To enable the learners to gain knowledge on film language.

**Learning Outcome:**

- The learner knows about shot, screenplay and lighting effects.
- The learner understands the basics of editing, sound and film genres.

**UNIT I**

Shot – sequence – scene - shot sizes – camera angles – Camera Movements – Story – idea – structure – plot – screenplay – point of view (Story, Direction, Camera, and Editing) – Mise –en- scene - 5 W's of film – Set Design – Props – Lighting – costumes.

**UNIT II**

Lighting – types of lighting – Three points lighting – high key lighting – low key lighting – contrast lighting – lighting in location – units of light – hard light – soft light – Image manipulation.

**UNIT III**

Principles of Editing – Cuts and Transitions – Chronological Editing – Cross Cutting – Parallel Editing – Continuity Editing – Montage – Deep Focus.

**UNIT IV**

Sound – Diegetic Sound and non-diegetic sound - cinematic time and space, noise.

**UNIT V**

Narrative structure – Linear Narrative structure – Non linear Narrative structure - Film Genres – Horror – Historical – Western – War and Crime – Science fiction – Action – Adventure – Comedy – Drama - Film Appreciation.

**Reference Books:**

1. Monaco. J, How to read a film, Oxford University Press, New York, 2000.
2. Robert Edgar Hunt, John Marland, Steven Rawle, Basics Film making of the language of film, AVA Publishing (UK) Ltd., 2010.
3. Bruce Block, The Visual Story: Creating the visual structure of Film, TV, and Digital Media, Second Edition, Focal Press, 2008.
4. Stephanie Marriott, Live Television: Time, space and the broadcast Event, Sage Publications, 2007.

**BVC 2427****PRACTICAL PHOTOGRAPHY****4 Hours / 4 Credits****Course Objective:**

To Enable the learners to gain knowledge for the practical application of photography in media.

**Learning Outcome:**

- The learner explains the various types of photography.
- The learner acquires skills in video journalism.

**UNIT 1**

Rule of third – composition – perspective – portraiture – landscape.

**UNIT II**

Over exposure - Under exposure - Photography with different types of lens (Normal lens, wide angle lens, telephoto lens)

**UNIT III**

Product Photography - Lighting for Product - Product photography with model - portraiture – landscape – street photography – candid photography – fashion photography.

**UNIT IV**

Photo Journalism - ethics of photo journalism.

**UNIT V**

Street photography - Candid Photography – fashion photography.

**Evaluation Pattern:**

Assessment I and Assessment II will be evaluated for 25 = 25 = 50 Marks and the record note will be evaluated for 25 Marks

**Reference Books:**

1. Bryan Peterson, Understanding Exposure: How to shoot great Photographs with any camera, Amphoto Books, Fourth Edition, New York, 2016.
2. Al Judge, Mastering Aperture, Shutter speed, ISO and Exposure, CreateSpace Independent Publishing Platform, 2014.
3. Arnold Wilson, Nature Photography: Location and studio Workshop, Fountain press Newpro UK Limited, 2001.
4. Vivien Morgan, Practising video Journalism, Routledge, 2008.

**BVC 2429****VISUAL ANALYSIS****5 Hours / 4 Credits****Course Objective:**

To enable the learners to gain knowledge on various media analysis techniques.

**Learning Outcome:**

- The learner knows about Semiotic and Marxian analysis.
- The learner understands the grid group analysis and its applications on the visuals.

**UNIT I**

Semiotic Analysis : Social aspects of semiotics : The individual and society – Saussure on the science of semiology – signs – Forms of signs – Signs and Truth – Connotation and Denotation – Syntagmatic analysis – Paradigmatic analysis – Codes – Cultural aspects of Codes – Semiotics of the television medium

**UNIT II**

Marxian Analysis: Materialism – Ideology – Alienation – The consumer society – Hegemony – Grid Group analysis – Marxist Criticism in the postmodern world

**UNIT III**

Psychoanalytic Criticism: The conscious – sexuality – The Oedipus complex- Media and Oedipus complex – Id,Ego and Superego- structural hypothesis applied to culture – symbols- Dreams - Aggression and Guilt – Freud and Beyond – Psychoanalytic analysis of Media

**UNIT IV**

Sociological analysis: Bureaucracy – Ethnicity – Lifestyle – Mass society – Postmodernism- Sex and Gender – Socialization – Stereotypes – Values

**UNIT V**

Cellphone, Social media and Problem of identity: social media-metaphors – Advertising analysis

**Evaluation Pattern:**

Continuous Assessment of Two tests for 30 marks each will be conducted based on the theoretical inputs by way of written tests. Analysing Texts and home exercises will be evaluated for 40 marks. External exam will be conducted for 100 marks.

**Reference Books:**

1. Arthur Asa Berger Media Analysis Techniques, Sage Publications, New Delhi,2012.
2. Marcell Denesi Messages, Signs and Meanings Canadian Scholars Press Inc. Torondo, 2004.
3. Gillian Rose Visual Methodology. Sage Publications India Pvt. Ltd., New Delhi, 2012.
4. Kunther Kress Reading Images: The Grammar of Visual Design,Routledge, New York, 2006.
5. Monaco. J, How to read a film: Movies Media and Beyond, Oxford University Press, 4<sup>th</sup> Edition, New York, 2009.



**BVC 2522****SOUND AND IMAGE****5 Hours / 5 Credits****Course Objective:**

To enable the learners to gain knowledge on the fundamentals of sound recording.

**Learning outcome:**

- The learner knows the history of sound recording systems.
- The learner understands the musical styles, musical genres and art and craft of matching sound and image.

**UNIT I**

History of Sound Recording – Cylindrical phonograph – Gramophone - Technology and elements of recorded medium - Magnetic tape – Stereo – Digital Recording.

**UNIT II**

Noise – sound – Music and its elements – Sound and texture – pitch – melody – Harmony – Scale – Rhythm – Dynamics – Musical Form – Voices.

**UNIT III**

Musical Styles and Genres – Indian and Western Classical (Carnatic, Hindustani and Symphony) – Contemporary Styles – Pop – rock – jazz – Hip hop – Mash up.

**UNIT IV**

The art and craft of matching sound and image – the art of listening – music and culture – Music and Imagination – Sound and Emotions - movies sound track – Documentaries – Tele serials – Ad – jingles – Music Time and Space

**UNIT V**

Sound Design for various visual genres – Recent application of sound among youth.

**Evaluation Pattern:**

End of semester exams will be conducted for 50 marks and a 50 marks practical project will be given.

**Reference Books:**

1. Deena Kaye, James LeBrecht, Sound and Music for the theatre: the art and technique of design, Gulf Professional Publishing, 2000.
2. Mann Hanson, Reinventing music video: Next generation directors, their inspiration and work, Rotovision, 2006.
3. Gorham Kindem, Robert B. Musburger, Introduction to Media Production: The path to digital media production, Focal press, Burlington, Third Edition, 2005.

**BVC 2428****THEORIES OF COMMUNICATION****4 Hours / 4Credits****Course Objective:**

Enable the learners to obtain knowledge in the theories of communication and media effects on audience.

**Learning Outcome**

The learner knows the need of communication.

The learner understands the theories of communication and the effects of media on audience.

**UNIT I**

Mass Communication: Definition, scope and need for communication – Elements of Communication – Theories of Persuasion and Human Communication

**UNIT II**

Theories of Media and Society – Marxist theory – Functionalist theory – Critical Political- economic theory – Development theory – Information theory and cultural theory

**UNIT III**

Sociological Theories of Mass Communication: Cultivation theory – Social Learning theory – Agenda setting theory – Play theory – Uses and Gratification theory – Dependency theory

**UNIT IV**

Normative theories of Mass media: Authoritarian theory – Libertarian theory – Social Responsibility theory – Soviet Communist theory – Development media theory – Democratic participant media theory

**UNIT V**

Media effects – Long term and short term – Comstock's model – effects model – Media audience – Audience positioning – Audience research tradition

**Evaluation Pattern:**

End of semester exams will be conducted for 100 marks

**Reference Books:**

Dennis Mc Quail, Mass Communication Theories: An Introduction, Sage Publication, New Delhi, 1998.

Stanley J.Baren, Introduction to Mass Communication, Mayfield Publications, London, 1999.

Fred Ingles, Media Theory – An Introduction, Basil Blackwell Ltd., UK, 1990.

**BVC 2524****SCREEN WRITING****5 Hours / 5 Credits****Course objective:**

To enable the learners to know the writing techniques, style, and structure in media production

**Learning outcome:**

- The learner knows the writing techniques.
- The learner prepares script for media.

**UNIT I**

Story telling: One line, Story, Story development,

**UNIT II**

Screenplay, Character Building in film, time and space, Point of view.

**UNIT III**

Types of Script formats: Full script, semi script, show down and run down sheet, shooting script: Shot break down, Scene Breakdown.

**UNIT IV**

Writing for Print Media: Articles, News, Feature, writing for Radio: News, Drama, Interviews, Documentary, Writing for visual Media for various television programmes: News, Reality show, Interview, Discussion, Serials, TV Documentary.

**UNIT V**

Story Board, writing for PSA (Public Service Announcement), writing for Short films and advertisement.

**Evaluation Pattern:**

Assessment I and Assessment II will be evaluated for 25 = 25 = 50 Marks and the record note will be evaluated for 25 Marks.

**Reference Books:**

1. Blacke synder, Save the Cat! Strikes back Save the Cat ! Press, 2009
2. Syd Field, The screenwriter's problem solver: How to recognize, identify, and define screenwriting problems, Bantam Dell, 2006.
3. David Tottier, The Screenwriter's bible: A complete Guide to Writing, formatting, and selling your script, Sixth Edition, Silman James Press, Los Angeles, 2014.
4. Pat Cooper, Ken Dancyger, Writing for Short Film, Third Edition, Focal Press, California, 2007.

**BVC 2526****2D ANIMATION****5 Hours/5Credits****Course Objective:**

To enable the learners to gain knowledge on the concepts and methods of Animation

**Learning Outcome:**

- The learner knows to create and edit the symbols.
- The learner applies filter effects on graphics.

**Unit I**

Introduction to Animation- About computer animation – Principles of Animation – Animation production – Animation tools& techniques – Computer animation production tasks

**Unit II**

Types of Animation – Introduction to 2D Animation – Creating Storyboard - An overview of Adobe Flash – Explore the panels – Creating and editing the symbols – Writing a basic Action script

**Unit III**

Editing layer properties – Text more in Flash – Managing the Timeline – Applying a Filter effect on Graphics – Optimizing Flash movies – Publishing Flash movies

**Unit IV**

Introduction to interactive multimedia – About Internet – Basic HTML scripting – About the web colours – Developing interactive web pages – Web Banner Creation

**Unit V**

Adding sound file to Flash projects – Converting movie file to FLV – Integrating Flash movies with HTML documents – Creating contents and presentations in Flash

**Project Outline:**

- Logo animation
- Web Banner
- 2D Product Ad.
- Web designing (front page)
- Portfolio

**Evaluation Pattern:**

Continuous assignment marks will be given on the basis of practical seminars conducted in the lab.

The end of the semester exam will be based on projects conducted in the lab and will be evaluated for 100 marks.

**Reference Books:**

1. Doug Sahlin and Bill Sanders, Flash CS4 all in one for dummies, First Edition, Wiley Publishing Inc., 2009.
2. Doug E. Comer., The Internet Complete Reference, Millenium Edition, Mc Graw Hill Companies
3. Wendy Willard, HTML A Beginner's Guide, Fourth Edition, Tata Mc Graw Hill, 2009.

**BVC 2430                      MEDIA BUDGETING & FINANCING                      5 Hours/ 4 Credits****Course Objective:**

To make the learners to understand the fundamentals of accounting and financial management

**Learning Outcomes:**

- The students of VISCOM can able to prepare a budget for their projects.
- The students can able to maintain accounts and understand their financial performance

**UNIT I**

Financial Accounting: Double-entry accounting, rules, Receipts and Payments Account, Income Statement, Structure of the balance sheet

**UNIT II**

Cash Management: Introduction, Meaning and Importance of Cash Management Objectives of Cash Management, Cash Planning, Cash Forecasting and Budgeting.

**UNIT III**

Financing Social reforms, credit financing, equity financing, the role of investment banks, taxes, sponsorship, gap financing, financing models, concepts and strategies

**UNIT IV**

Investment - Basics of financial mathematics, static and dynamic investment calculation method

**UNIT V**

Cost of Capital: Introduction, Meaning of Cost of Capital, Cost of Different Sources of Finance

**Reference Books:**

1. Khan M & Jain Y, Cost and Management accounting, Tata Mc Graw Hill India Ltd., New Delhi, 2002
2. Pandey, I M, Management Accounting, Vikas Publishing House, 2004.
3. Vinayagam, Mani Principles of Accountancy, S Chand & Co ltd, New Delhi, 2003
4. Gupta R. L, Gupta VK, Fundamentals of Accounting, S Chand & Sons, New Delhi, 2003

**BVC 2430 (2017 onwards) VISUAL AD****5 Hours/ 4Credits****Course Objective:**

To enable the learners to gain knowledge on the fundamentals of story development in visual ad

**Learning Outcome:**

- The learner knows the concept of screenplay.
- The learner understands types of advertising copy.

**UNIT I**

Idea /Concept – Story creation from idea – Story Development – Screenplay - Scriptwriting – Single column script – double column script – script for various programmes in television.

**UNIT II**

Character building – Characterization in story – internal conflict – external conflict – improvisation of character - Camera – introduction – Camera shot – camera angle – camera movement

**UNIT III**

Lighting – types of lighting – three-point lighting – Chroma-key - Advertisement – storyboard – writing for commercial – Slogan – logo – illustration – thumbnail for advertisement

**UNIT IV**

Copywriting – ad copy – types of ad copy – Different types of commercials – Jingles – corporate advertisements – Institution advertisements - Advertisement with dialogue – Advertisement without dialogue.

**UNIT V**

Sound – dubbing – voice over – narration in ad films - Editing – basic transition – effects – titling.

**REFERENCE BOOKS:**

1. Syd Field, The screenwriter's problem solver: How to recognize, identify, and define screenwriting problems, Bantam Dell, 2006.
2. Seema Hasan, Mass Communication – Principles and Concepts, CBS Publishers and Distributors Pvt. Ltd., New Delhi, 2013.
3. Herbert Zettl, Television Production Handbook, Wordsworth Publication, New York 2009.

**BVC 3621****TELEVISION PRODUCTION****6Hours/ 6Credits****Course Objective:**

To enable the learners to gain knowledge on programme production in TV.

**Learning Outcome:**

- The learner knows the production stages and scripting types.
- The learner understands the camera production and the role of lighting and sound in programme production.

**UNIT I**

Television Standards – NTSC – PAL – SECAM – Television technology – Standard – HD - Production stages – pre production – production – post production – Analog and Digital forms of television – Genres in Television - Understanding the television medium – signs – codes and functions of television.

**UNIT II**

Television Scripting – types of scripting – scripting for various programs in television – story board – Set Design - Production Crew and its functions.

**UNIT III**

Camera – an introduction – mounting devices - ENG and EFP Production - Single Camera Production – Multi-camera Production – Camera for various production – Fiction – TV Serials – Reality show – Nonfiction – News – Interview – TV Documentary – Video journalism.

**UNIT IV**

Lighting – an introduction – its importance in television– Colour Temperature –Types of lighting – Chroma Key – Chrominance - Luminance – Sound Design – On screen sound and Off screen sound - Microphone – Types of microphone – Usage of microphone in various programs.

**UNIT V**

Editing - On line editing and off line editing – Basic transitions – Television graphics, titling and special effects

**Evaluation Pattern:**

End of semester exams will be conducted for 50 marks and a 50-mark practical project will be given.

**Reference Books:**

1. Herbert Zettl, Television Production Handbook, Wordsworth Publication, New York 2009.
2. Seema Hasan, Mass Communication – Principles and Concepts, CBS Publishers and Distributors Pvt. Ltd., New Delhi, 2013.
3. Gerald Millerson, Jim Owens, Video Production Handbook: Fourth Edition, Focal Press, Burlington, 2008.
4. Charlotte Worthington, Basics Film making of Producing, AVA Publishing (UK) Ltd., Switzerland, 2009.

**BVC 3531****MEDIA LAWS AND ETHICS****5 Hours/ 5Credits****Course Objective:**

To enable the learners to gain knowledge on the importance of laws and ethics of media.

**Learning outcome**

- The learner knows the basics of Indian constitution and fundamental rights
- The learner explains media acts and code of ethics in various circumstances.

**UNIT I**

Indian Constitution - Fundamental Rights – Right to Information – Freedom of Expression – Freedom of Press – Contempt of Court – Defamation – Libel and Slander

**UNIT II**

Press and Registration of Books Act – Indian Telegraphy Act – Copy right Act – Official Secrets Act – Indecent Representation of Women (Prohibition) Act – Indian Penal Code – Press Council

**UNIT III**

Ethics of Advertising & Public Relations – Advertising and Social issues – Ethics in Advertising – ASCI (Advertising Standards council of India) Code – Media and Public relations – Ethics of Public Relations

**UNIT IV**

Code of ethics of Radio and TV and Cinema – Social responsibility of media – Chanda Committee – Verghese Committee – Ethics of Broadcasting – CBFC – Film Censorship – PrasarBharathi – VividhBharathi – Joshi Committee – Broadcast Regulation Bill (2007) – Cable TV Act

**UNIT V**

Cyber laws – Impact of Internet and Web – Plagiarism – Obscenity and Indecency – Social Networking – Cyber crime

**Reference Books:**

1. ParanjyGuhaThakurta, Media Ethics, Oxford University Press, New Delhi, 2012
2. Yashada, Right to Information Act 2005, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2006.
3. Seema Hasan, Mass Communication –Principles and Concepts, CBS Publishers &Distributors Pvt Ltd, New Delhi, 2013



**BVC 3623****3 D ANIMATION****6 Hours/ 6Credits****Course Objective:**

To enable the learners to gain knowledge on 3 D animation.

**Learning Outcome:**

- The learner knows the basics of animation.
- The learner understands the various tools of modeling.

**UNIT I**

Modeling – Introduction to MAYA – Tools for modeling- Create Basic Modeling – Poly Modeling – Face – Body – Hand- Ear

**UNIT II**

Shading – Introduction to Hyper shade – Maya nodes – 2D &3D Textures for UV mapping

**UNIT III**

Lighting- Introduction to Maya lights – Using default lights for Interior and Exterior - Shadow – Introduction to Monterey - Caustics – Illumination – final gathering

**UNIT IV**

Visual effects (dynamics) – Introduction to Particals – Fluid – fields- Soft and Rigid Bodies – Effects

**UNIT V**

Rigging– Introduction for rigging -Skeleton - Creating two leg skeleton – Skimming- Principles of animation – Introduction to Walk cycle – Camera rendering

**Evaluation Pattern:**

Continuous assignment marks will be given on the basis of practical seminars conducted in the lab.

The end of the semester exam will be based on projects conducted in the lab and will be evaluated for 100 marks.

**Reference Books:**

Danny Riddle, Andrew Birtt, MAYA, Peachpit, 2002.

John Kundet, Mick Carkins, Gibbs, Eric Kun Zendof, DariushDevakhshani, Mastering Maya 8.5, John Willy and Sons, New Delhi, 2008.

DariushDevakhshani, Introducing Maya, John Willy and Sons, New Delhi, 2010.

**BVC 3625****MEDIA PRODUCTION – I****6 Hours/ 6Credits****Course Objective:**

To enable the learners to gain knowledge on media production.

**Learning Outcome:**

- The learner gets exposure to photography.
- The learner edits the audio and video programs.

**The specializations for the students are;**

1. Photography (Event photography, Product Photography, Architect Photography, Portrait)
2. Editing (Audio Video Editing, Transitions, Titling)
3. Short Film and documentary (One minute short film, PSA, Television Documentary)

**Evaluation Pattern:**

Assessment I and Assessment II will be evaluated for 25 = 25 = 50 Marks and the record note will be evaluated for 25 Marks

**Reference Books:**

1. Scott Kelby, The Digital Photography, Second Edition, Peachpit Press, 2013.
2. Rick Sammons, Complete guide to Digital Photography, W.W. Norton & Company Inc., 2004.
3. Gerald Millerson, Jim Owens, Video Production Handbook: Fourth Edition, Focal Press, 2008.

**BVC 3225****PRACTICAL THEATRE****3 Hours/ 2Credits****Course Objective:**

To enable the learners to get knowledge on the practical theatre.

**Learning Outcome:**

- The learner knows the basics of theatre.
- The learner performs street play and Mime.

**UNIT I**

The games for actors - games for improving imagination – concentration – team spirit - spontaneity

**UNIT II**

Body, Mind, Voice Coordination through games and exercises

**UNIT III**

Various theatre forms - traditional – proscenium and other experimental theatre forms

**UNIT IV**

Creating scripts through Folk tales -short stories –poetries – issues and incidents

**UNIT V**

Play: working with scripts – planning rehearsals – performances

**Evaluation Pattern:**

All tests and quiz marks will be assessed on individual exercise and group performances. End of the semester exam will be assessed on the basis of a full length play production. Group performances will be evaluated. Internal 75 marks External 25 marks.

**Reference Books:**

1. Se. Ramanujam Naadakak Katturaigal Compiled by C. Annamalai, Kaavya Publishers, 2003.
2. Gill Foreman A Practical Guide to working in Theatre, First Edition, A & C Black Publishers, London, 2009.
3. Sally Mackey, Practical Theatre, First Edition, NelsonThomes, Cheltenham, 1997.
4. Alison Oddey, Devising Theatre: A Practical and Theoretical Handbook, First Edition, Routledge, New York, 1996.

**BVC 3200****ENVIRONMENTAL STUDIES****4 Hours/ 2 Credits****Course Objective:**

To enable the learners to gain knowledge on the importance of environment.

**Learning Outcome:**

- The learner knows the basics of environment.
- The learner understands the effects of pollution at local and global levels.

**UNIT I**

Introduction – multidisciplinary nature of environmental studies – Basics of Lithosphere – hydrosphere – Biosphere.

**UNIT II**

Sustainable energy – solar energy – energy from earth's forces – earth from biomass – nuclear energy – best resources – use and overexploitation – energy crisis – deforestation – afforestation measures.

**UNIT III**

Ecosystem – structure – function – Pond ecosystem – Grass land eco system – Food chain – Food web – energy flow pyramid.

**UNIT IV**

Biodiversity – Ecosystem diversity – hotspots – Eco tourism – Pollution – Water pollution – air pollution – Land Pollution – Global warming – Acid Rain – Ozone Depletion.

**UNIT V**

Media Environment – Global environmental issues and media responses – documentaries and feature film relating to environment.

**Evaluation Pattern:**

Assessment I and Assessment II will be evaluated for 25 = 25 = 50 Marks and the record note will be evaluated for 25 Marks

**Reference Books:**

1. Deena Kaye, James LeBrecht, Sound and Music for the theatre: the art and technique of design, Gulf Professional Publishing, 2000.
2. Erach Bharucha, Environmental studies for Undergraduate Courses, University Press. 2006.

**BVC 3622****FICTION AND FILM****6 Hours/ 6Credits****Course Objective:**

To enable the learners to obtain knowledge on fiction and film.

**Learning Outcome:**

The learner knows the history of fiction and film.

The learner understands the narrative structure, character building and elements of adaption.

**UNIT I**

History of cinema – Principles of film – Narrative form and non – formative form – Dividing a film into genres (language, style, grammar, syntax)

**UNIT II**

Understanding various narrative structures – Epic – Folktales – Short stories – novel – drama – Elements of visual narratives - plot, theme, character, settings, point of view - Scenes and Sequences

**UNIT III**

Character building – time, space and action – Character Checklist: physical, sociological and psychological data – Dialogue – Text and Sub text – Screenplay

**UNIT IV**

Elements of Adaptation – Transformation and Improvisation – from fiction to film

**UNIT V**

World Cinema: Charles Dicken's Oliver Twist – Alice Walker's Colour Purple

Indian Cinema: Balu Mahendra's KathaiNeeram – Short stories / short films and selected short films.

**Evaluation Pattern:**

End of semester exams will be conducted for 100 marks

**Reference Books:**

1. Richard MeranBarsam, Nonfiction film: A Critical History, Indian University Press, New Delhi,1992
2. Deborah Cartmell, I.Q.Hunter, Heidi Kaye, Imelda Whelehan, Classics in film and fiction, Pluto Press, 2000
3. David Bordwell, Narrative in the fiction film, University of Wisconsin Press, 1985
4. Linda Serger, Art of Adaptation: Turning Fact and Fiction into Film, First Edition, Owl Books, New York, 1992.

**BVC 3624 DEVELOPMENT COMMUNICATION****6 Hours/ 6Credits****Course Objective:**

To enable the learners to gain knowledge on the origin and evolution of development communication.

**Learning Outcome**

The learner knows the origin of development communication.

The learner undertakes projects for the development of the society.

**UNIT I**

Introduction to development - Dynamics of development – Developmental issues – Development indicators – Role of Communication in development – Approaches to Development Communication

**UNIT II**

Origin of development communication concept - Post II world war – Rise of International Communication – Early years of development - Role of Everet Rogers – Wilbur Schramm in development – Focus on Tele communication

**UNIT III**

Development Communication - Need for development Communication – Models of development Communication – Differences between communication and development communication – Role of media in Development – Using folk forms for social change

**UNIT IV**

Media for rural development – Radio and TV development programmes – Agriculture, Health, Education, Environment, Cultural Preservation – National Integration – SITE – Kheda Project

**UNIT V**

Modernization – Diffusion of Innovation – Culturist model – Self Reliance - New Communication Technologies and Development - Development Support Communication – Participatory Communication

**Evaluation Pattern:**

End of semester exams will be conducted for 60 marks in theory and for the remaining 40 marks the continuous assessment mark will be added.

**Reference Books:**

1. Paolo Mefalopulos, Development Communication Source book, The World Bank, Washington, 2008.
2. Thomas L. McPhail, Development Communication, A John Wiley & Sons Ltd., Publication, 2009.
3. Seema Hasan, Mass Communication – Principles and Concepts, CBS Publishers & Distributors Pvt Ltd, New Delhi, 2013.

**BVC 3532****INTERNSHIP****5 Hours/ 5Credits****Course Objective:**

To enable the learners to gain field knowledge on media.

The Internship training takes the students to the next level of growth in their career giving them a chance to exhibit their talents. Every student gets an opportunity to work in a firm of their choice, to continue their career in the future.

Moreover the internship enacts as a platform for employment. The internship period is for a minimum of 300hours.

The students will be assessed in terms of the knowledge, they acquired from the institutions they worked, thereby giving us the clear picture of where they stand in the growth ladder.

**Evaluation Pattern:**

The work will be assessed by both internal and external examiners for 75 marks and a vice voce will be conducted by the panel for 25 marks.

**BVC 3626****MEDIA PRODUCTION- II****6Hours / 6Credits****Course objective:**

To enable the learners to have knowledge on photography, editing and short film making.

**Learning Outcome:**

- The learner gets field experience in taking photographs.
- The learner gets field experience in editing and short film making.

**The specializations for the students are**

1. Photography (Creative wedding photography, Nature Photography, Landscape Photography, Candid Photography)
2. Editing (Audio Video Editing, Transitions, Titling, Visual Effects)
3. Short Film and documentary (short film, Tele Film, Documentary on social issues)

**Evaluation Pattern:**

Assessment I and Assessment II will be evaluated for 25 =25 = 50 Marks and the record note will be evaluated for 25 Marks

**Reference Books:**

1. Charlotte Worthington, Basics Film making of Producing, AVA Publishing (UK) Ltd, Switzerland, 2009.
2. Gorham Kindem, Robert B. Musburgerm, Introduction to Media Production: The path to digital media production, Focal press, Burlington, 2005.

**BVC 3226****ART FROM ANYTHING****3 Hours/ 2 Credits****Course Objective:**

To enable the learners to gain knowledge on making art works from any available material.

**Learning Outcome:**

- The learner understands the methods of making art.
- The learner makes art from any available material.

**UNIT I**

Making greeting cards using handmade papers – Dry flowers – Dry leaves and any available materials

**UNIT II**

Miniature Sculpture carvings – Candles – Soap, Chalk and Clay and from other available materials

**UNIT III**

Rubber Castings – Reproducing ant figures and design

**UNIT IV**

Wall Hangings- Decorative design using glass, wood, stain glass and cloth

**UNIT V**

Origami and paper craft

**Evaluation Pattern:**

Continuous assignment marks will be given on the basis of practical exercises given for each unit.

**Reference Books:**

1. Joanna Lorenz, Harriet Lanzer, Make it yourself, Annes Publishing Limited, 1997.
2. Neelam Verma, Traditions : A Complete Book of Indian Arts and Crafts Motifs: Special Reference to Rangoli Design, English Edition Publishers and Distributors, 2005.
3. Elizabeth Cumming, Wendy Kaplan, The arts and crafts movement, Thames and Hudson, 1991.
4. Dona Z. Meilach, Creating Art from Anything: Ideas, Materials, Techniques, 1974

**Programme for  
Undergraduate Department of B.Sc. Information Technology**

Sem	Part	Course No.	Course Title	Hrs	Credits	Marks
1	I	TAM/FRE /HIN	Language	3	2	30
1	II	ENS 1201	Conversational Skills	3	2	30
1	IIIC	BIT 1501	C Programming	5	5	75
1	IIIC	BIT 1403	C Programming Lab	4	4	60
1	IIIC	BIT 1405	Principles of IT	4	4	60
1	IIIS	BIT 1407	Digital Principles and Applications	5	4	60
1	IVNME -I	BIT 1201	e –Commerce	3	2	30
1	IVLS - I	BIT 1203	HTML 5	3	2	30
Total				30	25	375
2	I	TAM/FRE /HIN	Language	3	2	30
2	II	ENS 1202	Reading & Writing Skills	3	2	30
2	IIIC	BIT 1502	C++ Programming	5	5	75
2	IIIC	BIT 1404	C++ Programming Lab	4	4	60
2	IIIC	BIT 1406	Data Structures using C (TL)	4 (2+2)	4	60
2	IIIS	MAS xxxx	Statistics	5	4	60
2	IV NME-II	BIT 1202	Cyber law & Cyber security	3	2	30
2	IV LS-II	BIT 1204	Emerging Computing paradigms And Technologies	3	2	30
2	V		PED/NSS/SLP		1	15
Total				30	26	390
3	I	TAM/FRE /HIN	Language	3	2	30
3	II	ENS 2201	Study Skills	3	2	30
3	IIIC	BIT 2501	SAD (TL)	5(3+2)	5	75
3	IIIC	BIT 2503	Software Testing	5	5	75
3	IIIC	BIT 2505	Java Programming	5	5	75
3	IIIC	BIT 2407	Java Programming Lab	4	4	60
3	IIIS	MAS xxxx	Operational Research	5	4	60
Total				30	27	405



Sem	Part	Course No.	Course Title	Hrs	Credits	Marks
4	I	TAM/FRE /HIN	Language	3	2	30
4	II	ENG 2202	Career Skills	3	2	30
4	IIIC	BIT 2502	Operating System	5(3+2)	5	75
4	IIIC	BIT 2504	Computer Networks	5	5	75
4	IIIC	BIT 2506	Relational Database Management Systems	5	5	75
4	IIIC	BIT 2408	RDBMS Lab	4	4	60
4	IIIS	BIT 2410	S/W Project Management	5	4	60
4	V		PED/NSS/SLP		1	15
Total				30	28	420
5	IIIC	BIT 3601	Web Programming(TL)	6(3+3)	6	90
5	IIIC	BIT 3603	S/W Development Lab I (TL)	6(2+4)	6	90
5	IIIC	BIT 3605	Software Engineering	6	6	90
5	IIIC	BIT 3607	Enterprise Resource Planning	5	5	75
5	IVLS – III	BIT 3209	Internet Technologies	3	2	30
5	IVVE	VAL	Value Education	4	2	30
Total				30	27	405
6	IIIC	BIT 3602	.NET Programming(TL)	6(3+3)	6	90
6	IIIC	BIT 3604	S/W Development Lab II (TL)	6(2+4)	6	90
6	IIIC	BIT 3606	DM & DW	6	6	75
6	IIIC	BIT 3508	Mobile Technologies	5	5	90
6	IVEVS	BIT 3200	Environmental Studies	4	2	30
6	IVLS - IV	BIT 3210	Cloud Computing	3	2	30
Total				30	27	405
Grand Total (Semester I – VI)				180	160	2400

C: MAJOR CORE

S: MAJOR SUPPORTIVE

I: INNOVATIVE

NME: NON MAJOR ELECTIVE

VAL : VALUE EDUCATION

LS:LIFE SKILL

Course Offered to Non-Major Students by the Department of Information Technology

**Part IV Non-Major Electives**

Sem	Course No.	Course Title	Hours	Credits	Marks
1	BIT 1201	E –Commerce	3	2	30
2	BIT 1202	Cyber Law& Cyber Security	3	2	30
		Total	6	4	60

**Part IV Life Skill Courses**

Sem	Course No.	Course Title	Hours	Credits	Marks
1	BIT 1203	HTML 5	3	2	30
2	BIT 1204	Emerging Computing Paradigms And Technologies	3	2	30
3	BIT 3209	Internet Technologies	3	2	30
4	BIT 3210	Cloud Computing	3	2	30
		Total	12	8	120

**BIT 2501****SYSTEM ANALYSIS AND DESIGN****5(3+2) hr/5 cr****Objective:**

The objective of the course is to outline the importance of System analysis and Design and highlight the various phases in Analysis and Design.

**Unit 1**

**Information systems concepts-** Business information systems, information system levels - operational, lower, middle, top management- the system development life cycle concepts- Life cycle activities- life cycle flow chart, task, management review, baseline specifications, role of system analyst.

**Unit 2**

**Basic tool of system analysis:** forms design - basic parts of form, style and types of form, principles of form design, Tools for structure analysis and design- Types of basic charts, decision tables, decision trees, structured English, data flow diagram, data dictionary, system flow charts, flow charting symbols

**Unit 3**

**Study phase:** fact finding techniques, fact analysis techniques, steps in feasibility analysis, Design phase: Design phase activities, structure design, input design, output design

**Unit 4**

**Object Orientated Technology,** Development and OO Modeling, History, Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models, Class design.

**Unit 5**

**Development phase:** Development phase activities, bottom up and top down computer program development, training- programmer, operator, user trainings – conversion-change over plan- PERT- steps in computer program development- structured programming- development phase report.

**Text book(s)**

- 1) Kendall, **System Analysis And Design**, 9<sup>th</sup> edition, 2013
- 2) Grady Booch, James Rumbaugh, Ivar Jacobson, **The Unified Modeling Language User Guide**, Pearson Education, 2<sup>nd</sup> edition, 2005

**Reference Books:**

- 1) Marvin Gore & John Stubbe, **Elements Of System Analysis**, Galgotia Book Source, 4e, 1998
- 2) Michael Blaha and James Rumbaugh, **Oriented Modeling and Design with UML**, 2<sup>nd</sup> edition, 2005

**BIT 2503****SOFTWARE TESTING****5 hr/5 cr****Objective:**

The objective of the course is to outline the importance of Software Testing and to highlight the various types of Testing

**Unit 1**

**INTRODUCTION:** Testing as an Engineering Activity – Role of Process in Software Quality – Testing as a Process – Basic Definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Defect Classes – The Defect Repository and Test Design – Defect Examples – Developer/Tester Support for Developing a Defect Repository.

**Unit 2**

**TEST CASE DESIGN -I:** Introduction to Testing Design Strategies – The Smarter Tester – Test Case Design Strategies – Using Black Box Approach to Test Case Design Random Testing – Requirements based testing – positive and negative testing - Boundary Value Analysis – decision tables .

**Unit 3**

**TEST CASE DESIGN -II:** Equivalence Class Partitioning state-based testing– cause- effect graphing – error guessing - compatibility testing – user documentation testing – domain testing Using White-Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing - Paths – Their Role in White-box Based Test Design – code complexity testing.

**Unit 4**

**LEVELS OF TESTING:** The Need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests. Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – System Testing – types of system testing - Acceptance testing – performance testing - Regression Testing.

**Unit 5**

**TEST MANAGEMENT:** People and organizational issues in testing – organization structures for testing teams – testing services - Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process - Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

**Text book(s)**

1. Srinivasan Desikan and Gopalaswamy Ramesh, **Software Testing – Principles and Practices**, Pearson education, 2013.

**Reference Books:**

1. Aditya P.Mathur, **Foundations of Software Testing**, Pearson Education,2008.
2. Boris Beizer, **Software Testing Techniques**, Second Edition,Dreamtech, 2003.
3. Elfriede Dustin, **Effective Software Testing**, First Edition, Pearson Education, 2003.

**BIT 2505****JAVA PROGRAMMING****5 hr/5 cr**

**Objective:** The objective of this course is to train the students in core java and make them to develop programs for the industry standard.

**Unit 1**

Object oriented Programming concepts - Java features - JVM- Data types –variables - Operators – Control Strings - Arrays - Classes - Objects

**Unit 2**

Constructors – this keyword – Garbage Collection - Method Overloading –Overloading constructors - Recursion – Access control - Static Function – Command line arguments

**Unit 3**

Inheritance – Member access and inheritance - Multi level inheritance – Hierarchical inheritance – Method Overriding – Abstract class - Interfaces- Implementing interfaces – Nested interfaces

**Unit 4**

Creating and using packages – Access protection –importing packages- - Exception handling – Built in Exceptions- User defined Exceptions- Multithreading – Thread model - The Life cycle of a Thread - Synchronizing Threads

**Unit 5**

Overview of I/O Streams- Applets - Life cycle of applet- AWT - Event handling - JDBC architecture-Establishing database connectivity.

**Text book(s)**

1. Balagurusamy, **Programming with Java 4e A Primer**, Tata McGraw Hill edition, 2014

**Reference Books:**

1. Patrick Naughton and Herbert Schildt, **Java 2 The Complete Reference**, Tata Mc Graw Hill Publications, 7<sup>th</sup> edition, 2012
2. Kathy Sierra and Bert Bates, **Head First Java**, O'Reilly Media, Inc., 2nd Edition, 2005
3. Arnold, Ken & Gosling, James, **The Java Programming language**, Addison Wesley, 4<sup>th</sup> Edition, 2005

**BIT 2407****JAVA PROGRAMMING LAB****4 hr/4 cr****Objective:**

The Objective of the course is to train the student to develop problem solving abilities and facilitate them to build the necessary skill set and analytical abilities for developing java based software for real life problems.

Lab Components

1. Working with Array and flow control statement
2. Demonstrate the concept of command line arguments
3. Implementation of Single inheritance
4. Implementation of Multilevel inheritance
5. String Manipulation using Char Array.
6. Calculation of Student Total Mark using Interface
7. Implementing Thread based applications & Exception Handling.
8. File copy program
9. Checking Minimum Bank Balance using Userdefined exception
10. Database Creation for storing e-mail addresses and manipulation.
11. Creation of applet and passing parameter to applet
12. Calculation of Electricity bill using JDBC and Applet
13. Creation of Employee pay bill using JDBC and Swings
14. Login form using JDBC
15. Working with Dialogs and Menu control
16. Working with Panel and Layout control
17. Incorporating Graphics concept
18. Working with colors and Fonts

**BIT 2502                                      OPERATING SYSTEM                      (TL)                      5(3+2) hr/5 cr**

**Objective:**

This course enables the students to understand the basic operating system concepts. It highlights the goals and services of the OS and covers scheduling, memory management, paging and segmentation. It facilitates the students to write simple shell script programs in Unix.

**Unit 1**

Introduction to UNIX- Salient Features of Unix-Unix System Organization-Unix File system-Unix commands-File related commands-Directory Related Commands-Simple Shell Programming

**Unit 2**

Introduction to OS -Views- Goals - OS Structure - Components - Services – Types of OS – OS for PC - OS for Hand held devices – Mobile OS – Network OS - system calls - System Structure - Process Management - Process -Process Scheduling – Operations on processes - Cooperating Process – Inter Process Communication - Threads.

**Unit 3**

CPU Scheduling: CPU Schedulers - Scheduling Criteria - Scheduling Algorithms -Process Synchronization - Critical Section Problem – Semaphores – Deadlocks - Characterization - Methods for Handling Deadlocks - Deadlock Prevention – Avoidance - Detection - Recovery.

**Unit 4**

Memory Management: Introduction- Address Binding - Dynamic Loading and Linking – Overlays -Logical and Physical Address Space – swapping - Contiguous Allocation - Internal & External fragmentation - Non-Contiguous Allocation.

**Unit 5**

Paging and Segmentation Schemes-Virtual memory - Demand Paging - File System: Introduction - File Concepts - File System Structures- Access Methods - Directory Structures – Protection-Disk Schedule-Disk Scheduling Algorithm.

**Text book(s)**

1. Yashavant P. Kanetkar, **Unix Shell Programming**, BPB Publications, 2003
2. Silberschatz Abraham, Galvin and Gagne, **Operating System Concepts**, Wiley India Pvt., Ltd, 9<sup>th</sup> Edition, 2013.

**Reference Books:**

1. Nalini Vengatasubramaniyan, Viladimir Getov, Stephan Steglich, **Mobile Wireless Middleware, Operating system and Applications**, Springer Heidelberg Dordrecht London New York, 2011
2. William Stallings, **Operating Systems: Internal and Design Principles**, Pearson Education-2014.
3. Michael Palmer, Michael Walters, **Guide to Operating Systems**, Cengage Learning, 2011
4. Pramod Chandra P, Bhatt, **An Introduction to Operating Systems: Concepts and Practice**, PHI Learning Pvt., Ltd, 2010

**BIT 2510****COMPUTER****5 hr/5 cr****Objective:**

The objective of the course is to facilitate the students to understand various issues in establishing networks and the importance of various architectures and protocols in computer networks.

**Unit 1**

Introduction to Computer Communications and Networking Technologies-Uses of Computer Networks, Network Devices - Nodes, and Hosts- Types of Computer Networks and their Topologies.

**Unit 2**

Network Software: Network Design issues and Protocols, Connection-Oriented and Connectionless Services, Network Applications and Application Protocols, Network Architecture and the OSI Reference Model, TCP/IP reference model.

**Unit 3**

Analog and Digital Communications Concepts: Representing Data as Analog Signals, Representing Data as Digital Signals, Digital Carrier Systems, Guided and Wireless Transmission Media, Switching and Multiplexing.

**Unit 4**

Data Link Layer: Framing, Flow Control, Error Control, Error Detection and Correction, Media Access Control: Random Access Protocols, Token Passing Protocols, Token Ring - Introduction to LAN technologies: Ethernet, switched Ethernet, VLAN, fast Ethernet, gigabit Ethernet, token ring - Wireless LANs, Bluetooth, Network Hardware Components: Connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, Switches, Routers, Gateways;

**Unit 5**

Network Layer and Routing Concepts: Virtual Circuits and Datagrams- Routing Algorithms - Congestion Control Algorithms – Internetworking.

Network Security Issues: Security threats - Encryption Methods – Authentication - Symmetric Key Algorithms- Public Key Algorithms.

**Text book(s)**

1. Andrew S. Tanenbaum, **Computer Networks**, Pearson Education, 2011.

**Reference Books:**

1. Michael A. Gallo, William M. Hancock, **Computer Communications and Networking Technologies**, CENGAGE Learning, 2001.
2. Behrouz A Forouzan, **Data Communications and Networking**, McGraw Hill, 2012

**BIT 2506      RELATIONAL DATABASE MANAGEMENT SYSTEM      5 hr/5 cr**

**Objective:** This course enables the students to understand the basic Database concepts and RDBMS concepts using Oracle SQL and PL/SQL. It helps the students to acquire sound knowledge in Oracle.

**Unit 1**

File systems versus Database systems – Database System - DBMS Architecture – Advantages of a DBMS – Describing and Storing Data in a DBMS – Queries in a DBMS – Database users and Administrator- Data Models.

Relational Model: Structure of Relational Databases – Database Design – ER Model – Overview of the Design Process – The Entity-relationship Model – Integrity Constraints over Relations – Enforcing Integrity Constraints – Entity Relationship Diagrams.

**Unit 2**

Data Normalization: Pitfalls in Relational Database Design – Decomposition – Functional Dependencies – Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce-Codd Normal Form – Fourth Normal Form – Fifth Normal Form – De Normalization.

**Unit 3**

Structured Query Language - Basic Structure of SQL Queries - Working with Tables – DDL- DML-DCL-TCL-Set Operations – Restricting Data with WHERE clause - Aggregate Functions - Null Values - Nested Sub Queries – Views.

**Unit 4**

PL/SQL: A Programming Language: Fundamentals – Block Structure – Comments – Data Types - Declaration – Assignment operation - Printing – Arithmetic Operators - Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. PL/SQL Cursors and Exceptions: Cursors – Implicit & Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables.

**Unit 5**

Exceptions - Types of Exceptions - PL/SQL Composite Data Types: Records – Tables – Arrays - Named Blocks: Procedures – Functions – Packages –Triggers – Data Dictionary Views.

**Text books:**

1. Alexis Leon and Matthews Leon, **Essentials of Database Management System**, McGraw Hill Education India Private Limited, 2008
2. Riktesh Srivastava, **Relational Database Management System**, New Age International Pvt Ltd Publishers, 2015
3. Ivan Bayross, **SQL, PL/SQL: The Programming Language of Oracle**, BPB, 2010

**References Books:**

1. Nilesh Shah , **Database Management Systems using Oracle**, Pearson Education, 2015.
2. Arun Majumdar & Pritimoy Bhattacharya, **Database Management systems**, TMH publications, 2007.

**BIT 2408****RDBMS LAB****4 hr/4 cr****Objective:**

The Objective of the course is to train the students able to work on the basic Oracle commands and to develop real life problems using PL/SQL.

1. Creating database tables.
2. Modify the table, Rename and Drop the table.
3. Modify the column Name ,data type, Rename and Drop the column.
4. Practical Based on Data Manipulation.
5. Practical Based on Using following clauses  
Simple select clause,  
Accessing specific data with Where,  
Ordered By,  
Distinct and Group By
6. Practical Based on Aggregate Functions.
  - AVG
  - COUNT
  - MAX
  - MIN
  - SUM



7. Practical Based on implementing all String functions.
8. Practical Based on implementing Date and Time Functions.
9. Implement Nested Queries & JOIN operation.
10. Practical Based on performing different operations on a view.
11. PL/SQL programs using triggers.
12. PL/SQL programs using cursors.
13. PL/SQL programs using Functions & procedures in PL/SQL.
14. Make Database connectivity with front end tools.

**BIT 2410****SOFTWARE PROJECT MANAGEMENT****5 hr/4 cr****OBJECTIVES:**

The objective of the course is to outline the need for Software Project Management and highlight different techniques for software cost estimation and activity planning.

**Unit 1 Project Evaluation and Project Planning**

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost, benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

**Unit 2 Project Life Cycle and Effort Estimation**

Software process and Process Models – Choice of Process models – mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II, A Parametric Productivity Model – Staffing Pattern.

**Unit 3 Activity Planning and Risk Management**

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules.

**Unit 4 Project Management and Control**

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management.

**Unit 5 Staffing in Software Projects**

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackmdan job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.

**Text book**

1. Bob Hughes, Mike Cotterell and Rajib Mall: **Software Project Management** ,5th Edition, Tata Mc Graw Hill, New Delhi, 2012.

**Reference Books:**

1. Robert K. Wysocki , **Effective Software Project Management**, Wiley Publication, 2011.
2. Walker Royce: **Software Project Management**, Addison Wesley, 1998.
3. Gopalaswamy Ramesh, **Managing Global Software Projects**, McGraw Hill Education, 2013

**BIT 1408****DATA STRUCTURES USING C (TL)****4(2+2) hr/4 cr**

**Objective:** The aim of the course is to enable the students to build simple and complex data structures. Students are trained to develop algorithms and writing programs for the user defined data types such as Structures, Stacks, Queues, Lists and Trees. Also this course gives an in depth knowledge on Sorting, & Searching.

**Unit 1**

Introduction – Arrays – Strings – Stacks – Operations on stack –Representation of Stacks using Array and Linked list - infix - prefix and Post fix notations - Evaluation of Post fix - infix- prefix expression- Applications of stacks

**Unit 2**

Queues – Operations on queue -Representation of queue using array and linked list –Circular Queue – Operation on Circular queue - Representation of Circular queue using array and linked list

**Unit 3**

Linked List – Operations on linked list- Single Linked List- Operation on Single linked list - Double Linked list – Operations on Double Linked List

**Unit 4**

Trees – Binary tree – Traversal of a Binary tree – Applications of Binary Tree Binary Search Tree- Operations on Binary search tree – Applications of Binary search tree

**Unit 5**

Sorting and Searching - Bubble sort - Quick sort - Merge sort. Search – Linear Search – Binary Search

**Text book(s)**

1. Seymour Lipschutz, **Data structures with C**, Tata McGraw-Hill Education, 2011

**Reference Books:**

1. Balagurusamy.E, **Data structures using C**, Tata McGraw-Hill Publishing Company Ltd, 2013
2. Krishnamoorthy, **Data structures using C**, Tata McGraw-Hill Publishing Company Ltd, 2010
3. Aaron M. Tenenbaum, Y. Langsam, M. J. Augenstein, **Data Structures Using C**, Pearson Education, 2009
4. A.A.Puntambekar, **Data structures using C**, Technical Publications, 2009.

**POSTGRADUATE DEPARTMENT OF ENGLISH (SF)**

**Programme for M.A. ENGLISH from 2015 - 2016 onwards**

<b>Semester</b>	<b>Course code</b>	<b>Course Title</b>	<b>Hours</b>	<b>Credits</b>	<b>Marks</b>
<b>I</b>	PSE 4601	Chaucer to Shakespeare	10	6	120
	PSE 4403	Milton to Dryden	6	4	80
	PSE 4405	Pope to Johnson	6	4	80
	PSE 4407	Advanced Interpretation of Literature and Rhetoric	4	4	80
	PSE 4409 PSE 4411	Elective 1. English for Employment 2. English for Education Abroad	4	4	80
		<b>TOTAL</b>	<b>30</b>	<b>22</b>	<b>440</b>
<b>II</b>	PSE 4402	Romantic Literature	6	4	80
	PSE 4404	Victorian Literature	6	4	80
	PSE 4406	Modern Literature	6	4	80
	PSE 4408	Structure of Modern English	6	4	80
	PSE 4410 PSE 4412	Elective 1. English for Media 2. Literary Translations	6	4	80
		<b>TOTAL</b>	<b>30</b>	<b>20</b>	<b>400</b>
<b>III</b>	PSE 5401	Contemporary Literature	6	4	80
	PSE 5403	History of the English Language	6	4	80
	PSE 5505	Theories of Literature	6	5	100
	PSE 5407	Indian Writing in English	6	4	80
	PSE 5409 PSE 5411	Elective 1. African American Literatures 2. Canadian Literature	6	4	80
		<b>TOTAL</b>	<b>30</b>	<b>21</b>	<b>420</b>
<b>IV</b>	PSE 5402	American Literature	5	4	80
	PSE 5504	Literary Theories	5	5	100
	PSE 5406	Teaching English as a Second Language	5	4	80
	PSE 5408	New Literatures in English	5	4	80
	PSE 5410 PSE 5412	Elective: Research Methodology 1. Literature 2. English Language Teaching	4	4	80
	PSE 5614	Project	6	6	120
		<b>TOTAL</b>	<b>30</b>	<b>27</b>	<b>540</b>
		<b>TOTAL</b>	<b>120</b>	<b>90</b>	<b>1800</b>

**PSE 5401****Contemporary Literature  
(CL)****6Hrs. / 4Cr.**

This course aims at introducing students to contemporary literatures from 1960s to the present. Students will obtain a global perception of the literature by comprehending the new voices critically. The course envisages a comprehensive study of the major writers who have contributed to the body of world literature for past 40 years.

At the end of course the students will be able to

- i. learn literatures other than British literature.
- ii. empathize with the Post-Colonial stance.
- iii. read closely and understand contemporary literatures in the context of other contemporary development.
- iv. appreciate the developments of literary genres in contemporary literature.
- v. undergoes a wide range of literary experience illustrated by contemporary writers.

**Unit 1: Poetry**

Maya Angelou	-	Woman Work (1978)
Judith Wright	-	Train Journey (1978)
Margaret Atwood	-	Journey to the Interior (1960)
Derek Walcott	-	A Far Cry from Africa (1962)
Yasmine Gooneratne	-	There was a Country (1981)
Edwin Thumboo	-	Gods can die (1977)
Wole Soyinka	-	Telephone Conversation (1963)
Les .A. Murray	-	Wilderness (1969)
John Pepper Clark	-	Casualties (1970)
Razia Khan	-	My Daughter's Boy Friend (1970)

**Unit 2: Drama**

Linda Griffiths & Maria Campbell	-	<i>The Books of Jessica</i> (1989)
Sharon Pollock	-	<i>Walsh</i> (1973)

**Unit 3: Prose**

Pearl S. Buck	-	The Old Demon (1981)
Margaret Atwood	-	Survival (1972)
Peter Carey	-	Do you Love Me? (1979)

**Unit 4: Fiction**

Chinua Achebe	-	<i>Death and the King's Horseman</i> (1975)
Toni Morrison	-	<i>Sula</i> (1973)
Nadine Gordimer	-	<i>Burger's Daughter</i> (1979)

**Unit 5: Short Stories**

Patrick White	-	<i>Down or the Dump</i> (1971)
Katherine Mansfield	-	<i>The Escape</i> (1975)
Alice Munro	-	<i>Carried Away</i> (1993)

**Self study:**

Margaret Atwood	-	<i>Journey to the Interior</i> (1960)
Sharon Pollock	-	<i>Walsh</i> (1973)
Peter Carey	-	<i>Do you Love Me?</i> (1979)
Toni Morrison	-	<i>Sula</i> (1973)
Alice Munro	-	<i>Carried Away</i> (1993)

**References**

- Ashcroft, Bill. Et. Al. *The Empire Writes Back: Theory and Practice in Post-Colonial Literatures*. London: Routledge, 2002.
- Gates, Jr. Henry Louis (ed). *Black Literature and Literary Theory*. New York: Routledge, 1984.
- King, Bruce. *The New English Literatures: Cultural Nationalism in a Changing World* London: Macmillan. 1980
- Narasimhaiah, C. D. *An Anthology of commonwealth poetry*. India: Macmillan India, 1990
- Walsh, William (ed.). *Readings in Commonwealth Literature*. Oxford: Clarendon Press, 1973.

**PSE 5403****History of the English Language  
(HEL)****6 Hrs/4 Cr.**

The course aims to introduce students to history of the language from the beginning to the contemporary age. This course will also introduce students to the various aspects of the English language.

At the end of the course the students will be able to

- i. trace the history of English in terms of how it is historically developed, socially learnt, and orally transmitted,
- ii. appreciate the proper balance between internal and external history of English to liberate themselves from a narrow view of the language
- iii. understand and account for many of its apparent irregularities and irrationalities,
- iv. trace & appreciate the etymological, semantic, & structural values of words, and
- v. assess the impact of science and technology, and political, economic, military power on English, and the virtual world.

**Unit 1:** Theories on the origin of language, Origin of English, Old English: Sounds, Letters, vocabulary, grammar, Vowel Gradation, i-mutation, & influence of foreign languages, Middle English: Sounds, words, influence of French, Grammar

**Unit 2:** Influence of the Renaissance and Reformation on English, Early Modern English, & Role of Dictionaries in English

**Unit 3:** Influence of Science & Technology, colonization, the world wars on English, branching of English into the national dialects

**Unit 4:** Growth of Vocabulary, Change of meaning, & Etymology of Words

**Unit 5:** Contemporary English. English for Specific Purposes, English as a Global Language, English as the language of the virtual world

**Self Study:**

Origin of English  
 Role of Dictionaries in English  
 The World Wars on English  
 Students to prepare a diary on etymology  
 English as a Global Language

**Reference**

Baugh, Albert C. 2000. *A History of the English Language*. New Delhi: Routledge.  
 Flavell, Linda and Roger. 2000. *Dictionary of Word Origins*. London: Kyle Cathie.  
 Jespersen, Otto. 2009. *Growth and Structure of the English Language*. London: Cambridge Scholars Publishing.  
 Wood, Frederick T. 1979. *An Outline History of the English Language*. Madras: Macmillan.  
 Wrenn, C. C. 2001. *The English Language*. New Delhi: Vikas.

**PSE 5505**

**Theories of Literature  
 (TL)**

**6 Hrs. / 5 Cr.**

It is the first of the two sequential courses on literary theories and criticism. Structuralism and post-structuralism present a serious challenge both to conventional approaches to literature and Anglo-American New Critical tradition. Since theory is primary in reading literary discourse, this course introduces theories of literature from Plato to the 1960 Structuralism.

At the end of the course, students shall be able to

critically assess humanist literary theories  
 understand literariness of the literary discourse  
 familiarize with the principles of New Criticism and its limitations  
 examine how some 20<sup>th</sup> century critics revisited Aristotle's Poetics  
 appreciate literary texts as langue and not parole

**Unit 1: Humanist Theories**

Chapter 1 from Literary Theory: A Guide for the Perplexed by Mary Klages  
 Theory Before 'Theory' from Beginning Theory : An Introduction to Literary and Cultural Theory

**Unit 2: Russian Formalism**

Victor Shklovsky: Art as a Technique  
 Jan Mukarovsky: Aesthetic Function, Norm, and Value as Social Facts

**Unit 3: New Criticism**

I.A. Richards: Four Kinds of Meaning  
 Kenneth Burke: Formalist Criticism: Its Principles and Limits

**Unit 4: Chicago Aristotelianism**

R.S. Crane: Criticism as Inquiry; or, The Perils of the “High Priori Road”  
 Wayne C. Booth: Emotions, Beliefs, and the Reader’s Objectivity

**Unit 5: Structuralism**

Gerard Genette: Structuralism and Literary Criticism  
 Roland Barthes: Science versus Literature

**References**

Barry, Peter. 2010. *Beginning Theory : : An Introduction to Literary and Cultural Theory*. 3ed. Delhi : Viva  
 Newton, K.M. 1988. *Twentieth – Century Literary Theory*. China: Macmillan

**PSE 5407****Indian Writing in English****6Hrs/4cr****(IWE)**

The purpose of this course is to make the students understand the different movements and popular figures of Indian Writing in English through the study of selected texts and also to critically appreciate the different genres in Indian Writing in English.

At the completion of this course the students will be able to

- i. understand the rich tradition of Indian Writing in English
- ii. know the uniqueness of Indian Literature
- iii. recognize Indian writing in English as part of the mainstream World Literature
- iv. experience the richness of the Indian people of the past and the present
- v. analyze the literary contribution of the pre and post Independent Indian Writing in English

**Unit – I - Poetry**

Jayanta Mahapatra  
 A.K.Ramanujam  
 Kamala Das  
 Rabindranath Tagore  
 Nissim Ezekiel  
 Daruwalla  
 Dom Moraes  
 Dilip Chitre  
 Eunice De Souza  
 Arun Kolatkar

- Deaths in Orissa  
 - A River  
 - The Freaks  
 - Gitanjali (I,III,XXVIII)  
 - Farewell Party for Miss Pushpa  
 - The King Speaks to the Scribe  
 - Future Plans  
 - Father Returning Home  
 - Sweet Sixteen  
 - Biograph

**Unit –II (Drama)**

Girish Karnad  
 Mahesh Dattani

- *Tughlaq*  
 - *Dance Like a Man*



**Unit-III (Prose)**

Mother Teresa	- The Joy in Loving
Arundhati Roy	- The Ladies have Feelings. So...
Chitra Banerji	- The Bonti of Bengal
A.P.J. Abdulkalam	- To My Countrymen

**Unit-IV (Novel)**

Shashi Deshpande	- <i>The Dark Holds No Terror</i>
Manju Kapur	- <i>Difficult Daughters</i>
Amitav Ghosh	- <i>Shadow Lines</i>

**UNIT –IV(Short Stories)**

Ruskin Bond	-I can't climb Trees Anymore
Rabindranath Tagore	-The Wedding Garland
Khushwant Singh	-A Love Affair in London

**Self Study**

Dom Moraes	- Future Plans
Amitav Ghosh	- Shadow Lines
Mahesh Dattani	- Dance Like a man
Chitra Banerji	- The Bonti of Bengal
Ruskin Bond	- I can't climb Trees Anymore

**REFERENCE**

Gokak, V. K. *The concept of Indianness with Reference to Indian Writing in English*. Ibid  
 Iyengar, K. R. S. (Bombay: Asia Publishing house, 1962), PP.xxxvi – xxxvii  
 Naik, M.K. *The Indianness of Indian Poetry in English*,” Indian Poetry in English,ed,H.M.Prasad (Aurangabad: Parimal Prakashan,1983)P.33.  
 Paul Verghese, *Indian Writing in English* (New Delhi: N.V.Publications, 1975), P.2  
 Singh, Bijender, *Indian Writing in English: Critical Insights*. New Delhi, Authorpress’2014

**PSE 5409****African American Literatures  
(AAL)****6 Hrs. / 4 Cr.**

This course aims to expose the students to the African- American Literature which is one of the important world literatures. It focuses on the issues related to race, bigotry and hardships of the Black writers of America. This literature sheds light on the past history of America and is deeply rooted in American literature as well. The works reflect the authors' ideas on society, religion and politics. The students, through this Black literature, shall come across authors in whose works there is anger, triumph and survival, and transcendentalism and this in turn will help them relate to such issues in other literatures.

At the end of the course the students will be able to

- i. survey the writings of African-American authors from 1800 to the present
- ii. locate African-American texts with the cultural, political and historical contexts
- iii. consider the thematic elements that characterize African-American literary tradition in nineteenth, twentieth and twenty first centuries
- iv. understand the public perceptions on the black American life
- v. analyze and appreciate the richness of African American literature

### **Unit I Background study of African – American Literature**

Lemuel Haynes, “Liberty Extended: Or Free Thoughts on The Illegality of Slave Keeping”

Frederick Douglass – Oration, delivered in Corinthian Hall, Rochester, July 5, 1852

### **Unit II Prose**

Martin Luther King, Jr. – “I have a dream”

Marcus Garvey – Speech Delivered at Liberty Hall N.Y.C.

### **Unit III Poetry**

Gwendolyn Brooks - The Mother

Maya Angelou - I Know When The Caged Bird Sings

Langston Hughes – Brass Spittoons

James Weldon Johnson - Lift Every Voice and Sing

Paul Laurence Dunbar – We Wear The Mask

Etheridge Knight - A Poem for Myself

W.E.B. Dubois – A Litany of Atlanta

Claude McKay – America

Countee Cullen – Yet Do I Marvel

### **Unit IV Fiction**

James Baldwin – Sonny’s Blues

Toni Morrison/Alice Walker – Colour Purple

### **Unit V Drama**

Willis Richardson – The Broken Banjo

### **Self Study**

Speech delivered at Liberty

A Poem for Myself

Sula (1973)

### **Reference**

Edwin, M. Epstein and David R. Hampton. *Black American White Business*.

Paul and Lindsey, Owida. *Breaking the Bonds of Racism*. AETC Publications, 1974.

Wisker, Gina. *Black Women’s Writing*. Clive Bloom

**PSE 5411****CANADIAN LITERATURE  
(CL)****6Hr/4Cr.**

This course aims to introduce students to a variety of significant Canadian writers in the modern period and review the historical development from the contexts of English-Canadian fiction, and explore the relationship between the writers' narrative strategies and fictional concerns.

At the end of the course the students will be able to

- i. understand the prose writings from Canada.
- ii. comprehend the basic themes of the prescribed poems and analyze its diction.
- iii. analyze how the plays portray the indigenous people's struggle for survival amidst the overwhelmingly oppressive society.
- iv. appreciate short stories in the Canadian context and how it reflects authors personal experience.
- v. read novels based on the aspects of plot, character, point of view, theme and setting.

**Unit –I Poetry**

F.R. Scott	-	Laurentian Shield
Robert Finch	-	Peacock and Nightingale
A.J.M. Smith	-	Ode on the Death Of William Butler Yeats
Margaret Avison	-	Mordent for a Melody
A.M. Klein	-	Indian Reservation: Caughnawaga.
Dorothy Livesay	-	On Looking into Henry Moore.
P.K. Page	-	Adolescence
E.J. Pratt	-	The Dying Eagle
Earle Birney	-	Christmas Comes
Eli Mandel	-	Metamorphosis

**Unit – II Drama**

Sharon Pollock	-	<i>Blood Relations</i>
George Ryga	-	<i>The Ecstasy of Rita Joe</i>

**Unit – III Prose**

Alice Munro	-	<i>The Child's Play</i> <i>The Love of a Good Woman</i>
Charles Ritchie	-	<i>My Grandfather's House</i>

**Unit -IV Fiction**

Margaret Laurence	-	<i>The Fire Dwellers</i>
Margaret Atwood	-	<i>Surfacing</i>
Rohinton Mistry	-	<i>Family Matters</i>

**Unit – V Short Fiction**

Introduction to Canadian Literature		
Susanna Moodi	-	<i>Roughing it in the Bush</i> <i>Uncle Joe and his family</i> <i>The Village Hotel</i> <i>The Little Stumpy Man</i>

**Self-Study**

F.R. Scott	-	<i>Laurentian Shield</i>
George Ryga	-	<i>The Ecstasy of Rita Joe</i>
Alice Munro's	-	<i>The Child's Play</i>
Margaret Atwood	-	<i>Surfacing</i>
Susanna Moodie	-	<i>The Village Hotel</i>

**Reference**

- Munro, Alice. *Too Much Happiness*. London: Random House publications, 2009. Print
- .... *The Love of A Good Woman*. London: Random House publications, 2009. Print
- Moodie, Susanna. *Roughing it in the Bush Or, Life in Canada* Volume 1. New York: Cambridge University Press. 1852 Print.
- Narasimhaiah, C.D. *An Anthology of Commonwealth Poetry*. Chennai: ed by, Macmillan, 1990. Print.
- New, W.H. *A History of Canadian Literature*. London: Macmillan Education Ltd. 1989
- O' Donnell, Margaret. J. *An Anthology of Commonwealth Verse*. New Delhi: Blakie & son 1984.
- Ondaatje, Michael. *The Faber Book of Contemporary Canadian Short Stories*. London: Faber & Faber Ltd. 1990
- Parameswaran, Uma. *An Introduction to South-Asian Canadian Literature*. Madras: East West Books Pvt Ltd. 1996.

**PSE 5402****American Literature  
(AL)****5 Hrs. / 4 Cr.**

This course aims to help students explore American literature and understand it in terms of the differences and changes that they find in it. It enables students to approach it with historic perspective. It evokes the interest in students to study movements through Puritanism to Modernism. As American literature has its origin in British literature, students can make a comparative study of both literatures.

At the end of the course the students will be able to

- i. gain knowledge about the people of America, their beliefs, perceptions and philosophies
- ii. explore the culture from looking closely at the religious and historical literature
- iii. appreciate the diversity of individuals as represented in the fiction and poetry
- iv. understand the language, thought and expression of the writers
- v. attempt a comparative study of American and British literature

**Unit I Poetry**

Michael Wigglesworth - Vanity of Vanities  
 John Trumbull - The Country Clown  
 Edgar Allen Poe - The Raven  
 Henry Wadsworth Longfellow - Curfew  
 Ralph Waldo Emerson - Give All to Love/Earth-song  
 Walt Whitman - To You  
 Emily Dickinson - Because I Could Not Stop For Death  
 Robert Frost - Stopping by Woods on A Snowy Evening –

## Unit II Fiction

Nathaniel Hawthorne - The Scarlet Letter  
Mark Twain - The Adventures of Huckleberry Finn

## Unit III Short Stories

Nathaniel Hawthorne - The Minister's Black Veil  
Kate Chopin - Regret  
Edgar Allen Poe - The Cask of Amontillado

## Unit IV Drama

Tennessee Williams - A Streetcar Named Desire  
Arthur Miller - Death of A Salesman  
Lorraine Hansberry - A Raisin in the Sun

## Unit IV Prose

Ralph Waldo Emerson - The American Scholar  
Benjamin Franklin - The Perfect American Man

## Self Study

The Country Clown  
The Adventures of Huckleberry Finn  
Regret  
A Raisin in the Sun  
The American Scholar

## Reference

Bradbury, Malcolm and Temperley. *The History of American Studies*. Howard  
Delson, Jr. Charles and Bradtkorb, Jr. Paul. *American Literature*.

## PSE 5504

## Literary Theories (LT)

5 Hrs. / 5 Cr.

The second of the two sequential courses on literary theories and criticism aims at helping students in getting acquainted with post-structuralist theories. This course intends to familiarize students with the questioning of theory and the resistance to it as much as it relates to the need for theory in the global context.

- i. learn the basic tenets of post-structuralism,
- ii. acquaint themselves with psychoanalytic theories,
- iii. understand literary texts in the light of New Historicism and Cultural Materialism,
- iv. comprehend the aspects and tenets of feminist theories
- v. familiarize themselves with the different postcolonial theories and reading methods

## Unit 1 - Deconstruction

Jacques Derrida: Structure, Sign and Play in the Discourse of Human Sciences  
Paul de Man: The Resistance to Theory

**Unit 2 – Psychoanalysis**

Jacques Lacan: The Insistence of the Letter in the Unconscious

Shoshana Felman: The Madness of Interpretation: Literature and Psychoanalysis

**Unit 3 - New Historicism/Cultural Materialism**

Stephen Greenblatt: The Circulation of Social Energy from Shakespearean Negotiations (1988)

Fredric Jameson: On Interpretation: Literature as a Socially Symbolic Act

**Unit 4 – Feminism**

Elaine Showalter: Towards a Feminist Poetics

Gayatri Chakravorty Spivak: Feminism and Critical Theory

**Unit 5 – Postcolonialism**

Homi Bhaba: The Location of Culture

Ngugi Wa Thiong’ O : Decolonising the Mind - Chapter 1 : The Language of African Literature

**Reference**

Lodge, David and Wood (ed). 1988. *Modern Criticism and Theory*. Singapore: Pearson Education

**PSE 5406****Teaching English as a Second Language (TESL)****5 Hrs/4 cr.**

This course provides the theoretical input and the practice-teaching required for prospective teachers of English in the present context. It enables the students to learn theoretical concepts which serve as a back drop for teaching English, get trained in the methodology of teaching English as a second language, and in the material preparation, and also gain opportunities to teach in classroom situations in the college.

The Course aims at enabling the students to

- i. trace an overview of the field of second language teaching and learning,
- ii. identify the major trends and issues in ESL teaching
- iii. illustrate the major trends and issues and find ways to incorporate them into the students’ own teaching practice
- iv. acquire the basic skills and knowledge to teach ESL students, and
- v. get trained in teaching in real classroom environment

**Unit 1: METHODOLOGY**

Study the practices and procedures used in teaching and the principles and beliefs that underlie them- Methods Debate-Grammar-Translation Method- Audiolingualism- ‘Designer Methods’- Communicative Language Teaching- Task Based Language Teaching and Second Language Acquisition Research

**Unit 2: EXPLORING SKILLS:**

**Listening-** Top-down and bottom-up processing; different listening types; specific information and gist/global listening, inferences; examples of listening task types

**Speaking-**identify the “levels” of spoken language and explain their relationships; main difference between audiolingual method and communicative language teaching; techniques for fostering speaking skill

**Reading:** concepts central to understanding reading; silent reading, interactive models of reading, reading fluency, extensive reading and intensive reading; practical classroom techniques for teaching reading

**Writing:** ways of introducing writing instruction to ESL class- Process Vs Product approach to writing; quick writing; brainstorming; word mapping; drafting and peer review- Assessment options

**Unit 3: EXPLORING LANGUAGE**

Exploring four different features of language and how they are taught; The sound system, vocabulary (lexical system, grammatical system and discoursal system; Techniques for teaching pronunciation, vocabulary, grammar, and discourse in the classroom

**Unit 4: SUPPORTING THE LEARNING PROCESS:**

Ways of integrating and supporting the ideas presented in the first three units; Content Based Instruction; Computer –assisted language Learning; learning styles; Learning autonomy in the classroom – classroom-based assessment.

**Learning Theories and Styles:** language & brain; lateralization; critical period hypothesis; differences between multilingual & monolingual brain; Information Processing; order of acquisition; learner differences.

**Unit 5: TESL PRACTICE CUM INTERNSHIP:**

Internship involves practical teaching and teaching related experience

**Self Study:**

Audiolingualism, The sound system  
Learning styles, Information Processing

**Reference**

- Anderson, N.J. 1999. *Exploring Second Language Reading: Issues and Strategies*. Boston, MA: Heinle & Heinle
- Bailey, KM. and L. Savage (eds) 1994. *New Ways in Teaching Speaking*. Alexandria, VA: TESOL.
- Beatty, K.(2003). *Applied Linguistics in Action: CALL*. London: Pearson
- Benson, P. 2001. *Teaching and Researching Autonomy in Language Learning*. London:Longman
- Campbell, C. 1998. *Teaching Second Language Writing: Interacting with text*. Boston, MA:Heinle &Heinle
- McCarthy, M.1991. *Discourse Analysis for Language Teachers*. Cambridge: Cambridge University Press

- Mendelsohn, D. and J. Rubin (eds) 1995. *A Guide for the Teaching of Second Language Listening*. San Diego, CA: Dominie Press
- Nunan, D. 1999. *Second Language Teaching and Learning*. Boston, MA : Heinle & Heinle
- Richards J. and W. Renandaya (eds) 2002. *Methodology in Language Teaching*. Cambridge: Cambridge University Press

**PSE 5408****New Literatures in English  
(NLE)****5 Hr. / 4 Cr**

This course aims to introduce contemporary writers and their works spanning all the commonwealth countries. This paper will enable the student to acquire a highly comprehensive knowledge of commonwealth literature.

At the completion of this course the students shall be able to

- i. develop comparative perspectives with the different works of the major writers of the world
- ii. discuss the question of identity and dominance of landscape in Commonwealth literature
- iii. trace down the social history of post colonial countries
- iv. critically comment and reflect on the text read
- iv. write accurately, analytically and effectively about their understanding of New Literatures.

**Unit I: Introduction**

Critique of the term, New Literatures in English

**Unit II: Poetry**

A D Hope	- Australia
Judith Wright	- Turning Fifty
Derek Walcott	- Ruins of a Great House
Gabriel Okara	- Once upon a Time
Faiz Ahmad Faiz	- A Prison Evening
Leopold Sedar Senghor	- New York
Edwin Thumboo	- Gods Can Die
A R D Fairburn	- I'm Older than You
A M Klein	- "Indian Reservation: Caughnawage"
P K Page	- "First Neighbour"

**Unit III: Fiction**

Margert Lawrence	- The Diviners
Patrick White	- Voss
Bapsi Sidwa	- Ice Candy Man.

**UNIT IV: Drama**

Ray Lawler	- The Summer of the Seventeenth Doll
Wole Soyinka	- Death and King's Horseman



**UNIT V: Prose**

Alice Walker	- In Search of Our Mother's Garden
Chinua Achebe	- The Nature of the Individual and his Fulfillment
Wole Soyinka	- The Myth, Ritual and the African World

**Self Study:**

P K Page	- "First Neighbour"
Judith Wright	- Turning Fifty
Patrick White	- Voss
Ray Lawler	- The Summer of the Seventeenth Doll
Chinua Achebe	- The Nature of the Individual and his Fulfillment

**Reference**

- Ashcraft, Bill, et al. *The Empire Writes Back: Theory and Practice in Post-Colonial Literatures*. London: Routledge, 2002.
- Birbalsingh, Frank. *Novels and the Nation: Essays in Canadian Literature*. Toronto: TSAR Publications, 1995.
- King, Bruce. *The New English Literatures: Cultural Nationalism in a Changing World*. London: Macmillan, 1980
- Narasimhaiah, C.D. (ed.). *Commonwealth Literature*. New Delhi: Sterling Publishers, 1978
- Walsh, William (ed.). *Readings in Commonwealth Literature*. New Delhi: Sterling Publishers

**PSE 5410****Research Methodology: Literature  
(RM-Lit)****4Hr./4Cr.**

The course aims at training students in the skills of research writing that they need as postgraduate students at present and as research students later. Students shall acquire documentation skills, and mechanics of writing like clarity, focus, economy, and organization with reference to both APA and MLA formats for research language and literature respectively.

At the end of this course the students will be able to

- i. understand some basic concepts of research and its methodologies.
- ii. identify appropriate research topics
- iii. select and define appropriate research problems and parameters.
- iv. organize and conduct research (advanced projects) in a more appropriate manner.
- v. write a research report and thesis.

**Unit 1:** Meaning and objectives of literary research— research paper as a form of exploration, evaluating resources, language and style, writing drafts, outlining, grammar, guidelines to reduce bias in language, and study skills

**Unit 2:** Mechanics of writing – spelling, capitalization, abbreviations, quotations, headings, and format of research paper, preparing working bibliography, preparing footnotes, endnotes, and works cited

**Unit 3:** Materials and tools of research – articles for journals and books, assignments, papers for presentation, critical academic essays, term papers, and research reports

**Unit 4:** Methods of research– bibliography, history of ideas and technique, critical approaches and theories

**Unit 5:** The literary thesis– identifying topic sentence, developing topic sentence into paragraphs, use of coherence and cohesive devices, introduction and summing up skills, and writing five – paragraph essays

### Reference

Atick, Richard D. *The Art of Literary Research*, New York: W.W. Norton Company, 1963.

Gibaldi, Joseph. *MLA Handbook for writers and research papers*. 6<sup>th</sup> ed. New York: MLA Publications, 2003.

Sinha, M.P. *Research Methods in English*, New Delhi: Atlantic, 2014.

Thrope, James. Ed. *Aims and methods of Literary Scholarship*. Hyderabad : American Studies Research Centre, 1970.

Sanders, Chauncey. *An Introduction to Research in Literary History*. New York: Macmillan, 1957.

### **PSE 5412 RESEARCH METHODOLOGY: English Language Teaching 4 Hrs. / 4 Cr. (RM-ELT)**

This course aims at providing students with fundamental knowledge of research methods and facilitates students in using valid scientific methods to create knowledge in the field of English Language Teaching.

At the end of the course the students will be able to

- i. identify areas in Language teaching in which they have strong interests.
- ii. describe and discuss the concepts in various Language teaching research methods and design.
- iii. critically evaluate linguistic claims made in popular and academic media.
- iv. analyze and interpret quantitative data.
- v. verbally present their research findings in a coherent and concise manner.

#### **Unit I:**

Preparation for Research – Selecting a Topic for Research/Research Articles; Accessing and Documenting Resources: Sources and their Location, Library Services, Use of Index Cards/Preparing an Annotated Bibliography for Self Study.

Presenting the Research – Developing the Research Question; Statement of Objective; Writing the Introduction; Presenting the Literature Review; Formulating Chapters/Sections for Research Articles; Giving References; Citation Methodology: APA Format of the Thesis.

#### **Unit II:**

Research Tradition in Applied Linguistics – Experimental Method/Psychometric Study; Ethnographic Research; Case Study.

**Unit III:**

Basic Statistical Concepts – Mean, Standard Deviation; Standard Error; Frequency Distribution; Normal Distribution and Chi-Square; Comparison of Means through T-Test, F-Test and Analysis of Variance (ANOVA) Correlation Coefficient

**Unit IV:**

Key concepts in Research – Qualitative and Quantitative Research; Pure and Mixed Forms; Hypothesis Formation, Hypothesis-Testing and Falsification; Deductivism and Inductivism; Reliability and Validity of Research; Action Research.

**Unit V:**

Techniques of Data Collection and Analysis – Introspective Methods; Diary Studies; Retrospection; Production Tasks; Surveys; Questionnaires; Interviews; Classroom Observation; Interaction Analysis; Discourse Analysis.

**References**

- Bachman, L.F. (2004) Statistical Analysis for Language Assessment. CUP.  
 Brown, J.D (1988). Understanding Research in Second Language Learning. New York: CUP  
 Ghosh, B.N. (1992) Scientific Method and Social Research. New Delhi. Sterling Publishers Pvt. Ltd.  
 Kothari, C.P. (2009) Research Methodology: Methods and Techniques. New Delhi: New Age Publications.  
 Mackay, A & S. M. Gass (2005) Second Language Research Methodology and Design. Mahwah, N. J : Lawrence Erlbaum.  
 Majumdar, P.K (2005) Research Methods in Social Science. New Delhi. Viva Books Pvt. Ltd.  
 Mishra, R. P. (1988) Research Methodology: A Handbook. New Delhi. Concept Publishing Company.  
 Mohamed Syed, H.S. (2010) The Craft of Language and Literary Research. New Delhi. Atlantic.  
 Nunan, D. (1992) Research Methods in Language Learning. London. CUP.  
 Seliger, H.W. and Shohamy, E (1989). Second Language Research Methods. Oxford: OUP  
 Sharma, B.A. V, Prasad, D. R. and Satya Narayan, P. (1983) Research Methods in Social Sciences. New Delhi: Sterling Publications Pvt. Ltd.

**PSE 5614****Project  
(Pr)****6 Hrs./ 6 Cr.**

The course aims at enabling the students to develop the capacity of carrying out independent research work within the social, literary, cultural, and linguistic contexts. Students will be trained to develop their skills in academic writing leading to independent research projects on select topics, reflecting their critical insights.

The Postgraduate final semester students can choose any topic of his /her choice in consultation with the guide. The project should offer fresh and new perspective to the area of study and will lead to the students' pursuit of further research programmes.

### **Project Assessment**

The continuous and the summative assessment will be 1:1.

Continuous Assessment: there will be one test, one term paper and one seminar in 60:20:20 ratio.

The research committee consisting of the Head of the Department and the guides will monitor the progress of the project work.

There will be three stages of assessment.

**Stage 1:** The students will submit the project proposal by the end of the second week of the fourth semester.

**Stage 2:** The student will present the work in progress report focusing on the research method and design by the end of the fourth week of the fourth semester.

**Stage 3:** The students will submit the completed project by the end of the fourth semester. (A minimum of 40 pages (A4 size paper) shall be the length of the MA project thesis)

For the first two stages, the progress of the student is assessed by the guide in consultation with the Chairman of the project committee.

For the first stage it is 40 marks and the second stage it is 60 marks.

An external member nominated by the Project research committee, the Guide and the Chairman will evaluate the project and conduct the viva voce examination.

The final evaluation of the project will be done for 100 marks with the following break-up.

Evaluation of the project – 60 marks

Viva voce – 40 Marks

Project carries 200 marks

The passing minimum is 50 percent in the final examination and fifty percent in aggregate.

For project the passing minimum is 50 percent.

**Postgraduate Department of Physics (SF)**

**Programme for M.Sc Physics from 2015 series**

<b>SEM</b>	<b>Course No</b>	<b>Course Name</b>	<b>Hours</b>	<b>Credits</b>	<b>Marks</b>
1	PSP 4401	Mathematical Physics - I	4	4	80
1	PSP 4403	Classical Mechanics	4	4	80
1	PSP 4405	Electrodynamics	5	4	80
1	*PSP 4307/ *PSP 4309	Instrumentation /Renewable energy Physics	4	3	60
1	PSP 4411	Physics Laboratory – I	9	4	80
1	PSP4413	Analog & Physical Electronics	4	4	80
		<b>Total</b>	<b>30</b>	<b>23</b>	<b>460</b>
2	PSP 4402	Quantum Mechanics - I	4	4	80
2	PSP 4404	Statistical Physics	4	4	80
2	PSP 4406	Mathematical Physics - II	4	4	80
2	PSP 4408	Nuclear Physics	5	4	80
2	PSP 4410	Physics Laboratory – II	9	4	80
2	*PSP 4312/ *PSP 4314	Computational Physics /Nano Physics	4	3	60
		<b>Total</b>	<b>30</b>	<b>23</b>	<b>460</b>
3	PSP 5401	Quantum Mechanics –II	5	4	80
3	PSP 5403	Particle Detector and Accelerator	4	4	80
3	*PSP 5311/ *PSP 5313	Interfacing Microcontroller/Crystal growth and Thin films	4	3	60
3	PSP 5405	Condensed Matter Physics-I	4	4	80
3	PSP 5307	Physics Project – I	9	3	60
3	PSP 5409	Spectroscopic Techniques	4	4	80
		<b>Total</b>	<b>30</b>	<b>22</b>	<b>440</b>
4	PSP 5402	High Energy Physics	5	4	80
4	PSP 5404	Digital Electronics	4	4	80
4	PSP 5406	Condensed Matter Physics - II	4	4	80
4	PSP 5308	Physics Project – II	9	3	60
4	*PSP 5310/ *PSP 5312	Matrix & Fourier Optics /Laser and Nonlinear Optics	4	3	60
4	PSP5414	Astrophysics	4	4	80
		<b>Total</b>	<b>30</b>	<b>22</b>	<b>440</b>
		<b>Grand Total for Semester I - IV</b>	<b>120</b>	<b>90</b>	<b>1800</b>

**PSP 5401****Quantum Mechanics – II****5hr / 4 cr****Preamble:**

Quantum mechanics is essential to understand the behaviour of systems at atomic length scales and smaller. Important applications of quantum mechanical theory include superconducting magnets, light-emitting diodes, laser, transistors, semiconductors such as the microprocessor, medical and research imaging such as magnetic resonance imaging and electron microscopy, and explanations for many biological and physical phenomena.

**Objectives:**

1. To study the approximation methods for stationary states, evolution of time concepts and their applications.
2. To emphasize advanced topics such as the relativistic quantum mechanics and quantum field theory.

**Unit 1: Angular Momentum**

Dirac's notation – matrix representation of operators – unitary transformations – matrix theory of Harmonic oscillator – matrix representation of angular momentum operators – spin angular momentum – Non-relativistic Hamiltonian including spin – Addition of angular moments – Clebsch-Gordan coefficients – spin functions for a system of two spin-1/2 particles

**Unit 2: Scattering Theory**

Wave mechanical picture of scattering – Green's functions – scattering amplitude – Born approximation – Validity of Born approximation – Partial wave analysis – Phase shifts: relation to potential – mutual scattering of two particles.

**Unit 3: Approximation Method for Stationary States**

Time independent perturbation theory – Non-degenerate – degenerate – Applications – Variation method – Ground state energy – Application to excited states – Exchange interaction – WKB approximation – Applications.

**Unit 4: Time dependent Perturbation Theory**

Time dependent perturbation theory – Transition probability – Fermi's Golden rule – selection rules – Harmonic perturbations – Interaction of an atom with EM radiation – Dipole approximation – Einstein's coefficients – Equation of motion in Heisenberg's picture – interaction picture.

**Unit 5: Relativistic Quantum Mechanics and Quantum Field Theory**

Klein-Gordon equation – Dirac equation – Plane wave solutions – spin of the Dirac particle – Dirac particle in EM fields – Dirac equation in central field – spin magnetic moment – Euler-Lagrange's classical field equation – Schrödinger's field – commutation relations for Bosons, anti commutation relation for Fermions.

**Text Book(s):**

1. G. Aruldas, "Quantum Mechanics", 2<sup>nd</sup> ed PHI Learning Private Limited, (2013)
2. Mathews P.M & Venkatesan K. Reprint, "Text book of Quantum Mechanics" (2002) Tata McGraw, Hill, New Delhi,

**References:**

1. Thankappan V.K “Quantum Mechanics” 2<sup>nd</sup> Ed” Wiley Eastern Ltd (1993)
2. Schiff L.I. “Quantum Mechanics” 3<sup>rd</sup> Ed” McGraw Hill New York (1968)
3. Cohen Tannoudji C, Diu B & Laloe F. “Quantum Mechanics”, Vol I & II, John Wiley & sons, Inc.

**PSP 5403****Particle Detectors and Accelerators****4 hr / 4 cr****Preamble:**

Particle Physics, which probes matter on the smallest distance scales requires the use of the highest available particle collision energies. Therefore, for nearly all experimental particle physics programmes, the development of particle detector and accelerator technology has proved essential. Fundamental particle physics explores the nature of matter and of the forces that bind matter together. This field addresses some of the oldest and deepest questions in natural philosophy.

**Objectives:**

1. To learn the interaction of radiation with matter and different kinds of detector function.
2. To understand the experimental techniques and basic accelerator physics.

**Unit 1: Interaction of radiation with matter**

Matter Particle interaction – Interaction of high energy particles with matter Energy loss of heavy charged particles in matter – Electronic stopping power (Bohr and Bethe-Bloch formulae) - Energy loss of electrons and positrons: Electronic stopping and energy loss by bremsstrahlung radiation, Interaction of photons: -Hadron interactions, hadron showers.

**Unit 2: Particle detectors**

General characteristics of detectors: efficiency, response in energy, time, position and corresponding resolutions, recovery time or count rate handling capability.

**Unit 3: Detector Types**

Gas detectors - Semiconductor detectors - Silicon detectors (surface barrier, Scintillation detectors: Inorganic and organic scintillators, photomultipliers, photodiodes, avalanche photodiodes- Miscellaneous detectors: cryogenic detectors, thermal detectors, channeltrons and microchannel plates, plastic track detectors, hybrid detectors.- Large sized HEP detectors (typical example: CMS, ATLAS, INO)

**Unit 4: Experimental techniques**

Electronics modules for pulse processing: Preamplifiers (charge, voltage sensitive), amplifiers (spectroscopy or high resolution, fast and timing filter), timing discriminators (leading edge and constant fraction types), gate and delay generators, coincidence (fast and slow) units, linear gate and stretchers, scalars and rate dividers, computer based data acquisition systems (DAQ)

**Unit 5: Basic Accelerator Physics**

Introduction to accelerators; basic concepts; DC accelerators; Cockcroft – Walton, Van de Graff and tandem -cyclotrons; synchrotrons; intersecting storage rings; ion sources.

**Text Book(s):**

1. W.R. Leo “Techniques in nuclear & particle physics”, 2<sup>nd</sup>ed, Springer (2005)
2. G. Knoll “Radiation Detection & measurement”, 3<sup>rd</sup>ed, John Wiley & Sons (2007)

**References:**

1. Fernow, “Introduction to experimental particle physics”, Cambridge University Press (1989)
2. T. Ferbel, “Experimental techniques in HEP”, World Scientific press (1991)
3. Arvind Jain, “Introduction to Accelerator physics”, Macmillan (1993)

**PSP 5311****Interfacing Micro-controller****4 hr / 3 cr****Preamble:**

Microcontrollers can be used as the ‘brain’ to control a large variety of products. In order to control a device, it is necessary to interface the device with the microcontroller. This course helps to enable students with electronics experience to successfully complete interfacing tasks.

**Objectives:**

1. To understand the architecture and principles of operation of a microcontroller
2. To be able to interface a microcontroller to input and output devices.

**Unit 1: Architecture of microcontroller**

Micro controllers & Embedded Processors: Micro controller versus General-purpose Microprocessors, Microcontrollers for embedded systems, embedded applications, choosing a Microcontroller. 8051 Architecture: 8051 Microcontroller hardware, input/output pins, ports and circuits, external memory, counter and timer, serial data input and output, interrupts, other members of 8051.

**Unit 2: 8051 Instructions**

Addressing modes: immediate and register addressing modes, accessing memory using various addressing modes. Arithmetic instructions and programs: unsigned addition and subtraction, unsigned multiplication and division, signed members concepts and arithmetic operations.

**Unit 3: 8051 programs**

Logic and compare instructions rotate and swap instructions. Jump, Loop and call instructions; Loop and jump instructions, call instructions, time delay, generation and calculation. Single bit instructions and programming: single bit instruction programming, single bit operation with carry reading input pins versus port latch. I/O port programming: I/O programming, bit manipulation.

**Unit 4: 8051 Timer / Counter, serial communication and interrupts programming**

Timer / Counter programming: programming 8051 timers, counter programming, pulse frequency and pulse width measurements. Serial communication programming: Basics of serial communication, 8051 connection to RS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051; programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts.



**Unit 5: Application of 8051 micro controllers**

Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051 - Interfacing - Key board - LED / LCD- A/D & D/A converters-stepper motor.

**Text Book(s):**

1. Kenneth J.Ayala “The 8051 Microcontroller–Architecture Programming and Applications” Penram International Publication (1996)
2. Mazidi and Mazidi “8051 Micro controller and Embedded systems” Pearson Education Asia (2002)

**Reference:**

1. Rajkamal “The concepts and features of micro controllers (68HC11, 8051, 8096)” Wheeler Publications (2000)

**PSP 5313****Crystal Growth and Thin Film****4 hr / 3 cr****Preamble:**

Crystal growth involves a variety of research fields ranging from surface physics, crystallography, and material sciences to condensed matter physics. Crystal growth plays an important role in both theoretical and experimental research fields, as well as in applications.

Thin films science and technology plays an important role in the high-tech industries. Thin film technology has been developed primarily for the need of the integrated circuit industry. This course emphasizes the importance of thin films and their properties for new technologies and it explains fabrication, characterization and applications.

**Objectives:**

1. To impart the students hands-on experience of system operation, thin film coating and design.
2. To introduce the students to various crystal growth methods and characterization adopted in industries and scientific laboratories.

**Unit 1: Crystal Growth**

Nucleation – concept of nucleus formation – shapes of nucleus – phase diagrams phase rules – methods of melt growth –S-R Method– vapour growth – slow cooling – gel growth and etching techniques – crystal pulling – Czochralski process.

**Unit 2: Characterization techniques**

Geometry of X-ray reflections – interpretation of Laue photographs – method of taking powder photographs – determination of cell dimensions – measurement & determination of intensities of X-ray reflections – measurement of crystal grain size in polycrystalline aggregates. Micro hardness measurements: Mayer’s test – Vickers test – knoop test – effect of loading.

**Unit 3: Thin Film formation**

Thin Film definition- Types of formation of thin films- Physical Vapor deposition-- thermal and sputtering deposition – chemical vapor deposition

Thin film Lab: Low and high vacuum – production and measurement- Pump down characteristics of rotary and diffusion pump, flow rate determination, use of McLeod’s gauge, different types of valves and flanges.

**Unit 4: Growth and characterization of thin films**

Condensation, nucleation, theories of nucleation and growth of thin films – Characterization of thin films- film thickness measuring methods- structure characterization methods – spectrophotometer – STM – AES and XPS. Lab: reflection transmission curves using UV-visible spectrophotometer – determination of  $n$  and  $k$  values – Optical Eg determination – thickness measurement using crystal and Fizeau method.

**Unit 5: Properties and application of thin films**

Mechanical, electrical and optical properties - Piezoelectric and piezo-resistive properties - Thin film resistors – optical thin films – antireflection coatings – hard and protective coatings - Hard thin film coating- antireflection coating- transparent conductive coating

**Text Book(s):**

- 1) Milton Ohring “Materials of science of thin films deposition and structure”, 2<sup>nd</sup> ed, Academic press (2006).
- 2) Andrew Guthrie “Vacuum technology”, John Wiley & sons, Inc (1963).
- 3) T. J. Coutts “Electrical conduction in thin metal films”, Elsevier scientific publishing company (1974).

**References:**

1. L.I.Maissel and R.Glang “Handbook of Thin Film Technology” McGraw Hill Book Company New York(1970)
2. K.L.Chopra “Thin Film Phenomena” McGraw Hill Book Company NewYork(1969)
3. P.S.Raghavan and P.Ramasamy, “Crystal Growth Process and Methods” KRU publications, Kovilpatti(2000)
4. N.F.M.Henry, H.Lipson and W.A.Wooster “The Interpretation of X - ray Diffraction Photographs” Macmillan & Co Ltd. London (1969)

**PSP 5405****Condensed Matter Physics-I****4 hr/ 4 cr****Preamble:**

The field of condensed matter physics explores the macroscopic and microscopic properties of matter. The syllabus explores how matter arises from a large number of interacting atoms and electrons, and what physical properties it has as a result of these interactions.

**Objectives:**

1. To study how the diverse properties of condensed matter can be related to the interactions at the atomic level.
2. To provide a foundation in crystallography, x-ray diffraction, phonons and band theory.

**Unit 1: Crystallography and X-ray diffraction**

Basic concepts of Crystallography – Periodic arrays of atoms - crystal structure Fundamental types of lattices – crystal systems- Simple crystal structure - crystal symmetry elements-space groups-Bravais space lattices – Miller indices - Bragg law- diffraction conditions- Laue equation-Brillouin zone- reciprocal lattice – atomic form factor.

**Unit 2: Crystal binding**

Crystals of Inert gases-Vander Waals – London interaction- ionic crystals-electrostatic or Madelung energy-covalent crystals- metals- hydrogen bonds-analysis of elastic strains and stiffness.

**Unit 3: Phonons**

Lattice vibrations of crystals with monoatomic crystal- Phonon momentum- Phonon and thermal properties of solids: Einstein and Debye theory of specific heat of solids. Anharmonic crystal interactions- Thermal conductivity

**Unit 4: Band theory**

Free electron Fermi gas: energy levels in 1-D and 3-D- Heat capacity of the electron gas- Hall effect- Nearly Free electron model- Bloch functions- Kronig Penney model-Band theory of solids.

**Unit 5: Semiconductors crystals**

Band gap-Effective mass-: silicon and germanium-intrinsic carrier concentration-impurity conductivity-thermoelectric effects-Fermi surfaces and experimental methods in Fermi surface studies (Any two methods).

**Text Book:**

1. Charles Kittel, "Introduction to Solid State Physics", VII ed, Wiley Eastern Ltd. (2011)

**References:**

1. S. O. Pillai, "Solid State Physics", Wiley Eastern Ltd., (1994)
2. Leonid Azaroff, "Elements of X-ray crystallographyMcGraw Hill Company " (1968)
3. F. C Philips, "An introduction to crystallography" 4ed, ELB society(1971)
4. M.Ali Omar, "Elementary Solid State Physics" Pearson Education Pvt. Ltd. (2000)

**PSP 5307 & PSP 5308****Project Laboratory – I & II****9hr / 3cr**

Each student is to submit a project in each III and IV semesters. There will be no other practical work during these semesters. Usually, a project is approved by the staff supervisor/guide. Students shall maintain daily records and present at least two oral progress reports while doing the project. They shall submit the dissertation at the end of each semester (III and IV). All the above process is reckoned for assessment. Topics shall usually be experimental by nature. However, theoretical types may also be admitted in one of the two semesters.

**EVALUATION METHOD FOR PROJECT:**

- |  |     |
|--|-----|
| 1) Project proposal (oral and written) | 20% |
| 2) Oral progress reports               | 20% |
| 3) Continuous assessment               | 35% |
| 4) Final report                        | 25% |

**PSP 5409****Spectroscopic Techniques****4 hr/4 cr****Preamble:**

Spectroscopic techniques employ light to interact with matter and thus probe certain features of a sample to learn about its consistency or structure. The course presents a higher level of complexity in understanding the biochemical or biophysical characterisation. An understanding of the properties of electromagnetic radiation and its interaction with matter leads to an appreciation of the variety of types of spectra and, consequently, different spectroscopic techniques and their applications to the solution of biological problems.

**Objectives:**

1. To help students learn the relative merits of the techniques, the operating principles, and develop problem solving skills generally useful in chemical analysis.
2. To know the various aspects of spectroscopic chemical analysis relevant to both research and industry.

**Unit 1: Microwave spectroscopy**

Interaction of radiation with rotating molecule – Rotational spectra of rigid di-atomic molecules – Isotope effect in rotational spectra – Intensity of rotational line - Non rigid rotator – Linear poly atomic molecules – Symmetric top molecules – Asymmetric top molecules – Stark effect – Microwave spectrometer – Applications of microwave spectroscopy.

**Unit 2: Infrared Spectroscopy**

Vibrational energy of the diatomic molecule – Infrared selection rules – Vibrating diatomic molecules – diatomic vibrating rotator – vibration band – vibration of poly atomic molecules – Fermi Resonance – Hydrogen bonding – Rotating vibration spectra of a poly atomic molecule – Normal modes of vibration in crystal – Fourier transform infra red spectroscopy – applications.

**Unit 3: Raman Spectroscopy**

Theory of Raman Scattering – Rotational Raman spectra – Vibrational Raman spectra – Mutual exclusion principle – Raman spectrometer – Polarization of Raman scattered light – Structure determination using IR and Raman Spectroscopy – Raman investigation of phase transition – Proton conduction in solids – Raman spectral – Resonance Raman scattering.

Nonlinear Raman phenomena – Hyper Raman effect – Stimulated Raman scattering – Inverse Raman Effect – Coherent Anti Stokes Raman scattering – Photo acoustic Raman scattering – Multi photon spectroscopy.

**Unit 4: Electronic and Mossbauer Spectroscopy**

Vibrational coarse Structure – Vibrational analysis of band systems – Franck – Condon principle – Rotation fine structure of electronic vibration spectra – The Fortran parabola – Dissociation – Pre-dissociation – Electronic angular momentum in diatomic molecules – Photo electron spectroscopy – Recoilless emission and absorption – experimental techniques – Mossbauer spectrometer – Isomer shift – Quadra pole interaction – Magnetic hyper fine interaction – applications.

**Unit 5: Resonance Spectroscopy**

NMR – Magnetic properties of nuclei – Resonance condition – NMR instrumentation – Relaxation processes – Bloch equations – Chemical shift – NMR spectra of solids – Magic angle spinning NMR – Nuclear quadrupole effects – NMR imaging.  
 ESR – Principle of ESR – ESR spectrometer – Fine and hyper fine structure – Double resonance in ESR

**Text Book(s):**

1. N.Banwell and E.M.Mc Cash, “Fundamentals of Molecular Spectroscopy”, Tata Mc Graw Hill, 4<sup>th</sup> edition (1994)
2. G.ArulDhas, “Molecular Structure and Spectroscopy”, Prentice Hall of India Pvt. Ltd., New Delhi (2001)

**References:**

1. B.K.Sharma “Spectroscopy” 23<sup>rd</sup> Ed, Krishna Prakashan Media (P) Ltd (2013)
2. Gurdeep R. Chatwal and Sham K. Anand “Spectroscopy (atomic and molecular)” 5<sup>th</sup> Ed, Himalaya publishing house (2004)
3. B.P. Straughan and S.Walker, “Spectroscopy”, John Wiley & sons(1997)

**PSP 5402****High Energy Physics****5 hr / 4 cr****Preamble:**

High energy physics is the study of subatomic elements of matter and radiation, and their interactions. It is an important branch of Physics that it enables a picture to be built up of what matter is and how it works. The tools of particle physics—complex accelerators, sensitive detectors, grid computing, high-volume data storage and analysis—are making a significant and lasting impact on quality of life for people around the globe.

**Objectives:**

1. To know the characteristics of strong and weak interactions and to familiarize the consequences of boson exchange.
2. To provide the students a solid background for research and development projects within high-energy physics instrumentation.

**Unit 1: Preliminary notions**

Energy and length scales in HEP, particle accelerators and detectors, Hadrons and Leptons, Strong and Weak Interactions, Isospin and strangeness, List of particle properties, conserved quantum numbers

**Unit 2: Strong interactions**

Hadronic resonances, SU(2) and SU(3) symmetries, Lie groups and Lie algebras, quarks, baryons and mesons as composites of quarks and antiquarks, discovery of "colour", Deep inelastic scattering and partons

**Unit 3: Weak interactions**

Fermi's theory, parity violation, current x current theory, Electroweak dynamics, Neutral Current, W and Z bosons, Higgs boson, Kzero-Kzerobar oscillations, CP violation, CKM matrix

**Unit 4: Quantum Field Theory**

QED as an example of QFT, Yang-Mills theory, Higgs mechanism and electroweak theory, asymptotic freedom and QCD, Standard model of HEP

**Unit 5: Neutrinos**

Solar, atmospheric, reactor and accelerator neutrinos, neutrino oscillations, Majorana neutrinos and neutrinoless double beta decay, India-based Neutrino Observatory

**Text Book:**

1. Donald H. Perkins, "Introduction to High Energy Physics", Academic press (2000)

**References:**

1. Mark Thomson, "Modern Particle Physics", 1<sup>st</sup> Ed, Cambridge University Press (2013)
2. Brian Martin, "Particle Physics - A Beginner's Guide", Adams Media (2011)

**PSP 5404****Digital Electronics****4 hr / 4 cr****Preamble:**

This course explains how networks of semiconductor devices such as transistors perform signal-processing tasks. The digital nature of electronic signals offers a convenient, compact and noise-free representation of information. Digital signals can be easily stored in an electronic memory and can be easily understood by digital microprocessors.

**Objectives:**

1. To study digital logic along with the basics of Digital Circuits and different types of memories.
2. To help the students learn about the use of digital electronics in DAC, ADC and logical IC families for designing digital circuit.

**Unit 1: Flip –Flop and its Application**

Flip-Flop - Timing Considerations ,Master/Slave Flip-Flops, Flip-Flop Applications , Flip-Flop Synchronization, Detecting an Input Sequence, Data Storage and Transfer, Serial Data Transfer: Shift Registers, Frequency Division and Counting ,Schmitt-Trigger Devices ,One-Shot (Monostable Multivibrator),Analyzing Sequential Circuits, Clock Generator Circuits, Troubleshooting Flip-Flop Circuits , Edge-Triggered Devices

**Unit 2: Counter and its Design**

Asynchronous Counters, Synchronous (Parallel) Counters, Synchronous Down and Up/Down Counters, Pre-settable Counters, Decoding a Counter , Decoding Glitches, Cascading BCD Counters, Synchronous Counter Design, LPM Counters, State Machines

**Unit 3: DAC and ADC**

Digital versus Analog, Digital-to-Analog Conversion, D/A-Converter Circuitry, DAC Specifications, an Integrated-Circuit DAC, DAC Applications, Troubleshooting DACs Analog-to-Digital Conversion, Digital-Ramp ADC, Data Acquisition, Successive-Approximation ADC, Flash ADCs, A/D Conversion Methods, Digital Voltmeter, Sample-and-Hold Circuits, Multiplexing

**Unit 4: IC Logic families**

Digital IC terminology, TTL logic family, TTL series characteristics, Improved TTL series, TTL loading and fan-out, other TTL characteristics, Connecting TTL outputs together, tristate TTL, ECL family, MOS digital ICs & Characteristics, CMOS logic & characteristics, Bilateral switch, TTL driving CMOS and vice-versa, Low voltage technology.

**Unit 5: Semiconductor Memories, Programmable Logic Devices**

RAM architecture, Static RAM, Dynamic RAM (DRAM), DRAM structure, and operation, DRAM Read/Write cycles, DRAM refreshing, Expansion of word size and capacity, Basic idea, PLD architecture (PROM), PAL, PLAs, Applications of a programmable Logic Device

**Text Book:**

1. Ronald J.Tocci, "Digital Systems-Principles and Applications" ,6<sup>th</sup>Ed, PHI, New Delhi (1999)

**References:**

1. Herbert Taub and Donald Schilling, , "Digital Integrated Electronics" McGraw Hill(1985)
2. S.K. Bose, "Digital Systems" 2<sup>nd</sup> Ed, New Age International (P) Ltd (1992)
3. D.K. Anvekar and B.S. Sonde "Electronic Data Converters: Fundamentals & Applications" ,TMH, (1994)
4. A.P. Malvino and D.P. Leach, , "Digital Principles and Applications" TMH (1991)

**PSP 5406****Condensed Matter Physics – II****4 hr/4 cr****Preamble:**

Condensed matter physics is a highly diverse area of research, ranging from innovative studies of the basic properties of novel materials, the study of complex fluids and nonlinear phenomena, to the development and study of nanometer-scale electronic, spintronic, superconducting and optical systems. It forms the basis for the exploration of new materials such as carbon nanotubes and semiconducting nanowires, as well as the basis for the next generation of electronic devices. Much of the modern technology that energizes today's society (e.g. electronics, magnetism, and photonics) is rooted in condensed matter physics.

**Objectives:**

1. To study the optical properties of solids, superconductivity and their applications.
2. To provide a foundation for the quantum theory of magnetism.

**Unit 1: Optical properties of solids**

Dielectric function of the electron gas-Plasmons, Polaritons and Polarons- Optical processes and excitons: Kramers-Kronig relations-Excitons

**Unit 2: Superconductivity**

Superconductivity- Meissner effect - London theory- BCS theory of superconductivity- Type I and Type II superconductors- DC and AC Josephson effects and their applications- High temperature superconductors, SQUID

**Unit 3: Magnetism**

Quantum theory of dia and para magnetism- Rare earth ions- Hund's rule- Orbital quenching- Paramagnetic susceptibility of conduction electrons- Ferromagnetic order- antiferromagnetic order- Magnons, thermal excitons, spin waves- Hall effect, quantum Hall effect – Fractional Hall effect

**Unit 4: Dielectrics and Ferroelectrics**

Macroscopic electric field- Local electric field at an atom- Dielectric constant and polarizability- Structural phase transitions – Landau phase transitions - Ferroelectric crystals

**Unit 5: Defects and Dislocations**

Point defects: Lattice vacancies- Diffusion- Color centers- Surface and interface physics: Surface crystallography- surface electronic structure- Magneto resistance in a two-dimensional channel- p-n junctions- Heterostructures- Semiconductor lasers- Light emitting diodes- Scanning tunneling microscopy- Dislocations: Shear strength of single crystals- Dislocations- Strength of alloys- Dislocations and crystal growth- Hardness of materials

**Text Book:**

1. Charles Kittel, 'Solid State Physics', 7<sup>th</sup> Ed, John Wiley and sons, (1996)

**References:**

1. H.V. Keer, 'Principles of Solid State'Wiley Eastern Ltd, (1994)
2. S.O.Pillai, 'Solid State Physics'Wiley Eastern Ltd, (1994)
3. A.C.Rose-innes and E.H.Rhodrick, 'Introduction to Superconductivity' Paramount Press, (1978)
4. S.V.Subramanian, E.S.Rajagopal, 'High Temperature Superconductivity'Wiley Eastern Ltd, (1989)
5. Azaroff and David Mermin, 'Solid State Physics'Sounders College, (1981)
5. W. F. Dejong "General Crytallography", W. H. Freman and company (1959)
6. M.A.Wahab, " Solid State Physics" Narosa Publishing House, Delhi (1999)

**PSP 5310****Matrix & Fourier Optics****4 hr / 3 cr****Preamble:**

This course examines the use of ray-transfer matrices for some topics in Fourier optics, exploiting the mathematical simplicity of ray matrices compared to diffraction integrals. A simple analysis of the physical meaning of the elements of the ray matrix provides a fast derivation of the conditions to obtain the optical Fourier transform. These matrix methods are particularly useful when a large number of elements are considered.

**Objectives:**

1. To introduce the students to the use of matrix methods in optics.
2. To enable the students to study Fourier techniques in optics.

**Unit 1: Matrix methods in Optics**

Paraxial Optics: Translation matrix and refraction matrix The ray-transfer matrices for a system — Derivation of properties of a system from its matrix – Experimental determination of the matrix elements of an optical system.



**Unit 2: Matrices in Polarization Optics**

Stokes parameter – use of Muller calculation for transferring a Stokes parameter – use of Jones calculus for transferring a Maxwell's column – Experimental determination of the elements of a Jones matrix.

**Unit 3: Fourier Optics**

Fourier analysis in two dimensions - Scalar Diffraction theory: The Rayleigh – Sommerfeld theory of diffraction by a plane screen – Approximation of Huygens – Fresnel principle – Examples of Fraunhofer diffraction patterns and of Fresnel. Fourier transforming and imaging properties of lenses

**Unit 4: Frequency Analysis of Optical Imaging Systems**

Frequency analysis of diffraction – limited coherent and incoherent imaging systems- Spatial Filtering and optical image processing - frequency domain synthesis – Vander Lugt filter – application of character recognition

**Unit 5: Holography**

The basic principle – Gabor hologram – The Leith Upatnieks hologram – Effects of film non linearity and emulsion thickness – Reflection holograms – Application: Microscopy – Interferometry – Vibration analysis – Character recognition.

**Text Book(s):**

1. Gerard A & Burch J.M “Introduction to Matrix Methods in Optics”, John Wiley (1975)
2. Goodman J.W “Introduction to Fourier Optics”, McGraw Hill, New York (1996)

**References:**

1. Gaskill J.D “Linear Systems, Fourier Transform and Optics”, John Wiley (1975)
2. Ghatak. A.K & Thyagarajan.K. “Optical Electronics Cambridge University Press, Cambridge ”(1989)
3. Pedrotti F.L and Pedrotti L.S. “Introduction to Optics”, Prentice hall in Inc. (1987)
4. Grant R. Fowles “Introduction to Modern Optics”, Holt, Rinehart & Winson, Inc. (1975)
5. Nussbaum A & Philips R.A. “Contemporary Optics for Scientists and Engineers”, Prentice Hall, New Delhi, (1976)

**PSP 5312****Laser and Non Linear Optics****4 hr / 3 cr****Preamble:**

Lasers produce highly monochromatic beams, which can be concentrated to extremely high intensities. Non-linear optics is an extensive field theory. The key that opened the door to Non-linear optics was the availability of high-power lasers of hundreds of varieties. A peculiar property of the laser beam, essential to non-linear optics, is its high degree of coherence, because the stimulated emissions of different radiating atoms are synchronized.

**Objectives:**

1. To deal with the basic physics behind laser operation, different laser systems and their applications like interaction with matter and information processing
2. To study Non-linear techniques in optics

**Unit 1: Laser Theory**

Einstein Coefficients – Light amplification – threshold condition – rate equations – three level systems – four level systems - variation of laser power around threshold – optimum output coupling – line broadening mechanisms – Q factor

**Unit 2: Laser Modes**

Modes of a rectangular cavity and the open planar resonator – The ultimate line width of a laser – mode selection – Transverse and longitudinal Q – Switching -mode locking – modes of a confocal resonator system

**Unit 3: Laser Types and Applications**

Types of Laser: Gas laser – solid state laser – semiconductor laser – dye lasers – excimer lasers. Applications of lasers: Lasers and interaction – lasers and information

**Unit 4: Crystal Optics and Electro Optic Effect**

Plane wave in anisotropic media – wave refractive index – ray refractive index – The index ellipsoid - Fresnel's equation of wave normal - The electro optic effect in KDP, lithium niobate and lithium tantalite crystals – The index ellipsoid in the presence of external electric field

**Unit 5: Acousto and Non – Linear Optic Effect**

Raman-Nath diffraction – Theory of Raman – Nath diffraction – Bragg diffraction – Raman – Nath - acousto optic modulator – Bragg modulator- self – focussing phenomenon – Second harmonic generation - non linear phenomena

**Text Book(s):**

1. Thyagarajan.K & Ghatak.A.K. “Lasers: Theory and Applications, Plenum Publishing Corporation, New York, ( 1981)
2. Ghatak.A.K & Thyagarajan.K. “Optical Electronics”, Cambridge University Press, Cambridge (1989)

**References:**

1. Milonni.P.W & Ederly J.H. Lasers, John Wiley & Sons, (1988)
2. Gaskill J.D Linear Systems, Fourier Transforms and Optics, John Wiley, (1975)
3. Pedrotti F.L and Pedrotti L.S. Introduction to optics, Prentice Hall Int. Inc, (1987)
4. Grant R. Fowles Introduction to Modern Optics, Holt, Rinehart & Winston, Inc, (1975)

**PSP 5414****Astrophysics****4 hr / 4 cr****Preamble:**

This course covers the physical properties of heavenly bodies and their behaviour. The interactions between these celestial bodies are studied in detail as well. Studying astrophysics provides students with ample opportunities in the arenas of astronomy, space research and other pertaining fields.

**Objectives:**

1. To impart a deep understanding of typical topics in Astronomy by presenting them in an active program.
2. To provide students with the background and training in Research Methods and Skills related to Astronomy.

**Unit 1: Positional Astronomy**

Development of Astronomy and Birth of Modern Astronomy – Physics of Kepler and Newton – Seasons – Time and Precession – Constellation and nomenclature of stars – Stellar distance – Stellar magnitude – Spectral Classification – Colour index – Aberration and Parallax.

**Unit 2: Astronomical Observations**

Optical telescopes – Types of telescopes – Reflector and refractor type - Recording devices – Photography, Photomultipliers and CCDs. Radio telescope – Interferometers, T, Y and Cross interferometers. Techniques of observation in IR, UV, X – Ray and Gamma ray regions.

**Unit 3: Sun and Stellar Bodies**

Sun as a star – layers of Sun – Photosphere – Chromosphere – Corona – phenomenon of Sun – sun spots – Prominences – solar flares – eclipses – limb darkening – Galaxy – Types of Galaxies – Milky way galaxy – Comets- Asteroids and meteoroids.

**Unit 4: Stellar Structure and Evolution:**

Basics equations of stellar structure – Nuclear energy sources – Jean's criterion - Star formation – H-R diagram – Main sequence stars – end state of stars – Chandrasekar mass limit – white dwarfs – Novae and Super novae – Pulsars – Neutron star – Black hole – Binaries and Variable stars.

**Unit 5: Cosmology**

Hubble's law – Models of Universe – The Big-Bang – Steady State theory – consequences of general theory of relativity – Bending of light – Background radiation – Future of the Universe.

**Text Book(s):**

1. George o. Abell, 'Exploration of the Universe', Saunders College Publishing, (1986)
2. Frank H. Shu, The Physical Universe, An introduction to Astronomy, University Science Books, Mill Valley, California, (1982)
3. R.Alder, M.Bazrin and M.Schiffer, 'Introduction to General theory of Relativity', McGraw Hill Publications, (1975)

**References:**

1. K.D.Abhyankar, Astrophysics – Stars and Galaxies, Tata McGraw Hill Publications, (1989)
2. William Kaufmann Astronomy: The Structure of the Universe, McMillan Publishing Co.inc, New York (1999)

**M.Sc FOOD SCIENCE**  
**Proposed Curriculum Plan (2016-2017)**

Semester	Course Code	Course Title	Hours	Credits	Marks
<b>I</b>	PFS 4501	Food Chemistry	6	5	100
	PFS 4503	Food Microbiology	6	5	100
	PFS 4505	Food Science	6	5	100
	PFS 4507	Nutrition	6	5	100
	PFS 4309	Lab in Food Microbiology	3	3	60
	PFS 4311	Lab in Food Chemistry and Nutrition	3	3	60
		<b>Total</b>	<b>30</b>	<b>26</b>	<b>520</b>
<b>II</b>	PFS 4502	Clinical Nutrition and Diet Therapy	6	5	100
	PFS 4504	Advances in Food Science	6	5	100
	PFS 4506	Principles of food processing & Preservation	6	5	100
	PFS 4508	Food packaging	6	5	100
	PFS 4310	Lab in Advances in Food Science	3	3	60
	PFS 4312	Lab in food processing and preservation	3	3	60
		<b>Total</b>	<b>30</b>	<b>26</b>	<b>520</b>
	<b>PFS4514</b>	<b>Summer Internship</b>		<b>5</b>	<b>100</b>
<b>III</b>	PFS 5501	Food Analysis, Safety and Food Laws	6	5	100
	PFS 5503	Food Biotechnology	6	5	100
	PFS 5505	Community nutrition and public health	6	5	100
	PFS 5507	Research methodology and biostatistics	6	5	100
	PFS 5309	Lab in Food Analysis	3	3	60
	PFS 5311	Lab in Food Biotechnology	3	3	60
		<b>Total</b>	<b>30</b>	<b>26</b>	<b>520</b>
	* ELECTIVES(Theory)		6	5	100
	* ELECTIVES(Lab)		3	3	60
<b>IV</b>	PFS 5910	PROJECT	21	9	180
		<b>Total</b>	<b>30</b>	<b>17</b>	<b>340</b>

**ELECTIVES – Theory and Lab (Any one theory & Corresponding lab) - IV Semester**

PFS 5502	Dairy and Dairy products	6	5	100
PFS 5302	Lab in Dairy and dairy products	3	3	60
PFS 5504	Meat and poultry	6	5	100
PFS 5304	Lab in Meat and poultry	3	3	60
PFS 5506	Fruits and Vegetables	6	5	100
PFS 5306	Lab in Fruits and Vegetables	3	3	60
PFS 5408	Cereals and legumes	6	5	100
PFS 5308	Lab in Cereals and legumes	3	3	60

**PFS 4501****FOOD CHEMISTRY****(5+1=6h/wk) (5cr)**

Theory course on Food chemistry includes introduction, methods of analysis, chemistry of carbohydrates, amino acids, proteins, lipids, plant pigments and essential oils.

**1. Introduction to chemistry of foods:** composition and factors affecting the composition of foods, Proximate Composition of Foods; Instrument and methods used in food analysis, Colorimetry, Spectrophotometry, Fluorimetry, Atomic absorption spectroscopy and Chromatographic methods

**2. Carbohydrates:** occurrence and classification; structure determination, diagrammatic representation of isomers, sugar derivatives; caramelization;; Chemistry of cellulose, starches and other polysaccharides; starch degrading enzymes; commercial sources gel formation and starch retrogradation; pectic substances: their occurrence, structure, properties and use in foods; gums, mucilage and their commercial sources. Metabolism of carbohydrates.

**3. Amino acids and proteins:** classification of proteins, chemical and physical properties of proteins, structure of proteins and techniques used in elucidation of protein structure; denaturation of proteins; forces involved in protein conformation, functional properties of proteins in foods, hydrolysis of proteins, major food proteins and their sources; changes in proteins during processing . Metabolism of proteins.

**4. Lipids and plant pigments:** chemistry, occurrence, classification and composition; physical and chemical properties of fats. Emulsions-types of emulsions, emulsifying agents; metabolism of lipids. Plant pigments: their occurrence, chemistry, functions and changes during processing, Plant acids, acid and taste relationship; Essential oils: Chemistry, occurrence and extraction; Terpeneless oils and their use in foods

**5. Enzymes:** Classification, nomenclature, general properties, mechanisms of enzyme action, regulation of enzyme activity.Role of Coenzymes and cofactors in enzyme activity. Factors affecting enzyme activity Enzyme inhibition, Isoenzymes, immobilized enzymes, clinical significance of enzyme assays.

**References**

1. Owen R. Fennema (1996) Food Chemistry Third Edition Marcel Dekker, Inc. New York
2. H.D.Belitz, W.Grosch, P.Schieberle (2009) Food Chemistry 4<sup>th</sup> revised and extended edition Springer publishers.
3. Beltz, H.D. 2005. *Food Chemistry*. Springer Verlag.
4. Fennema, O.R, 2006, Food Chemistry, Academic Press.
5. Meyer, L.H. 1987. *Food Chemistry*. CBS publishers and Distributors, New Delhi.
6. Potter, N.N. and Hotchikiss, J.H. (2006), Food Sciences, Fifth edition, CBS publishers and Distributors, New Delhi.

**PFS 4503****FOOD MICROBIOLOGY****(5+1=6h/wk) (5cr)**

This course provides information on basic microbiology, food spoilage and preservation, food borne bacterial and viral diseases and food borne parasitic diseases. It also provides information on use of microorganisms in food preparation.

**1. Overview of Basic Microbiology** An introduction to microbial world: Bacteria, Fungi, Yeast, Viruses Importance and significance of microorganisms in food science - Factors affecting the growth of microorganisms in food - Intrinsic and extrinsic factors that affect microbial growth.

**2. Food Spoilage and Preservation** Definition, sources of contamination and microorganisms involved in spoilages of various foods: Milk, Bread, Canned food, Vegetables and fruits, Fruit juices, Meat, Eggs and Fish Physical and chemical means used in destruction of microbes: Definition of sterilization and disinfection, Thermal- role of heat, pasteurization, Non-thermal- filtration and radiation in sterilization, use of chemical agents- alcohol, halogens and detergents.

**3. Food Borne Bacterial and Viral diseases** Bacterial food borne diseases (*Staphylococcal* intoxicification, Botulism, Salmonellosis, Shigellosis, Enteropathogenic *Escherichia coli* Diarrhoea, *Clostridium perfringens* gastroenteritis, *Bacillus cereus* Gastroenteritis) Food Borne Viral Pathogens (Norwalk virus, Norovirus, Reovirus, Rotavirus, Astrovirus, Adenovirus, Parvovirus, Hepatitis A Virus). Preventive and control measures.

**4. Food Borne Parasitic Diseases**

Food Borne Animal Parasites Protozoa – Giardiasis, Amoebiasis, Toxoplasmosis, Sarcocystosis, Crypto sporidiosis, Cysticercosis/Taeniasis. Roundworm – Trichinosis, Anisakiasis Mycotoxins: Aflatoxicosis, Deoxynivalenol Mycotoxicosis, Ergotism. Preventive and control measures.

**5. Microorganisms and Food preparation**

Fermentation process-kinetics of fermentation process. Prebiotics-Probiotics and single cell proteins. Dairy products (cheese and yoghurt) and traditional Indian fermented foods and their health benefits. Fermented Beverages- wine, beer, toddy and oatka.

**References**

1. Frazier Food Microbiology 4<sup>th</sup>edi. Tata McGraw-Hill Education
2. James Jay, Loessner, Martin J., Golden, David A., Modern Food Microbiology - Springer publishers
3. Bibek Ray & ArunBhunia Fundamental Food Microbiology, Fifth Edition CRC Press
4. M. R. Adams, M. O. Moss Food Microbiology Royal Society of Chemistry,

**PFS 4505****FOOD SCIENCE****(5+1=6h/wk) (5cr)**

This course on Food Science deals with sensory science and various food products such as cereal, legumes, fats and oil seeds, fruits, vegetable and dairy products, poultry, meat and marine foods and confectionery products.

**1. Sensory Science** Sensory science - Introduction to sensory science - Panel selection methods in sensory analysis, Instrumentation - Recent Development in sensory science - Colour and texture of foods - Colour measuring systems- CIE system, tintometers - Physical characteristics of foods - Texture measurement- instrumental methods - Texture profile analysis - Rheology of foods - Flow behaviour of fluid foods - Viscosity measurement- consistometers and viscometers - On-line viscosity measurement

**2. Cereals, Millets, Fats and Oil Seeds**

Rice: Composition, primary and secondary processing-raw and boiled rice. Millets: Types, composition, processing. Legume: Types, composition, milling, germination, cooking & processed products. Oilseeds: Use of oilseeds and oilseed meals, sunflower and gingelly oil-composition-processing.

**3. Fruits and vegetables:** Fruits and vegetables: Composition, pectins, plant acids, types of pigments, effect of cooking on colour and texture of vegetables. Dairy and Dairy products- Milk and milk products: Composition, functionality in food system, processing of different products like ghee, butter, milk powders, khoa, paneer, cheese, milk products and ice creams.

**4. Poultry, Meat and Marine Foods:** Eggs - Quality grading, structure, composition, functional properties and products. Flesh foods - Types, composition, structure of muscle, and conversion of muscle to meat - physicochemical changes, cooking and processing. Marine foods - Types, composition, cooking and processing.

**5. Confectionery:** Sugar and Jaggery: Principles of sugar crystallization, stages of cookery and role in Indian traditional sweet preparations, manufacturing of candies and sweets

**References**

1. Meyer, I.H. Food Chemistry. Reinhold Pub. Corpn., New York, Charles R. Turtle Co., Tokyo, [1960].
2. Deman, J. M. Principles of Food Chemistry, AVI Publishing Company, [1980].
3. Stryer L. Biochemistry, 4th Ed. W. H. Freeman and Company, [1995].
4. Stanier R Y and others. General Microbiology, Macmillan, India.[1986]
5. Frazier and Westhoff. Food Microbiology.3rd Ed. Tata McGraw Hill, [1978].

**PFS 4507****NUTRITION****(5+1=6h/wk) (5cr)**

The course on nutrition deals with basis of computing nutritional requirements, section on body composition, energy metabolism, nutritional aspects, macro and micronutrients

**1. Basis for Computing Nutrient Requirements** Latest concepts in dietary recommendations, RDA – ICMR and WHO: their uses and limitations. Balanced diets: Food groups, formulation of balanced diets, ICMR balanced food for Indians. Body mass index

**2. Body Composition** Methods of studying body composition- underwater weighing, air displacement technique, DXA (dual X-ray absorptiometry), skin fold caliper, bio-impedance. Body composition changes during lifecycle- relationship between maternal anthropometry with fetal composition, determinants of postnatal growth and body composition during early childhood, during pregnancy, and elderly years. Nutritional disorders and effect on body composition- protein energy malnutrition. Body fluids and water balance

**3. Energy Metabolism** Basal and resting metabolism- influencing factors. Methods to determine energy requirements & expenditure. Thermogenesis, adaptation to altered energy intake, latest concepts in energy requirements and recommendations for different age groups.

**4. Nutritional Aspects of Macronutrients** Carbohydrates - dietary sources. Lactose intolerance, dental carries. Artificial sweeteners. Role of dietary fibre in health and disease. Disorders of CHO metabolism. Glycemic index and glycemic load of foods, intrinsic and extrinsic factors influencing GI. Proteins - dietary sources- disorders and protein deficiency. Lipids - Concepts of visible and invisible fats. EFA, SFA, MUFA, PUFA – sources and physiological functions. Role of cholesterol, lipoproteins and triglycerides in health.

**5. Nutritional Aspects of Micronutrients** Vitamins and Minerals – classification, functions, dietary sources, deficiency and toxicity. Bioavailability of minerals; Effect of food processing on micronutrient content and bioavailability. Food fortification.

**References**

1. A.Catherine Ross, Benjamin Caballero, Robert J.Cousins, Katherine L. Tucker, Thomas R.Ziegler 2014 Modern Nutrition in Health and Disease. 11<sup>th</sup> Edition. (Eds.). Walters Kluwer / Lippincot Williams & Wilkins, Philadelphia,.
2. L.Kathleen Mahan, Suylvia Escott – Stump, Janice L.Raymond (Eds.). 2012.Krause's Food and the Nutrition Care Process. 13<sup>th</sup> Edition. Elsevier Saunders.
3. Gail.C.Frank (Ed). 2008 Community Nutrition. 2<sup>nd</sup> Edition. Jones & Bartlett Publishers,
4. Mahtab S. Bamji, N.Pralhad Rao, Vinodini Reddy (Eds). 2009 Text Book of Human Nutrition. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi,.
5. Nutrient Requirements and Recommended Dietary Allowances for Indians. Indian Council of Medical Research, New Delhi, 2010.



**PFS 4309****LAB IN FOOD MICROBIOLOGY****(3h/wk) (3cr)**

Laboratory course on food microbiology includes exercises such as preparation of media, various staining procedures, isolation of specific culture, microbiology of food, water and microbiological analysis of unprocessed and processed food.

- Precautions and safety regulations, sterilization techniques
- Staining: Gram's staining, acid-fast, spore, capsule and flagellar staining, Motility of bacteria, Staining of yeast and molds.
- Identification of important molds and yeast.
- Microbiological analysis of milk.
- Microbiological analysis of water.
- Microbiological analysis of a typical unprocessed food
- Microbiological analysis of typical processed food.
- Isolation of specific culture – Monoculture
- Wine fermentation –fermentation kinetics

**References**

1. Bibek Ray & Arun Bhunia Fundamental Food Microbiology, Fifth Edition CRC Press
2. M. R. Adams, M. O. Moss Food Microbiology Royal Society of Chemistry,

**PFS 4311****LAB IN FOOD CHEMISTRY AND NUTRITION****(3h/wk) (3cr)**

Laboratory course on Biochemistry and Nutrition includes exercises such as basic analytic techniques, quantitative estimation of proteins, carbohydrates, lipids, oils and crude fibre. It also includes determination of enzyme activity, body mass index and Blood analysis.

- Quantitative analysis of proteins- Kjeldahl method
- Qualitative and quantitative analysis of carbohydrates, such as free and total sugar, starch and pectin; Determination of sugars- polarimetry
- Analysis of oils and fats; methods for physical and chemical characterization of fats
- Estimation of crude fibre
- Analytical techniques – Basics of spectrophotometer
- Flourimetry, HPLC, GC, etc., (Demonstration)
- Determination of enzyme activity (lipase, amylase, alkaline phosphatase)
- Blood analysis – Glucose, cholesterol, protein; Hematology – hemoglobin, hematocrit, Differential count, RBC, WBC

**References**

1. Berg JM, Tymoczko JL and Stryer L. (2002) Biochemistry 5th ed. W.H. Freeman.
2. Conn EC, Stumpf PK, Bruening G and Doi RH (2001) Outlines of Biochemistry. 5th ed. John Wiley and Sons (Asia).
3. Devlin TM. (2002) Text Book of biochemistry with Clinical Correlations 5<sup>th</sup> ed. John Wiley and Sons.
4. Murray RK, Granner DK, Kayes PA and Rodwell VW. (2003) Harper's Illustrated Biochemistry. 26th ed. McGraw-Hill. Asia.
5. Nelson DL and Cox MM. (2005) principles of Biochemistry. 4th ed. Freeman and Company.

**PFS 4502                      CLINICAL NUTRITION AND DIET THERAPY    (5+1=6h/wk) (5cr)**

This theory course on clinical nutrition and diet therapy focuses on guidelines for dietary planning, therapeutic diets, nutritional intervention and nutrient counselling. It also includes role of dietitian in clinical nutrition.

**1. Guidelines for Dietary Planning** Weights and Measures, Determining nutritional needs, Basic Guidelines for diet planning, Nutritional status of Indians, Cultural aspects of dietary planning.

**2. Therapeutic Diets:** Functional foods and nutraceuticals- Modifications of normal diet, therapeutic diets for various disease conditions. Identification of high risk patients - nutritional assessment, nutritional diagnosis, nutrition intervention, monitoring and evaluation of nutritional care. Assessment components-medical and nutritional care - record types and uses. Format for medical and nutrition charting and documentation record.

**3. Nutritional Intervention** Nutritional intervention and diet modification-diet prescription, modifications of the normal diet. Nutrition care for hospitalized patients- standard hospital diet, other types of diet in hospital, modifications of food intake

**4. Nutrition Counseling** Nutritional counseling –concept, recipient and counseling environment, the problem solving counseling method. Activities for behavior changes, intervention counseling models, types of counseling session in patients. Empowerment, interpersonal skills. Nutritional counseling components – planning, implementation and evaluation.

**5. Role of Dietitian** Role of dietitian for hospitalized and outdoor patients and development of nutritional care plan. Specific functions of a therapeutic, administrative and consultant dietitian. Team approach in patient care. Psychological considerations in patient care. Interpersonal relationship with patients. Objectives of diet therapy- regular diet and rationale for modifications in energy and other nutrients, texture-fluid, soft diets.

### References

1. Sari Edelstein 2015 Life Cycle Nutrition – An evidence-based approach.2<sup>nd</sup> Edition. (Ed.) Jones & Barlett Learning..
2. A.Catherine Ross, Benjamin Caballero, Robert J.Cousins, Katherine L. Tucker, Thomas R.Ziegler 2014 Modern Nutrition in Health and Disease.11<sup>th</sup> Edition. (Eds.). Walters Kluwer / Lippincot Williams & Wilkins, Philadelphia,.
3. L.Kathleen Mahan, Suylvia Escott – Stump, Janice L.Raymond 2012 Krause’s Food and the Nutrition Care Process. 13<sup>th</sup> Edition. (Eds.). Elsevier Saunders,.
4. P.Insel; D.Ross; K.McMahon&M.Bernstein (Eds). 2011 Nutrition.4<sup>th</sup> Edition. Jones & Bartlett Publishers, Massachusetts,
5. .Gail. C.Frank 2008 Community Nutrition.2<sup>nd</sup> Edition.Jones & Bartlett Publishers,.

**PFS 4504****ADVANCES IN FOOD SCIENCE****(5+1=6h/wk) (5cr)**

This course on Advances in Food Science deals with sensory science and various food products such as cereal, legumes, fats and oil seeds, fruits, vegetable and dairy products, poultry, meat and marine foods and confectionery products.

**1. Sensory Science** Sensory science - Introduction to sensory science - Panel selection methods in sensory analysis, Instrumentation - Recent Development in sensory science - Colour and texture of foods - Colour measuring systems- CIE system, tintometers - Physical characteristics of foods - Texture measurement- instrumental methods - Texture profile analysis - Rheology of foods - Flow behaviour of fluid foods - Viscosity measurement- consistometers and viscometers - On-line viscosity measurement

**Unit-II Emerging trends in food processing.**

Emerging technologies in food processing – necessity and advantages. Minimal processing, power ultrasound, Microwave, PEF, HPP, Ohmic Heating, Spray-freeze drying, Dense phase CO<sub>2</sub>, super critical fluid extraction processes in food materials.

**Unit-III Value added products.**

Extrusion - cold and hot extrusion – production of pasta - principles- extrusion cooking, applications, - value addition by flaking, Puffing, Parching, - encapsulation – micro and nano level process – process and methods – selection of core and wall materials – quality of encapsulated products - coating – coating materials and equipments – battering and breading, seasoning. Foods for future- Space foods.

**Unit-IV Waste and byproduct utilization and disposal.**

Waste materials, sources and classification, Utilization of byproducts and wastes from food industries- meat and fish processing industries, Dairy plants, Milling Industries, Beverage industries. Waste treatment. and – production of paper and paperboards, particle board, fuel briquettes - production of fibre, activated carbon, furfural and adhesive

**Unit-V Energy auditing and pollution control in food industries.**

Energy management and audit – definition – objectives – types, Energy auditing case studies. Industrial energy auditing and conservation measures - Policy recommendations. Energy auditing report preparation, pollution control- Environmental Audits-Regulations on pollution control.

**References**

1. Meyer, I.H. Food Chemistry. Reinhold Pub. Corp., New York, Charles R. Turtle Co., Tokyo, [1960].
2. Deman, J. M. Principles of Food Chemistry, AVI Publishing Company, [1980].
3. Stryer L. Biochemistry, 4th Ed. W. H. Freeman and Company, [1995].
4. Stanier R Y and others. General Microbiology, Macmillan, India.[1986]
5. Frazier and Westhoff. Food Microbiology.3rd Ed. Tata McGraw Hill, [1978].
6. Fellows, P. 1988. Food Processing Technology. Ellis Horwood International Publishers, Cambridge.
7. Marcus Karel Owen R.Fennema and Daryl B.Lund. 1975. Principles of Food science Part II, Physical principles of Food Preservation, Marcel Dekker, Inc. Newyork.

## JOURNALS

1. Indian Food Industry
2. Processed Food Industry
3. Journal of food science and technology
4. Journal of food engineering

## E- REFERENCES

1. [www.foodnetbase.com](http://www.foodnetbase.com)
2. [www.pcra.org](http://www.pcra.org)
3. [www.ireda.org](http://www.ireda.org)
4. <http://rpaulsingh.com/teaching/Lectures.htm>

## PFS 4506 PRINCIPLES OF FOOD PROCESSING AND PRESERVATION

(5+1=6h/wk) (5cr)

This theory course on Food processing and preservation includes principles of food storage, processing and preservation by heat and water removal. It also includes cold preservation, preservation of food by irradiation, chemical and Nonthermal methods.

**1. Pre and post harvest processing:** Nature of harvested crop, plant, animal products. Maturity index-assessing the maturity index of different crops. storage of grains, storage conditions, effect of cold storage and quality

**2. Processing and Preservation by Heat and Water Removal:** Blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying. Retort processing of Ready to eat (RTE) products. Drying – water activity, microbial spoilage due to moisture. Dehydration of fruits, vegetables, milk- freeze drying.

**3. Cold Preservation:** Mechanism of action, effect on food and micro-organisms refrigeration, freezing- methods of freezing, chilling injuries, defects in cold storage- psychrotrophs, cryopreservation- refrigerated gas storage.

**4. Food Irradiation and Chemical Preservation:** Technology, application and safety assessments, legal aspects for UV, IR and gamma irradiation. Effects on food and microorganisms. Chemicals in food preservation, safety of preservatives, GRAS and permissible limits for chemical preservatives. Food additives; Definition, types and functions, permissible limits and safety aspects. Merits and demerits.

### 5. Processing and Preservation by Non-Thermal Methods

High pressure, pulsed electric field, ultra sound, Cold plasma technology, Use and application of enzymes and microorganism in processing and preservation of foods; food fermentations and pickling.

## References

1. Chakraverty, A. 1988. Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi.
2. Girdhari Lal, Siddappa, G.S. and Tandon, C.L. "Preservation of Fruits and Vegetables". ICAR, New Delhi. [1967].
3. Potter . Food science, 2nd Edition ,AVI Publishing Company, [1973].

4. Norman W. Desrosier and Donald K. Tressler, Fundamentals of food freezing, AVI publishing company [1977].
5. Ranganna, S. Hand book of analysis of quality control for fruit and vegetable products. Second edition, Tata McGraw Hill Pub. Co., New Delhi [1986].

**PFS 4508****FOOD PACKAGING****(5+1=6h/wk) (5cr)**

This theory course on Food packaging includes introduction, packaging materials and their properties, packaging systems and methods, packaging aspects of fresh and processed foods and packaging design and environmental issues in packaging.

**1. Introduction to food packaging:** Packaging terminology- definition. Functions of food Packaging, Packaging environment. Characteristics of food stuff that influences packaging selection.

**2. Packaging material and their properties:** Glass, Paper and paper board, Corrugated fibre board (CFB), Metal containers: Tin and Aluminum, Composite containers, Collapsible tubes, Laminations, Metalized films, Co extruded films, physical testing of polymeric packaging materials. Food Packaging Polymers (Polyethylene, PET, PVC, Polypropylene, Polystyrene & Nylon)

**3. Packaging Systems and methods:** Canning-Vacuum Packaging, Controlled atmospheric packaging, Modified atmospheric packaging, Aseptic Packaging, Retort processing, Active Packaging, intelligent packaging, shrink and stretch packaging-cling.

**4. Packaging aspects of fresh and processed foods:** Packaging of Fruits and vegetables, Fats and Oils, Spices, meat, Poultry and sea foods, Dairy Products, Bakery, beverages, Dehydrated and frozen foods. Liquid and powder filling machines – like aseptic system, form and fill (volumetric and gravimetric), bottling machines. Form Fill Seal (FFS) and multilayer aseptic packaging machines.

**5. Packaging Design & Environmental Issues in Packaging:** Food marketing and role of packaging-Packaging aesthetic and graphic design; Coding and marking including bar coding; Consumer attitudes to food packaging materials; Packaging Laws and regulations, safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials; Packaging material residues in food products; Environmental & Economic issues, recycling and waste disposal.

**References**

1. Food Packaging: Principles and Practice, Third Edition, By Gardon L. Robertson
2. Food Packaging Technology, Richard Coles, Derek McDowell, Mark J. Kirwan
3. Active Packaging for Food Applications, Aaron L. Brody, E. P. Strupinsky, Lauri R
4. F.A.Paine .Fundamentals of packaging .John willey and Sons, London, [1962].
5. H.Y.Paine and F.A.Paine . Hand book of Food Packaging, Leonarol Hill Publishing Company, [1983].

**PFS 4310                      LAB IN ADVANCES IN FOOD SCIENCE                      (3h/wk) (3cr)**

- 1) Sensory Evaluation ..... (Same as per given syllabus)  
Analysis and Interpretation of sensory data.
- 2) Minimal processing of fruits and vegetables.
- 3) Color measurement
- 4) Viscosity measurement
- 5) Textural Profile Analysis (TPA) of fresh and processed foods
- 6) Value added product using extrusion technology and quality assessment.
- 7) BOD and COD analysis of waste
- 8) Case study on energy auditing of a food industry
- 9) Visit to a modern food industry.

**Reference**

1. Potter, N.N., Joseph, H., Hotchkiss. 1997. Food Science. CBS Publishers and Distributors. New Delhi.
2. book for National Certification Examination for Energy Managers and Energy Auditors, Book 1. General aspects of Energy Management and Energy Audit, Bureau of Energy Efficiency.
3. Energy Auditing made Simple by P. Balasubramanian – Bala Consultancy Services Publishers.
4. Fellows, P. 1988. Food Processing Technology. Ellis Horwood International Publishers, Cambridge.
5. Marcus Karel Owen R. Fennema and Daryl B. Lund. 1975. Principles of Food science Part II, Physical principles of Food Preservation, Marcel Dekker, Inc. New York.

**PFS 4312                      LAB IN FOOD PROCESSING AND PRESERVATION                      (3h/wk) (3cr)**

This laboratory course includes exercises such as preservation of food by various methods, sensory analysis, development of new food product, survey on types of convenience of food, analysis of food labeling and visit to food processing and preservation unit.

- Drying and dehydration-cereals, legumes, vegetables-characteristics
- Preservation with sugar - jams, jelly- water activity measurements.
- Preservation - salt, oil, vinegar-pickling.
- Preservation of foods using chemical preservatives –tomato ketchup, squash.
- Canning of foods
- Retorting of foods.
- Survey on types of convenience foods / consumer behavior / analysis of food labeling.
- Blanching and browning control
- Development of a new food product, standardization, acceptability studies and submission of project report.
- Visit to food processing and preservation unit.

## References

1. Pantastico, Er. B. Post harvest physiology, handling and utilization of tropical and subtropical fruits and vegetables. AVI Pub. Co. Inc., Westport, Connecticut [1975].
2. Weichman, J. and Basel, Post harvest physiology of vegetable. Marcel Dekker Inc., New York [1987].
3. Hulme, A.C. Food science and technology, a series of monographs "The Biochemistry of fruits and their products". Vol. 1 Ed. Academic Press, London and New York [1970].
4. Cruess, W.V. "Commercial Fruit and Vegetable Products". 4th Edition. MCGRAW hill Book Company. [1958].
5. Girdhari Lal, Siddappa, G.S. and Tandon, C.L. "Preservation of Fruits and Vegetables". ICAR, New Delhi. [1967].

## PFS 5501 FOOD ANALYSIS, SAFETY & FOOD LAWS (5+1=6h/wk) (5cr)

This course has three sections. First section on food analysis focuses on preparation of the sample and sample analysis using various methods. Second unit on Food safety includes concepts of Food safety and food safety programs. The third on food laws focuses on principles of food laws and various governing bodies.

**1. Preparatory measures of food analysis:** Sampling and preparation of samples- quality criteria for sampling-grinding dry materials, grinding moist materials, Enzymatic in activation and microbial act, and reporting results of given samples.

**2. Methods of Food analysis:** Theory of spectroscopy absorption of radiation, Rotations, Vibration, Electransition, Molecular Energy states, problems and measurement of color by using colorimetry and their function. Theory of Electrophoresis paper and thin layer chromatography about their functions and applications- HPLC, LCMS, GCMS.

**3. Food Safety:** Food safety concept - Importance of food safety in the food processing industry, Risk classification, National and international food regulatory agencies, General food laws and food safety regulations, Nutritional labeling regulation (mandatory and optional nutrients, nutritional descriptors and approved health claims); Microbial contamination (including cross contamination/ indirect contamination) Chemical contamination, Physical contamination, Allergen contamination.

**4. Food Safety Programs:** Definitions and importance, HACCP, Good Manufacturing Practices (GMPs), Pest Control Program, Facility Maintenance, Personal Hygiene, Supplier Control, Sanitary, Design of Equipment and Infrastructure, Procedures for Raw Material Reception, Storage and Finished Product Loading, Sanitation Program. (Sanitation Standard Operating Procedures (SSOPs), Product Identification, Tracking and Recalling Program, Preventive Equipment. Hurdle technology.

**5. Food Laws:** Principles in the general National and International food laws, governing bodies. Principles of self control, risk analysis on food, Indian Food regulations – History of Indian Food Regulations: BIS, ISI, FPO, PFA and FDA. Food Safety and Standards Act 2006.

## References

1. Food safety: The science of keeping food safe. Ian C. Shaw, Wiley-Blackwell, 2013.
2. The Microbiology of Safe Food, 2nd Edition. Stephen J. Forsythe, Wiley-Blackwell, 2010.
3. ILBCO's Food Safety and Standards Act, Rules, Regulations -12<sup>th</sup> edition 2014.
4. Food safety for the 21st Century : Managing HACCP and food safety throughout the global supply chain Wallace, C. A. Wiley-Blackwell, 2010.
5. Advances in microbial food safety. Sofos, John. Woodhead Publishing, Cambridge, 2013.

## PFS 5503

## FOOD BIOTECHNOLOGY

(5+1=6h/wk) (5cr)

Theory course on Food Biotechnology deals with use of genetic engineering, cloning and cell culture in Food Biotechnology, prospects, traditional applications, xenobiotics and its elimination and role of Biotechnology in food industries.

**1. Prospects of Biotechnology:** Definition, scope and applications. Application of biotechnology in food. Basic principles of molecular biology and biotechnology: Recombinant DNA Technology.

**2. Genetic Engineering, cloning and cell culture:** Fundaments of molecular biology and genetics. Central dogma. Concept of genetic engineering and molecular cloning. Plant and animal culture, transgenic plants, application of genetic engineering in food science and technology. Genetically modified foods – concept, types and application.

### 3. Food Nanotechnology:

Nanomaterials - Definition - History – Properties. Food Nanotechnology: Current developments and future prospects; Definition of Nanocomposites – Formation of Nanocomposites - Polymer Nanocomposites - Bio-based Nanocomposites - Starch – Pectin – Cellulose – Polylactic acid - Protein Nanocomposites. Nanotechnology and applications in food safety; Nanotechnology for food: delivery system; Nanostructured encapsulation systems: food antimicrobials. Barrier Packaging – Antimicrobial Packaging- Antimycotic Packaging- Bio-based Packaging- Bio-degradable Packaging- Active Packaging – Smart Packaging. Safety of Nanomaterials in Food

**4. Xenobiotics :** Definition, components, drug adverse reactions, nutrient drug interactions, industrial chemicals, Bio- dynamics of xenobiotics , overall metabolic fate of xenobiotic in the body Naturally occurring food toxicants and its elimination: Sources, toxicity, elimination- protease inhibitors, goitrogens, haemagglutinins, glucosinolates, cyanogens, saponins, gossypols, lathyrogens, falcism and carcinogens.

**5. Role of Biotechnology in Food Industries:** Production of organic acids, vitamins, aminoacids- downstream processing-Food additives, synthesis, sweeteners – glucose syrup and High Fructose Corn Syrup (HFCS): thickeners and gelling agents, xanthan gums. Food industry solid waste management – utilization and disposal, effluent treatment: resource recovery, recycle, reuse, treatment and disposal.



## References

1. Green P.J 2002, Introduction to Food Biotechnology, CRC press, U.S.A
2. Mansi, EMT, Bryce, CFA, Demain,A.L and Allman, R, Fermentation Microbiology and Biotechnology, Taylor and Francis, NewYork, 2007.
3. Primrose, S.B 2001, Molecular Biotechnology, second edition, Panima Publishing Corporation, New Delhi.
4. Satyanarayana, U, 2007. Biotechnology, Books and Allied (P) Ltd., Kolkata.
5. William J.Thieman and Michael A.Palladina, 2004, Pearson Education Inc. and Dorling Kindersley Publishing, Inc. First Impression.
6. Nano: The essentials: Understanding Nanoscience and Nanotechnology - T. Pradeep - 2009 – Tata Mc Graw Hill.
7. Nanotechnology in the Agri-Food Sector: Implications for the Future - L.J. Frewer, W. Norde, A. Fischer and F. Kampers, 2011 Wiley-VCH.

## E References

1. <http://www.crnano.org>.
2. <http://www.nanotech-now.com>.
3. <http://www.nanowerk.com>.

## PFS 5505 COMMUNITY NUTRITION AND PUBLIC HEALTH (5+1=6h/wk) (5cr)

This theory course on community nutrition and public health deals with nutrition at different stages of life such as Infant, children and adults. It also covers nutritional problems and assessment of nutritional status. Last section deals with nutrition policy and programmes.

**1. Nutrition during Early Years:** Pregnancy: Physiological adjustments, Nutritional requirements. Lactation: physiology of lactation, Factors affecting lactation, nutritional requirements. Infancy: Growth and development, nutritional requirements. Feeding pattern-weaning and supplementary foods. Preschool age-Growth and development, nutritional requirements

**2. Nutrition for Children and Adults :** School age and adolescent children : Growth and development, nutritional requirements, special care in feeding preschoolers, nutritional problems specific to this age. Young adults : Nutritional requirements, Nutrition status of Indian adult population, nutritional problems common to this age. Elderly: Nutritional requirements, Special needs, Nutritional problems

**3. Nutritional Problems and Assessment of Nutritional Status :** Prevalence, causes, manifestation and prevention.- Anthropometry, clinical and biochemical assessment. -Diet surveys at household and community level – 24-hour recall method, food frequency method, weighment method, inventory method.

**4. Nutrition Policy and Programmes :** National nutrition policy : need for nutrition policy, policy strategies and their implementation. Nutrition programs: National anemia prophylaxis programme, Prevention of night blindness, Vitamin A prophylaxis program, National iodine prophylaxis program, Goiter control program ICDS. National nutrition surveillance system. Food for work, NGO in community development operations.

## **5. Nutrition Education:** Rationale, planning, execution and evaluation.

### **References**

1. Park A. (2007), Park's Textbook of Preventive and Social Medicine XIX Edition M/S Banarasidas, Bharat Publishers, 1167, Prem Nagar, Jabalpur, 428 001(India)
2. Bamji M.S, Prahlad Rao N, Reddy V (2004). Textbook of Human Nutrition II Edition, Oxford and PBH Publishing Co. Pvt. Ltd , NewDelhi
3. Bhatt D.P (2008), Health Education, Khel Sahitya Kendra, New Delhi
4. Gibney MJ, Margetts BM, Kearney JM, Arab L (2004) Public Health Nutrition Blackwell Publishing Co. UK
5. Swaminathan M (2007), Essentials of Food and Nutrition. An Advanced Textbook Vol.I, The Bangalore Printing and Publishing Co. Ltd, Bangalore

## **PFS 5507 RESEARCH METHODOLOGY AND BIOSTATISTICS (5+1=6h/wk)(5cr)**

This course has two parts. First part deals with research methodology, research problem and methods of data collection. The second part deals with statistics and data analysis using statistical tools.

### **1. Research Methodology**

Meaning, objectives and Significance of research.Types of research, research approaches and scientific methods.Research process and criteria of good research.

### **2. Definition and Identification of a Research Problem**

Selection of research problem, Justification, development of hypothesis, basic assumptions. Limitations and delimitations of the problem.

**3. Methods of Data Collection :**Schedules and questionnaires ; Interview, Case study, Home visits, scaling methods, Reliability and validity of measuring instruments, Statistical issues , Basic principles and regulations in humans and animal research, Analysis and reporting of data.

**4. Introduction to Statistics:** Introduction and Describing data: frequency distributions and descriptive statistics – Sampling and Experimental design – classification, tabulations of statistical data – Diagrammatic representation – graphs – plotted curve – Sampling method and standard errors – random sampling – means – confidence limits – standard errors – variance.

**5. Data Analysis :** Measure of central tendency – measures of dispersion – Skewness, kurtosis, moments – Probabilistic features of certain data distributions : Binomial, Poisson and Normal Distributions – Hypothesis Testing – Comparing two sample means; Type I and II errors – Comparing paired samples – Statistical power – Conditions for test validity and assessing data normality; Transformations – parametric tests: t-test, z-test, chi-squares test, ANOVA; non-parametric tests: Mann-Whitney, Kruskal Wallis, Kolmogorov-Smirnov-Introduction to bivariate analysis – Correlation and regression – Linear regression; Analysis of categorical data: Goodness of Fit and Contingency Tables.

## References

1. Pedreschi et al. 2010. Proteomics for the food industry: Opportunities and Challenges
2. Myra L. Samuels, Jeffrey A. Witmer, Andrew Schaffner. 2012. Statistics for the Life Sciences, 4<sup>th</sup> edition. Prentice Hall
3. John A. Rice. 2010. Mathematical Statistics and Data Analysis, Duxbury Press.
4. John M. Lachin. 2010. Biostatistical Methods: The Assessment of Relative Risks, 2nd Edition ISBN: 978-0-470-50822-0
5. Snedecor, George, W. Cochran and William, G. 1967. Statistical Methods, Sixth edition, Oxford and IBH Publishing Co., Oxford

## PFS 5309

## LAB IN FOOD ANALYSIS

(3h/wk) (3cr)

Laboratory course on Food analysis includes exercises such as analysis of food composition, determination of moisture, ash, estimation of minerals, vitamins and food additives.

- Analysis of food composition :
  - Proximate analysis – Moisture, ash, crude fibre, fat and protein, CHO by difference
  - Analysis of minerals – Iron, calcium, zinc – AAS
- Carbohydrates – Free sugars, Starch (Total & available), Dietary fiber.
- Mineral estimation – Dry and wet ashing, calcium, iron, phosphorous.
- Vitamin estimation – Ascorbic acid, thiamine, riboflavin and  $\beta$  carotene.
- Determination of additives (colours, preservatives, artificial sweeteners etc.,)
- Identification and estimation of common adulterants
- Identification of antinutritional factors

## References

1. Food chain integrity: A holistic approach to food traceability, safety, quality and authenticity. Jordan, K. Woodhead, Cambridge, 2011.
2. Food analysis by HPLC Nollet, L. M. L. CRC Press Inc., 2013.
3. Handbook of food analysis : Methods and instruments in applied food analysis Nollet, L. Marcel Dekker Inc., New Delhi, 2004.
4. Food Quality Assurance: Principles and Practices. IntezAlli. CRC Press / Taylor and Francis.
5. Total Quality Assurance for the Food Industries, Gould, W.A CTI Publications Inc. Maryland, USA, (2001).
6. Winton & Winton, (1991) Techniques of Food Analysis. Allied Scientific Publishers.
7. Pomeranz Yeshuraj, Food Analysis: Theory and Practice.

**PFS 5311****LAB IN FOOD BIOTECHNOLOGY****(3h/wk) (3cr)**

Laboratory course on Food Biotechnology includes exercises such as fermentation, production of food enzymes, effluent treatment, enzyme immobilization techniques, demonstration of easy to use equation solving, modeling and simulation software.

- Fermentation monitoring and control
- Submerged fermentation (mass transfer coefficient)
- Production of food enzymes by solid state fermentation
- Effluent treatment (aerobic & anaerobic) – COD, BOD assessment
- Analysis of probiotic potential of microbial cultures
- Enzyme immobilization techniques
- Demonstration of easy-to-use Equation Solving, Modelling – Simulation software
- Industrial visit

**References**

1. Lopez, G.F.G. and Canovas, G.V.B. “Food Science and Food Biotechnology” CRC Press, Florida, USA. 2003.
2. Joshi, V.K., and Pandey, A. Biotechnology: Food Fermentation. Vols.I,II. Education Publ. 2002.
3. Bains, W. Biotechnology from A to Z. Oxford Univ. Press. 2009.
4. Lee, B.H. Fundamentals of Food Biotechnology.VCH. 2006

**PFS 5502****DAIRY AND DAIRY PRODUCTS****(5+1=6h/wk) (5cr)**

The elective course on dairy science includes introduction to dairy science, processing of milk, principle and preparation of milk products, packaging of milk and milk products.

**1. Introduction to milk:** chemical composition of milk, unit operations in dairy industry- filtration, clarification, pasteurization, homogenization and sterilization. Processing of milk- types of processed milk- pasteurized, toned, flavoured, fermented, powdered and infant formula milk.

**2. Methods in milk processing:** Use of bio-protective factors for preservation of raw milk: effects on physicochemical, microbial and nutritional properties of milk and milk products, present status of preservation of raw milk by chemical preservatives.

**3. Thermal processing of milk:** Pasteurization-Methods of determining lethality of thermal processing, UHT processed milk products, their properties and prospects, types of UHT plants, aseptic fillers, heat stability and deposit formation aspects, effect on milk quality; techno- economic considerations; retort processing.

**4. Milk and milk products:** Preparation methods and principles- different types of milk- milk powder, ghee, butter, ghos, paneer, cheddar cheese, curd, yoghurt, ice cream. Packaging, storage and quality evaluation packaging and storage of milk and milk products, quality evaluation. Food laws and standards of dairy products.

**5 .Current trends in cleaning and sanitization of dairy equipment:** biological; detergents; Automation; Ultrasonic techniques in cleaning; bio-detergents, development of sanitizers-heat; chemical; radiation, mechanism of fouling and soil removal; Bio-films, assessing the effectiveness of cleaning and sanitization of dairy products.

### References

1. Modern Technology Of Milk Processing & Dairy Products (4th Edition) 2013 NIIR Board NIIR PROJECT CONSULTANCY SERVICES Publishers ISBN: 9788190568579 Code: NI9
2. Ellen Muehlhoff, Anthony Bennett, Deirdre McMahon 2013 Milk and Dairy products in human nutrition Food And Agriculture Organization Of The United Nations Rome, [www.fao.org/ publications](http://www.fao.org/publications)
3. Early, Ralph 1997 Technology of Dairy Products 2<sup>nd</sup> Edition Springer US publications
4. Varnam, A., Sutherland, Jane P. 1994 Milk and Milk Products Technology, chemistry and microbiology Springer US publications

### PFS 5302

### LAB IN DAIRY AND DAIRY PRODUCTS

(3hr/wk) (3Cr)

The laboratory course on Dairy and Dairy products includes exercise such as preparation, detection of various biochemical parameters in milk and preparation of dried milk.

- Platform test for milk –titrable acidity
- Preparation of Sample of Condensed/Evaporated Milk-TSS
- Determination of Fat by Gurber Method in Condensed/Evaporated Milk
- Preparation of Dried Milk- milk powder
- Determination of Moisture in Dried Milk
- Determination of Fat in Dried Milk
- Determination of Total Carbohydrates in Dried Milk
- Determination of Milk Protein in Milk Solids not Fat of Dried Milk
- Preparation of Butter – moisture analysis
- Preparation of flavoured milk
- Determination of Fat and Curd (Milk solids not Fat) in Butter
- Determination of Salt Content in Butter
- Visit to Dairy Plant (Aavin, Arockya)

### References

1. Lab Manual FSSAI, 2015 Manual of methods of analysis of foods food safety and standards authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi 2015
2. Dr. Rajesh Kumar Dr. Ram Bhagat Sangwan Dr. (Mrs) Bimlesh Mann 2007 A Laboratory Manual -- on Chemical Analysis of Milk Proteins National Dairy Research Institute -(Deemed University) (ICAR) Karnal-132001 India

**PFS 5504****MEAT AND POULTRY – Elective****(5+1=6h/wk) (5cr)**

This elective course deals with meat and muscle, spoilage of meat, storage and preservation of meat by different methods, quality of meat and egg preservation.

**1. Meat and Muscle: Origin of meat animals** –Sheep/goat, cattle and poultry basic aspects of slaughter techniques- pre and post slaughter techniques. Structure of Muscle- Proportion of muscle, tissue and muscle fiber structure. Chemical and Biochemical constitution of muscle- Chemical aspects,, muscle protein, intramuscular fat, muscle function, post mortem glycolysis, onset of rigor mortis, conditioning. Conversion of muscle to meat- pre-slaughter handling, glycogen loss, stunning, bleeding conditioning, protein denaturation, proteolysis, and chemical changes. Meat analog.

**2. Spoilage of meat** - Endogenous infection and exogenous infection, symptoms of spoilage, organisms associated with meat spoilage, spoilage due to temperature, pressure, ph, oxidation reduction potential, and other atmospheric conditions. Prophylaxis-hygiene conditions, biological controls, antibiotics and ionizing radiations

**3. Storage of meat-** temperature control, storage above freezing point, fresh and chilled carcass, prepackaging and storage conditions. Storage below freezing point- effect of freezing on muscular tissue, freezing of meat. Thermal processing- Pasteurization, sterilization process.

**4. Preservation of meat:** Principal of dehydration, freezing and hurdle concept, biochemical aspects, physical aspects and sensory aspects. Preservation by curing - chemical and biochemical aspects of curing ingredients, smoking, and maturing. Functional properties of additives used in meat product formulations and fresh meat processing, Preservation by ionizing radiation and by chemicals- chemical and biological aspects

**5. Quality of meat, Cooked meat and Egg preservation** - Quantity and chemical nature of myoglobin, discoloration, water holding capacity, juiciness, Drip loss. Quality of cooked meat- protein aspects on cooking under different conditions, texture and tenderness and flavour components in meat. Toxic compounds formed during processing and cooking of meat. Tenderization by Marination, natural and artificial tenderizers, Egg structure, preservation of egg, physiological and chemical changes during egg preservation. Chemical aspects of protein and lipid associated with egg and functional properties. Nutritional aspects of meat, poultry and egg

**References**

1. Meat Science: An Introductory Text By P D Warriss
2. Meat Science By R A Lawrie
3. Olson, V M; Shemwell G A and Pasch, S (1998) Egg and Poultry Meat Processing, VCH P, New York

**PFS 5304****LAB IN MEAT AND POULTRY****(3h/wk) (3cr)**

This laboratory course on meat and poultry deals with basic composition of meat, hygienic meat production, measurement of physical properties of meat, tenderization, egg quality evaluation and meat evaluation.

- Basic composition- Moisture, pH, fat, protein
- Rigor mortis-change in pH and drip loss
- Hygienic meat production
- Microorganisms in meat-
- Dehydration and Freezing of meat-textural changes
- Measurement of meat texture and colour
- Water holding capacity of meat
- Traditional/Convenience/novel meat products-processing effects on protein, and sensory
- Meat tenderization-Marination, additives identifications
- Egg quality evaluation
- Salting and curing of meat
- Sensory quality evaluation, products formulation and development

**PFS 5506****FRUIT AND VEGETABLES- Elective****(5+1=6h/wk) (5cr)**

This elective course focuses on post-harvest technology of fruits and vegetables, storage and transportation, thermal processing of vegetables and fruits, preparation of juices, jam, tomato products, pickles and chutney.

**1. Post harvest technology:** Pre- and post-harvest physiology, maturation changes, and maturity indices. Pre- and post-harvest pathology, pathological spoilages.during storage and ripening and control measures. Storage disorders. Post-harvest handling, packaging, storage, transportation, marketing and export. Methods of precooling, post-harvest treatments to hasten and delay ripening.

**2. Storage and Transportation:** Cold storage, controlled/modified atmosphere storage. Cold storage construction and requirements. Transportation by road/ rail /air /surface. Export requirements. Quarantine requirements, quality management, insect and pest infestation and control measures.

**3. Minimal and thermal processing :** Minimal processing of fruits and vegetables.Thermal processing.Quality requirements for processing.Raw material - preparation, blanching, preparation of syrups and brines, canning and bottling operations for commercially important fruits and vegetables. Machinery used for the operations. Dehydrated fruits and vegetables.

**4. Juices and Jams :** Beverages, RTS, Squashes, syrups, sherbat, recipes, preparation, packaging, quality standards and specifications. Juice concentrates, unit operations and equipments. quality control and specifications. Packaging and storage. Jams, jellies, preserve and marmalades and technology of their production.Packaging, quality control and specifications.

**5. Purees, pickles and chutney :** Tomato products, raw material quality for different types of products, preparation of products - juice, puree, paste, ketchup, soup and sauces. Packaging, storage, quality control and specifications. Pickles and chutney, their types and production. Packaging of pickles and chutneys. Spoilage, quality control and specifications.

### References

1. Thompson A K. Fruit and Vegetable-Harvesting, Handling and Storage Golob et al. Crop Postharvest: Science and Technology (Vol 1- Principles and Practices, chapter on “ Technology and management of storage
2. Salunkhe D.K., Kadam, S.S. Hand book of fruit science and technology: Production, composition, storage, and processing. Marcel Dekker, Inc. 270 Madison Avenue, New York, New York - 10016 [1995].
3. Salunkhe, D.K., Kadam, S.S. Hand book of vegetable science and technology : Production, composition, storage, and processing., Marcel Dekker Inc. 270 Madison Avenue, New York, New York - 10016 [1998].
4. Wills, R.B.H.; Lee, T. H.; Graham, D.; McGlasson, W. B. and Hall, E. G. Postharvest: An introduction to the physiology and handling of fruits and vegetables. AVI Publishing Co. Westport, Conn[1981]
5. Kader, A. A. Postharvest Technology of Horticultural Crops. University of California Publication No 3311, Oakland, Calif. [1992].

### PFS 5306

### LAB IN FRUIT AND VEGETABLES

(3h/wk) (3cr)

This laboratory course on fruits and vegetable includes post harvest spoilage, physical measurements, preparation of food products such as jams, jellies, candies, juices, beverages, squashes, syrups, tomato juice, ketchup, soup, pickles and chutney.

- Post harvest spoilage - microbiological spoilage and physiological disorders.
- Measurement of respiration and ethylene production of fruits and vegetables.
- Preparation of jams, jellies, preserves and candies.
- Canning of fruits, vegetables, and Cut-out analysis.
- Fruit juices beverage/ concentrate preparation - RTS squashes, syrups, lime juice cordial.
- Preparation of tomato juice, puree, paste, ketchup and soup.
- Preparation of pickles and chutneys.
- Field study - commercial cold storages and processing units.

### References

1. Pantastico, Er. B. Post harvest physiology, handling and utilization of tropical and subtropical fruits and vegetables. AVI Pub. Co. Inc., Westport, Connecticut [1975].
2. Weichman, J. and Basel, Post harvest physiology of vegetable. Marcel Dekker Inc., New York [1987].
3. Cruess, W.V. “Commercial Fruit and Vegetable Products”. 4th Edition. MCGRAW hill Book Company. [1958].



**PFS 5408****CEREALS AND LEGUMES – Elective (5+1=6h/wk) (5cr)**

The elective course on cereals and legumes focuses on classification of cereals, physical properties, drying, parboiling of rice, wheat production, rheology, legumes, coarse cereals and pseudo cereals.

**1. Cereals and Rice :** classification of cereals, production, chemistry, nutritional importance, usage and consumption pattern. Rice: production, agronomy, botany, varieties, chemical composition, grain structure, distribution of nutrients, classification of rice. Physical properties of paddy and rice, morphology, grain dimensions, grading systems, density, porosity, angle of repose

**2. Processing of Rice :** Drying of paddy, occurrence and prevention of crack formation. Aging and curing of paddy Physico-chemical properties of rice, nutrients, viscosity, gelatinization, gel consistency, cooking qualities, solid loss, water uptake and volume expansion. Parboiling of rice; methods of parboiling, changes in physico-chemical properties of rice after parboiling, advantage and disadvantages of parboiling.

**3. Wheat:** Production, varieties, chemistry, grain morphology, flour quality, protein quality in relation to baking characteristics, functional properties of wheat flour, protein-lipid-carbohydrates interaction and their influence on the quality of the baked product. Rheology: basic approaches to dough rheology, influence of flour constituents on dough rheology.

**4. Legumes:** production, types of legumes, chemical aspects, morphological aspects, cooking quality of legumes, functional properties of legume proteins, water uptake, foaming properties, minor pulses

**5. Coarse cereals, Millets and Pseudo cereals:** Maize, sorghum, millets, grain morphology, production, chemical composition, nutritional quality and health benefits. Pseudocereals: Production, chemistry, nutritional significance, food uses

**References**

1. Chakraverty, A. 1988. Postharvest Technology of Cereals, Pulses and oilseeds. Oxford and IBH, New Delhi.
2. Khalil Khan and Peter R Shewry. Wheat: Chemistry and Technology. Fourth Edition. AACC International PRESS
3. Mathews, R.H. Ed. 1989. Legumes: Chemistry, Technology and Human Nutrition. Marcel Dekker, New York.

**PFS 5308****LAB IN CEREALS AND LEGUMES – Elective (3h/wk) (3cr)**

- Measuring physical parameters of rice, length-breadth, 1000 kernel weight and angle of repose
- Changes in physical parameters of rice after parboiling, color measurement, crack detection
- Measuring the volume expansion and solid loss of rice on cooking, comparison between raw and parboiled rice
- Detection of cooking time of different legumes
- Morphology of cereals
- Determination of bulk density and sphericity of sorghum and millets
- Water absorption capacity of wheat flour
- Foaming capacity and water uptake of different legumes
- Estimation of equilibrium moisture content of paddy as a function of steeping temperature
- Milling experiment-milling yield.
- Estimation of moisture content analysis in grains.

**References**

1. Durbey, S.C. 1979. Basic Baking: Science and Craft. Gujarat Agricultural University, Anand (Gujrat).
2. Elaine T Champagne. 2004. Rice: Chemistry and Technology. Third Edition. : AACC International PRESS
3. Kent, N.L. 1983. Technology of Cereals. 3rd Edn. Pergamon Press, Oxford, UK.
4. Pomeranz, Y. Ed. 1978. Wheat: Chemistry and Technology. Am. Assoc. of Cereal Chemist. St. Paul, Minnesota.
5. Pomeranz, Y. 1987. Modern Cereal Science and Technology. VCH Pub., New York.
6. Salunkhe, D.K., Kadam, S.S. Ed. 1989. Handbook of World Food Legumes: Chemistry, Processing and Utilization, (3 vol. set). CRC Press, Florida

**THE AMERICAN COLLEGE, MADURAI**  
**DEGREE OF MASTER OF PHILOSOPHY (M.Phil) IN MATHEMATICS**

**Objective:** To provide intellectual input in the frontier areas of Mathematics to the scholars with a view to inculcate the research attitude through class room interactions.

To provide the necessary academic ambiance for independent research.

**Eligibility:** 55% marks in M.Sc.(Mathematics) and other norms as per Madurai Kamaraj University.

**Duration:** One year consisting of two semesters.

**Course of Study:** I Semester: Papers: 1. Research Methodology

2. Core Paper- I

3. Core Paper- II

4. Elective Paper

II Semester: Dissertation

	Course	Title	Lect.	Self/Lib.	credits	Internal	External	Total
I Sem.	MPM 6500	Research Methodology	5	3	5	50	50	100
	MPM XXXX	Core Paper- I	4	3	4	50	50	100
	MPM XXXX	Core Paper- II	4	3	4	50	50	100
	MPM XXXX	Elective Paper	5	3	5	50	50	100
II Sem.	MPM 6800	Dissertation			8	100	100	200
		Seminars (2)			4	100		100
		Viva-voce			6		100	100
	Total				36			800

**Core Papers:**(Any two papers from the list)

MPM 6401- ALGEBRA

MPM 6403- ANALYSIS

MPM 6405- ALGEBRAIC TOPOLOGY

**Elective Papers:**MPM 6501- ADVANCED TOPICS IN GRAPH THEORY

MPM 6503- FRACTAL GEOMETRY AND FUZZY MATHEMATICS

MPM 6505- ANALYTIC NUMBER THEORY

MPM 6507-ADVANCED TOPOLOGY

MPM 6509- ADVANCED FLUID DYNAMICS

MPM 6511- DIFFERENTIAL EQUATION

MPM 6513- ADVANCED FUNCTIONAL ANALYSIS

MPM 6515- STATISTICAL INFERENCE AND STOCHASTIC PROCESS

MPM 6500

RESEARCH METHODOLOGY

5 hr / 5 cr

**Objectives:**

To get prior idea on preparing research articles and dissertation in Mathematics. To develop enough skills in LATEX so that students themselves able to prepare articles and dissertation in Mathematics.

**Unit- I:**

Theses and Dissertations-Defining the Problem-Limiting the problem – Consulting source material – preparing a working bibliography – Selecting a topic - Mathematical Journals – AMS subject classification (primary and secondary. Main subjects only) - Impact factor-citation index-search engines.

**Unit-II:**

Sample files – editing cycle – The key board- your first note-lines too wide-more text features - Editors in latex – Latex editor – texnic center-Bokamatex – texcad - A note with math- errors in math- building blocks of a Formula-Displayed formulas - The anatomy of an article-An article template-using latex-converting an article to a presentation.

**Unit-III:**

Problems and Theorems of Closed sets – Limit points – Continuity - Connectedness.Problems and Theorems of Compactness – Countability -  $T_0$ ,  $T_1$ ,  $T_2$  and regular spaces

**Unit-IV:**

Study of a research article in Topology (recommended by the course teacher)

**Unit- V:**

Named theorems in Separation Axioms (PPT Presentations by the Students).

**Reference Books:**

1. Primer,**Latex Tutorials**, Indian TEX Users Group,2002.
2. Alan M Johnson AM, **Charting a Course for a Successful Research career**, Elsevier, Second Edition, 2011.
3. Seymour Lipschutz,**Theory and problems of general Topology**,McGraw Hill, International Edition, 2010.
4. James R.Munkres,**Topology** (Second Edition), Prentice – Hall of India, Private Ltd, New Delhi, 2006.

**MPM 6401****ALGEBRA****4 hr / 4 cr****Objectives**

To create awareness to do research work in Algebra.

**UNIT I: FUNDAMENTAL GROUP AND COVERING SPACES**

Homotopy – Fundamental group – Covering spaces , Retraction and Fixed Points –  
Simplicial complexes – Geometry of Simplicial complexes – Barycentre subdivision –  
Simplicial approximation theory.

**UNIT II: MODULES & STRUCTURE OF MODULES**

Basic Definitions – Quotient Modules – Generation of Modules – Homomorphisms of  
modules – Direct summands – Direct sums and product of modules, Free Modules –  
Decomposition of rings – Semi simple modules .

**UNIT III**

The socle and the radical – Finitely generated and finitely co generated modules –  
Change of scalars - Simple Modules - Semi-simple Modules - Structure of Semi-simple  
Modules - Chain conditions.

**UNIT IV: THE STRUCTURE OF RINGS**

Simple and Primitive Rings - Schur's theorem on simple modules, Wedderburn  
theorem – The Jacobson Radical.

**UNIT V: COMMUTATIVE RINGS**

Prime and Primary Ideals- Primary decomposition Noetherian Rings.

**REFERENCE BOOKS:**

1. Pierce R.S, **Associative Algebras**, Graduate Texts in Mathematics, Springer Verlag, New York, 1982.
2. Herstein, **Non-Commutative Rings**, John Wiley and Sons, Inc., Chapters I&II, 2002.
3. Musili, **Introduction to Rings and Modules**, 2nd Edition, Narosa Publishing House, New Delhi, 2002.
4. Anderson and Fuller, **Rings and Categories of Modules**, 2nd Edition, Graduate Texts in Mathematics, Vol.13, Springer – Verlag, New York, 1992.
5. Singer and Thotpe, **Lecture Notes on Elementary Topology**, Springer Verlag, New York, 1967.

**MPM 6403****ANALYSIS****4 hr / 4 cr****OBJECTIVE:**

To enable students acquire developing research idea in real analysis and to create awareness to do research work in Analysis.

**UNIT I: ABSTRACT INTEGRATION**

The concept of measurability – Simple functions – Elementary properties of measures  
– Integration of positive functions – Integration of complex functions – The role played by  
the sets of measure zero.

**UNIT II: ELEMENTARY PROPERTIES OF HOLOMORPHIC FUNCTIONS**

Complex differentiation – Integration over paths – The local Cauchy theorem

**UNIT III:**

The power series representation – The open mapping theorem – The global Cauchy theorem – The calculus of residues.

**UNIT IV: FOURIER TRANSFORMS**

Formal properties – The inversion theorem – The Plancherel Theorem - The Banach algebra  $L^1$  – Two theorems of Paley and Wiener

**UNIT V: RIEMANN INTEGRAL**

Riemann integral - The Lebesgue integral of bounded function over a set of finite measure-The integral of a non-negative function-The general Lebesgue integral-Convergence in measure.

**REFERENCE BOOKS:**

1. Rudin Walter, **Real and Complex Analysis**, Tata Mc-Graw Hill, Third Edition, 2006.
2. Paul R. Halmos, **Measure Theory**, Springer 1974.
3. Royden, **Real Analysis**, The Macmillan Company, New York, Third Edition, 1988.
4. Elras, Stein and Ramishakarchi, **Complex Analysis**, Princeton University Press, 2003.

**MPM 6405****ALGEBRAIC TOPOLOGY****4hr / 4 cr****Objective:**

To enable them in the Algebraic Topology & its applications and to train them in the field of Topological Algebra to make them expert

**Unit- I**

Homotopic maps, homotopy type, retraction and deformation retract. Fundamental group. Calculation of fundamental groups of  $n$ -sphere,  $n \geq 1$ .

**Unit- II**

The cylinder, the torus, and the punctured plane.

**Unit- III**

Applications: The Brouwer fixed-point theorem, the fundamental theorem of algebra.

**Unit- IV**

Covering projections, the lifting theorems, relations with the fundamental group. Classification of covering spaces, Universal covering space.

**Unit- V**

The Borsuk-Ulam theorem, free groups, Seifert –Van Kampen theorem. Applications of Seifert –Van Kampen theorem

## References

1. Armstrong, **Basic Topology**, Springer Verlag, 1983
2. Bredon, **Geometry and Topology**, Springer Verlag, 1993
3. Massey, **A Basic Course in Algebraic Topology**, Springer-Verlag, Berlin, 1991.
4. Rotman, **An Introduction to Algebraic Topology**, Springer-Verlag, Berlin, 1988

## ELECTIVE PAPERS

**MPM 6501**

**ADVANCED TOPICS IN GRAPH THEORY    5hr / 5 cr**

### **Objective:**

Graph theory is an important branch of Mathematics which has plenty of applications in almost all other fields such as Physics, Chemistry, Operations Research, Management, Sociology, Linguistics, Computer engineering, Electrical engineering, etc. The objective of the course is to give a complete exposure to Graph theoretical ideas and to cover very recent research areas of graph theory, so that interested students can continue their research in this area.

### **UNIT I: Product Graphs**

Basic concepts of graphs – Hyper cubes and isometric subgraphs - Cartesian product – Cartesian Products Prime factor decompositions – Cartesian product of triangles – Automorphism – transitive group action on products – Fixed box theorems.

### **UNIT II: Factorizations and decompositions**

Definitions and Examples – Generalization of factorization, 1-factorable and 2-factorable graphs Standard results - factorization and decompositions of complete graphs and bipartite graphs – related theorems

### **UNIT III: Labelings of graphs**

Definition - types of labeling - Necessary conditions for graceful graphs – classes of graceful graphs – Euclidean models and complete graphs- Introduction to magic labeling.

### **UNIT IV: Coloring of Graphs**

Basic concepts of coloring – types of coloring – T-coloring –  $L(2,1)$  colorings – Radio colorings – Hamilton Colorings.

### **UNIT V: Domination in graphs**

Bounds in terms of order and size – Bounds in terms of degree, diameter and girth – bounds in terms of independence and covering - Product graphs and Vizing's conjecture – grid graphs

## References

1. West, **Introduction to graph theory**, PHI, 2002.
2. Chartrand and Lesniak, **Graphs and Digraphs**, Chapen& Hall/ CRC Press, 1996.
3. Gould, **Graph Theory**, Benjamin/Cummings, Menlo Park, 1989.
4. Gibbons, **Algorithmic Graph Theory**, Cambridge University Press, Cambridge, 1989.

5. Wilson. and Watkins, **Graphs: An Introductory Approach**, John Wiley and Sons, New York, 1989.
6. Wilfried Imrich and Sandi Klavzar, **Product graphs: Structure and recognition**, John Wiley and sons Publication, 2000
7. Teresa W. Haynes, Stephen T. H., Hedetniemi and Peter J Slater, **Fundamentals of domination in graphs**, Marcel Dekker, New York, 1998.
8. Gary Chartrand, **Chromatic Graph Theory**, Chapman & Hall/CRC, 2009.

### **MPM 6503 FRACTAL GEOMETRY AND FUZZY MATHEMATICS 5hr / 5 cr**

**Objective:** To provide the basic ideas of Fractal Geometry and Fuzzy set theory to motivate the students to convert the real life situations in analytical representations.

#### **Unit I**

Classical fractals and self- similarity , Metric spaces, Equivalent spaces and Space of fractals Transformations on metric spaces , Contraction mappings and the construction of fractals , contraction mapping theorem, condensation sets, collage theorem

#### **Unit II**

Chaotic dynamics on fractals, Addresses of points on fractals, continuous transformations from code space to fractals and introduction to dynamical systems Fractal dimension , the box counting theorem, Julia sets, IFS whose attractors are Julia sets, parameter spaces and Mandelbrot sets

#### **Unit III**

Basic fuzzy operations and related theorems, fuzzy relations, binary relations, equivalence and similarity relations and orderings, fuzzy relation equations

#### **Unit IV**

Fuzzy measures, belief and plausibility measures, probability measures

#### **Unit V**

Types of uncertainty, measures of fuzziness and classical measures of uncertainty

#### **Reference books:**

1. Barnsley, **Fractals everywhere**, Academic Press, UK, 1990.
2. Edgar, Measure, **Topology and fractal geometry**, Springer verlag, 1990.
3. Klir and Folger, **Fuzzy sets, Uncertainty and Information**, Prentice Hall of India, 2001.
4. Klir and Bo. Yuan, **Fuzzy sets and fuzzy logic and their applications**, Prentice Hall of India, 1997.

### **MPM 6505 ANALYTIC NUMBER THEORY 5hr / 5 cr**

**Objective.** To make enable the scholars to get exposed to the frontier areas of analytic Number theory. This course deals with the applications of analysis in number theory and partition theory.



**UNIT I.**

Arithmetical functions: Dirichlet product, Mobius inversion formula, Mangoldt function, Lioville's function, Divisor functions, Generalised inversion formula, Bell series, Derivatives of arithmetical function, Selberg identity. Averages of arithmetical functions: The big oh notation, Euler's summation formula, Dirichlet's asymptotic formula, average order of the divisor functions, average order of the Euler's phi function, average order of the Mobius function, Mangoldt function and its equivalence to Prime number theorem.

**UNIT II**

Dirichlet characters: Characters of finite abelian group, the character group, orthogonality relations, Dirichlet characters, sums involving Dirichlet characters. Proof of Dirichlet theorem on primes in arithmetical progressions using sums involving Dirichlet characters. Gauss's sums associated with Dirichlet's character, Dirichlet characters with non vanishing Gauss's sums, Induced moduli and primitive characters, Gauss sum and the quadratic reciprocity law, reciprocity law for quadratic Gauss sums.

**UNIT III**

Dirichlet series and Euler product: The half-plane of absolute convergence of a Dirichlet series, Uniqueness theorem, Euler product, analytic properties of Dirichlet series, Mean value formulas for Dirichlet series, An integral formula for the coefficients of Dirichlet series, An integral formula for the partial sums of a Dirichlet series, Perron's formula.

**UNIT IV**

Partitions: Generating function of partition function  $p(n)$ , analytic proof of Euler's pentagonal number theorem, analytic proof of Jacobi's triple product identity, recursion formula for partition function, logarithmic differentiation of generating function, recursion formula for sum of divisors function, Hardy-Ramanujan-Rademacher expansion of  $p(n)$ .

**UNIT V**

Asymptotics of Infinite product generating function: Meinardus theorem, asymptotic formula for  $p(n)$ . Congruence properties of partition functions: Operators related to Hecke operators, Rodseth's theorem for Binary partitions, Ramanujan's conjecture for  $5^n$ , Dyson's theorem.

**Reference books:**

1. George E. Andrews, **The Theory of Partitions**, Addison-Wesley Publishing Company, 1976.
2. Tom M. Apostol, **Introduction to Analytic Number theory**, Springer International Student Edition, 2000.
3. Tom M. Apostol, **Modular Functions and Dirichlet series in Number theory**, Springer Verlag, 1990.
4. Henry Iwaniec & Emmanuel Kowalski, **Analytic Number Theory**, American Mathematical Society- Colloquium Publications, Vol. 53, 2013.

**MPM 6507****ADVANCED TOPOLOGY****5hr / 5 cr**

**Objective:** To make them expertise in the topological concepts and their relevance in different fields and to develop the firm footing on the core subject of Topology.

**Unit I: Quotient Spaces**

Identification Topology – Quotient Spaces – Decomposition

**Unit II: Uniform Spaces**

Uniformity - Uniform Continuity – Product Uniformity – Metrization

**Unit III: Proximity Spaces**

Uniform Subspaces – Completeness in Uniform Spaces – Uniform via Pseudo – Matrices – Compactness in Uniform Spaces – Proximity Spaces.

**Unit IV: Function Spaces**

Point wise Topology – The Compact -Open Topology

**Unit V: Bitopological Spaces**Pairwise  $T_1$  and  $T_2$  Spaces – pairwise Regular Spaces – Pairwise Normal spaces.**Reference Books:**

1. James R.Munkres, **Topology**, Prentice Hall of India, New Delhi, Second Edition (2008).
2. K.C.Rao, **Topology**, Narosa Publishing House, New Delhi (2009).

**MPM 6509****ADVANCED FLUID DYNAMICS****5hr / 5 cr**

**Objective:** To provide the advanced topics in Fluid Dynamics to motivate the students to do research in the field of engineering and industrial sectors.

**Unit I: General theory of stress and rate of strain**

Introduction-Newton's law of viscosity-Newtonian and Non-Newtonian fluids-Body and surface forces-Stress vector and components of stress tensor-State of stress at a point-Symmetry of stress tensor-Transformation of stress components-Plane stress, Principal stresses and principal directions- Principal stresses, principal directions of stress tensor, principal planes-Nature of strain-Transformation of the rates of strain components-Relation between stress and rates of strain.

**Unit II: Navier-Stokes equations and Energy equation**

Navier-Stokes equations of motion of a viscous fluid-Equations of motion in cylindrical polar coordinate system and in spherical polar coordinate system-Energy equation-Equation of state for perfect fluid-Diffusion of vorticity and Dissipation of energy-Vorticity equation-Diffusion of a vortex filament-Dimensional analysis-Technique of dimensional analysis-Model analysis and dynamic similarity, Reynold's number-Some useful dimensionless numbers-Some dimensionless coefficients employed in the study of flow of viscous fluids.

**Unit III: Laminar steady flow of viscous incompressible fluids**

Limitations and some exact solutions of Navier-Stokes equations-Steady flow between two parallel planes-Plane Couette flow-Plane Poiseuille flow-Theory of lubrication-Hagen-Poiseuille flow-Laminar steady flow between two coaxial circular cylinders-Laminar steady flow of incompressible viscous fluids in tubes of cross-section other than circular-Laminar flow between two concentric rotating cylinders-Couette flow-Steady motion of viscous fluid due to slowly rotating sphere-Steady flow of viscous incompressible fluid between two porous plates.

**Unit IV: Laminar unsteady flow of viscous incompressible fluids**

Unsteady flow of viscous incompressible fluid over a suddenly accelerated flat plate-Unsteady flow of viscous incompressible fluid between two parallel plates-Unsteady flow over a viscous incompressible fluid over an oscillating plate-Slow motion of a sphere in an incompressible viscous fluid-Flow in convergent and divergent channels- small Reynold's number flows-Flow past a sphere- Flow past a circular cylinder.

**Unit V: Magnetohydrodynamics & Introduction to Boundary layer theory**

Nature of Magnetohydrodynamics-Maxwell's electromagnetic field equations: Medium at rest and Medium in motion-Equation of motion of a conducting fluid-Rate of flow of charge-Simplification of electromagnetic field equations-Magnetic Reynold's number-Alfen's theorem-Magnetic body force-Ferraro's law of isorotation-Laminar flow of a viscous conducting liquid between parallel walls in a transverse magnetic field- Introduction to Boundary layer theory-Prandtl's boundary layer theory and its importance –Some basic definitions-Boundary layer equations in 2D flow-Boundary layer flow over a flat plate.

**Reference Books:**

1. Raisinghania, **Fluid Dynamics with complete Hydrodynamics and Boundary layer theory**, S.Chand & Company Ltd, 2006.
2. Chorlton, **Fluid Dynamics**, CBS Publishers and Distributors, 2004.
3. Goyal & Gupta, **Fluid Dynamics**, Pragati Prakashan Publishers, 2012.
4. Acheson, **Elementary Fluid Dynamics**, Clarendon Press. Oxford, 1989.

**MPM 6511****ADVANCED DIFFERENTIAL EQUATIONS 5hr / 5 cr**

**Objective:** To provide the advanced topics in Differential Equations to motivate the students to do research in the field of engineering and industrial sectors.

**(ODE)****Unit I**

Existence and Uniqueness of Initial Value Problems:  
Picard's and Peano's theorems, Gronwall's inequality, continuation of solutions and maximal interval of existence, continuous dependence.

**Unit II**

Two Dimensional Autonomous systems and Phase space analysis: critical points, proper and improper nodes, spiral points and saddle points.

**Unit III**

Asymptotic Behavior: stability (linearized stability and Lyapunov methods).

**(PDE)****Unit IV**

Laplace equation: mean value property, weak and strong maximum principle, Green's function, Poisson's formula, Dirichlet's principle, existence of solution using Perron's method.

**Unit V**

Heat equation: initial value problem, fundamental solution, weak and strong maximum principle and uniqueness results. Wave equation: uniqueness, D'Alembert's method, method of spherical means and Duhamel's principle.

**Reference books:**

1. Hirsch, Smale and Devaney, **Differential Equations**, Dynamical systems and introduction to Chaos, Academic Press, 2004.
2. Perko, **Differential Equations and Dynamical Systems**, Texts in Applied Mathematics, Vol. 7, 2<sup>nd</sup> ed., Springer Verlag, New York, 1998.
3. Rama Mohana Rao, **Ordinary Differential Equations: Theory and Applications**, Affiliated East-West Press Pvt. Ltd, New Delhi, 1980.
4. Sanchez, **Ordinary Differential Equations and Stability theory: An introduction**, Dover Publ. Inc., New York, 1968.
5. DiBenedetto, **Partial Differential Equations**, Birkhauser, Boston, 1995.
6. Evans, **Partial Differential Equations**, Graduate Studies in Mathematics, Vol. 19, AMS, Providence, 1998.

**MPM 6513****ADVANCED FUNCTIONAL ANALYSIS****5hr / 5 cr****Objective**

To introduce some aspects on advanced functional analysis.

- Unit I** Contraction mapping theorem and its applications to differential equation, integral equation and system of linear equations. Equicontinuity, Arzla-Ascoli theorem and its application to differential equations.
- Unit II** Weierstrass's Approximation Theorem, Stone-Weierstrass's Approximation Theorem. Semicontinuity and its applications to Arclength.
- Unit III** Definition of normed and Banach algebras with identity. Haar measure. Regular points and spectrum. Compactness of spectrum. Resolvent function and its analyticity in the set of regular points. Gelfand's theorem about isomorphism between Banach algebras and complex numbers.
- Unit IV** Spectral radius and the spectral mapping theorem for polynomial Ideals and Maximal ideals in commutative Banach algebras with identity. The set  $C(M)$  of complex functions on the set  $M$  of maximal ideals in a Banach algebra. Gelfand representation for algebras with identity.

**Unit V** Bilinear Mappings, Bounded bilinear mappings, sesquilinear mappings, Hermitian form, bounded sesquilinear mappings, bounded sesquilinear forms in Hilbert space.

**Reference Books:**

1. Babu Ram, **Metric Spaces**, Vinayaka Publications, New Delhi, 2005.
2. Bachman, G. and LawrerieNarici, **Functional Analysis**, Academic Press, 1966.
3. Goffman, C. and Pedrick, **First Course in Functional Analysis**, Printice Hall of India, 1987.
4. Berberian, S.K., **Introduction to Hilbert Spaces**, Chelsea Publishing Co.N.Y,1976.

**MPM 6515 STATISTICAL INFERENCE & STOCHASTIC PROCESS 5hr / 5 cr**

**Objective:** The objective of this course is to develop statistical research on interpretation of data with mathematical rigorous treatment

**Unit I**

Statistical inference: Sufficient statistics – sufficiency and completeness – sufficiency and variance . MLE – properties.

**Unit II**

Neyman – Pearson fundamental lemma – distribution with monotone likelihood ratios, confidence bounds. Two-sided hypotheses – tests for parameters in a Normal distribution.

**Unit III**

Unbiasedness: application to one parameter exponential family – similarity and completeness. Invariant tests: Symmetry and invariance – maximal invariance – most powerful invariant tests- Unbiasedness and invariance.

**Unit IV**

Introduction to stoch. Process: Basic ideas and definition – classification of stoch. process. Markov chain: Introduction and examples – Two-state markov chain, classification of state Limiting probabilities.

**Unit V**

Markov process – simple markov process – Poisson process – pure-birth process. Birth and death process – application to queues.

**Reference Books:**

1. Lehman E.L, **Theory of point estimation**, springer, 1988.
2. Lehman E.L, **Testing Statistical Hypothesis**, John Wiley & sons, 1986.
3. Medhi,J, **Stochastic process**, Wiley Eastern, 1983.
4. Srinivasan,S.K&K.M.Mehata, **Stochastic Process**, Tata McGraw Hill, 1988.

**AMERICAN SCHOOL OF BUSINESS ADMINISTRATION**  
**M.Phil. (Management) one year full time programme**  
**(for candidates admitted from the academic year 2016 -2017 onwards)**

**Course Structure**

<b>SEMESTER</b>	<b>COURSE NO.</b>	<b>TITLE OF THE PAPER</b>	<b>HOURS WEEK</b>	<b>MARKS</b>
Semester I	MMB6501	Functional Management Decision	5	100
	MMB6503	Research Methods in Management	5	100
		Advanced Elective Paper (The Scholar should choose any <b>ONE PAPER</b> from the following streams of the elective)		
	MMB6505	Marketing Management	5	100
	MMB6507	Human Resource Management	5	100
	MMB6509	Financial Management	5	100
	MMB6511	Banking and Insurance Management	5	100
	MMB6513	Trade and Logistics Management	5	100
	MMB6515	Operations Management	5	100
	MMB6517	Entrepreneurship Development	5	100
	MMB6519	Information Technology	5	100

<b>SEMESTER</b>	<b>COURSE NO.</b>	<b>TITLE OF THE PAPER</b>	<b>HOURS WEEK</b>	<b>MARKS</b>
Semester II	MMB6600	M. Phil Dissertation and Viva-Voce	-	200

## **M.PHIL - MANAGEMENT**

### **Objective:**

The main objective is that all students get the needed proficiency to pursue Master in Philosophy in Management.

### **Program Description**

The M. Phil course is of one year's duration. The first semester will comprise of course work followed by exams. There will be a total of 3 papers – 2 compulsory and 1 optional from each area of specialization, i.e. Marketing, Human Resource Management, Finance, Banking and Insurance , Trade and Logistics Management, Operations Management, Entrepreneurship Development and Information Technology. (Optional areas offered will depend upon students' area of interest and faculty expertise). During the second semester the students will work on their dissertation. Following viva voce, successful candidates will be awarded an M. Phil degree in Management.

## **I SEMESTER**

### **MMB6501 FUNCTIONAL MANAGEMENT DECISION**

**5Hrs& 5 credits**

#### **An Introduction**

This course provides an introduction to the management function. It will focus on the theory and fundamental concepts of principles of management- human resource- marketing- operations and financial management. Further it develops an understanding of the development thoughts through innovative practices.

#### **Objectives:**

To enable the research scholars gain exposure in core areas of functional management. To facilitate the research scholars in carrying out research pertaining to Human resources management-marketing- finance and in operational management.

#### **Skills acquired in this course:**

Scholars acquired in this course include the ability to understand the fundamental management decision and critically evaluate a range of applied business management principles and practices to complex problem in the context of business

#### **Teaching/Learning Strategy:**

Researchers will learn through lectures-management activities-case studies-invited lectures and focused workshop.

### **SYLLABUS**

#### **UNIT I - GENERAL MANAGEMENT**

Planning -Organising-Staffing and Controlling - Mergers and Acquisitions -Professional ethics -Business environment-Benchmarking- Management by Objectives & Exception- Management By Walking Around -Corporate social Responsibility - Business Adoption - Work-life balance-

Personality -Perception -Attitude and Values -Motivation - Job satisfaction -Leadership - Group dynamics -Organisational Climate and Culture-Organisational development.

#### **UNIT – II HUMAN RESOURCES MANAGEMENT**

Selection and recruitment -Training and Development -Industrial relations - Industrial Disputes- Labor welfare -Man power planning - Job evaluation and merit rating - Performance appraisal- Employee compensation and rewards-Knowledge management - Employee engagement - Retention strategies and outplacement.

#### **UNIT –III MARKETING MANAGEMENT**

Concepts of Marketing and market- Marketing Mix- Product- Price- Promotion- Place- Product: Product concept- Product classification- New Product Development- Product life cycle- Product mix decision- Branding- Packaging-Labelling decisions-- Pricing policies- Pricing methods. Recent innovations in online marketing.

**UNIT IV – OPERATIONS MANAGEMENT**

Plant Location-Plant layout -Product design & process selection -Production planning and control - Inventory Management -Materials management –Maintenance management and Emerging trend in Supply chain management.

**UNIT V-FINANCIAL MANAGEMENT**

Introduction to finance- Fundamental principles objectives of financial- Functions of Financial Management. Time value of Money- Investment decisions- Capital Budgeting- Investment evaluation techniques- Estimation of cash flow for new project-replacement projects- Risks in capital budgeting- Factors affecting cost of capital-- Dividend policy- Working Capital.

**TEXT BOOKS**

1. Peter F. Drucker- Principles and Practice of Management Practice Hall Ltd.-New Delhi.
2. L. M. Prasad(2008)- Management Principles and Practice- Himalayas Publishing House- New Delhi.

**REFERENCES**

1. Philip Kotler: Marketing management (Millennium edition)- prentice hall of India P (ltd)- New Delhi 2001.
2. IMP Andy- “ Financial Management”-Vikas Publishing House Pvt.Ltd- 8<sup>th</sup> edition- 1999.
3. James C Varnhorn-“ Financial Management and Policy-” Pearson Education Asia (Low Priced Edition) 12th edition- 2002
4. Prasanna Chandra-“ Financial Management - Theory and practice-” Tata McGraw Hill Publishing Company Ltd.
5. Decenzo and Robbins- Human Resource Management-Wilsey- 6th edition- 2001
6. S. N. Chatter- Production and Operation Management.
7. Kazami Azhar- Strategic Management and Business Policy.

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks



## **MMB6503 RESEARCH METHODS IN MANAGEMENT**

**5Hrs& 5 credits**

### **An Introduction:**

This course presents the fundamentals of qualitative research methods. It prepares researcher to design, carry out report, read and evaluate qualitative research projects. Scholars learn how to collect data using methods including interviewing- focus groups- participant observation- and historical work. The challenges and opportunities of research design- quality indicators and ethics are addressed. Scholars will use these theoretical underpinnings to begin to critically review literature relevant to their field or interests and determine how research findings are useful in informing their understanding of their environment (work- social- local- global).

### **Objective:**

To enable the research scholars understand the advanced concepts of research methods. To expose the research scholars have a thorough knowledge on Research.

### **Skills acquired in the course:**

Research skills acquired in this course to enhance their knowledge of qualitative and quantitative research methods and able to learn how to apply in their respective discipline and interpret research findings.

### **Teaching/Learning Strategy:**

Teaching methods include readings, lectures, group discussions, exercises using SPSS and assignments. Lectures are designed such that ensure greater scholar participation.

## **SYLLABUS**

### **UNIT I: RESEARCH IN MANAGEMENT**

Research: Meaning – Purpose – Types of research- Significance of research – Research in Management – Steps in research – Identification- selection and formulation of research problem – Research Design – Hypothesis; concepts- sources and types – Formulation of hypothesis – Review of literature: Nature and Purpose.

### **UNIT II: SAMPLING METHODS AND DATA COLLECTION**

Meaning of sample – Sampling theory – Sampling techniques – Probability sampling – Non probability sampling – Advantages and disadvantages of sampling – Sampling and Non-Sampling errors – Estimation of sample size -Sources of Research data: Primary and secondary sources. Primary data collection methods: Questionnaire and testing of questionnaire. Attitude measurement: Scales of measurement (Nominal- Ordinal- Interval- Ratio). Rating scales: Attitudes scales (Likert scale- semantic differential scale). Observation- Interview- Schedule.

### **UNIT III: STATISTICAL ANALYSIS I**

Univariate analysis with the help of descriptive statistics. Investigation of association (Bivariate data). Pearson's correlation coefficient (Interval and ratio scales). Spearman's rank correlation coefficient (ordinal data). Contingency coefficient (Nominal data). Simple regression analysis – Testing of hypothesis: Framing null and alternate hypothesis. Critical region- test statistic- standard error and its role Parametric Test: Tests based on normal- t- f- Chi-square distributions.

**UNIT IV: STATISTICAL ANALYSIS II**

Non-parametric test; Kolomogrov – Smirnov one and two sample test- run test-MannWhitney U test- Will Coxson signed rank test – Kruskal – Wallish test – Fried mann test andKendall’s W test. Overview of some advanced statistical tools: Principle component analysis– Measures of association of minimal data: Lamda- Phi coefficient.

**Unit V: REPORT WRITING**

Chapter Format – Pagination –Indentation – Using Quotations – Presenting Footnotes – Abbreviations- Presentation of tables and figures – Referencing – Documentation – Use and format of Appendices – Indexing – Technique- style and linguistic aspects of Report Writing.

**TEXT BOOKS**

1. Kurtz- R. Norman- 1983. Introduction to Social Statistics- New Delhi- McGraw-Hill International.
2. Donald R.Cooper and Pamela S.Schindler- 2000- 6<sup>th</sup> Ed.-Business Research Methods-Tata McGraw Hill Publishing Company Limited.

**REFERENCES**

1. Sullivan-Monette and Dejong- 2001.Applied Social Research (Tools For The HumanServices)- Harcourt Brace College Publishers.
2. Baker- T.L.- 1999. Doing Social Research- III edition- New York- McGraw Hill.
3. Gilbert- A. and Churchil Jr.- 1983. Marketing Research: Methodological Foundations- India- Prentice Hall
4. Tull- D.S. and Hawkins- D.I.- 2000. Marketing Research: Measurement and Methods- Prentice hall India.

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

**MMB6505 MARKETING MANAGEMENT**

**5Hrs& 5 credits**

**An Introduction**

This subject aims to cover the marketing concepts and philosophies and focus on the impact of various marketing environmental factors in business. The emphasis will also be given to the difference between individual and business buyer behaviour based on their varied geographic- demographic phenomenon and how the marketers can create the competitive advantage through identifying and serving the most lucrative target group by creating distinct position in the industry. Moreover this course will also stressed on the building blocks of marketing mix and extended marketing mix and its implications for the domestic and international marketing strategies.

**Objectives:**

This course enable tounderstand the factors affecting consumer behavior and make the scholars carry out research on marketing management.

**Skills acquired in the course:**

The skills acquired in this course to investigate basic principles/concepts and practices and to develop a strong foundation in the specialized area of marketing

**Teaching/Learning Strategy:**

Teaching methods include readings, lectures, group discussions, exercises and assignments. Lectures are designed such that ensure greater scholar participation.

**SYLLABUS****UNIT I :ADVERTISING**

Purpose and Functions of Advertising Process - Advertising in the marketing mix-Setting Advertising Objectives - The Budget Decision - Visualization of Ad Layout - Elements of Ad Copy and Creation-Media-The Internet as an Advertising Medium-Measuring Advertising Effectiveness-Sales Promotion as a Promotion Tool - Types of Sales Promotion Techniques - Evaluation of Sales Promotion Schemes.

**UNIT II :SERVICE MARKETING**

Nature and Scope of Services – Unique characteristics of services - Challenges and issues-opportunities-Classification of services – Expanded marketing mix –Service Life Cycle – New service development –GAP model of service quality – Measuring service quality – SERVQUAL – Service Quality function development.Designing service delivery System– Service Marketing Strategies for health – Tourism – Financial – Logistics -Educational – Entertainment & public utility Services.

**UNIT III :CONSUMER BEHAVIOUR**

Introduction to the study of Consumer Behaviour- Social and Societal Marketing Concepts- Role of Research in understanding consumer behaviour: The consumer research process Model of Consumer Behaviour-Internal and external Influences- Basics of Motivation- Motivation Theories-Personality: Basics of Personality- Theories of Personality and Marketing Strategy- Applications of Personality concepts in Marketing- Personality and understanding consumer diversity Brand Personality and Perception-Consumer Learning.

**UNIT IV :ANALYSING MARKETS AND MARKETING RESEARCH**

Analysis of marketing opportunities -Marketing Intelligence -Analysis of micro and macro environment-Understanding individual and industrial buyer behavior-Buying decision processStrategies for market segmentation- targetingand positioning- brand management-application of marketing research-productlaunching- advertising- brand preferences-customer satisfaction-retail stores image- customer perception- distribution- competitor analysis.

**UNIT V:OTHER AREA IN MARKETING**

International marketing – Rural Marketing - Online marketing – Web based marketingprogrammes - Marketing to non-profit organizations - Marketing to organizations - Marketing of services – Event marketing – Emotional marketing – Holistic marketing - Emerging new trends and challenges to marketers - Building customer satisfaction -Database marketing - Customer Relationship Management.

**TEXT BOOKS**

1. Philip Kotler: Marketing management (Millennium edition)- Prentice Hall of India Pvt (Ltd)- New Delhi 2001.
2. Zikmund & Amico, Marketing South western, Thomson Learning, 2000.
3. Sherlekar S.A., Marketing Management, Himalaya publishing, New Delhi

**REFERENCES**

1. Wells- Burnett & Moriarty: ADVERTISING PRINCIPLES AND PRACTICES- Prentice-Hall
2. Suja Nair - Consumer Behaviour in Indian Himalaya Publishers- 2004.

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

**MMB6507 HUMAN RESOURCE MANAGEMENT**

**5Hrs& 5 credits**

**An Introduction**

This course focuses on maximizing employee performance to meet the employer's strategic objectives. It involves concentration on policies and systems, recruitment, training, development, performance appraisal, managing payments and benefits, industrial relations, harmonious employer and employee relations and also balancing of organizational practices. To learn the major initiatives taken by a company's top management on behalf of corporates-involving resources and performance in external environments. It entails specifying the organization's mission- vision and objectives- developing policies and plan to understand the analysis and implementation of strategic management in strategic business units.

**Objective:**

This course enables the research scholars to gain a complete insight into different domains of human resources management. Able to help them and have a thorough theoretical as well as research knowledge of human resource practices.

**Skills acquired in the course:**

The scholar's learn the major initiatives taken by a company's top management on behalf of corporates, involving resources and performance in external environments. It entails specifying the organization's mission, vision and objectives, developing policies and plan to understand the analysis and implementation of strategic management in strategic business units.

**Teaching/Learning Strategy:**

Students will learn through lectures, case study, guest lectures from corporate, management games and conference.

**SYLLABUS****UNIT I: ORGANISATIONAL DEVELOPMENT**

Definitions-Characteristics of Organization Development-Evolution of human resource management-Importance of the human factor –Objectives of human resource management - Scope of HRM - HRM Models -Role of human resource manager -Skills and qualities of HR manager-Human resource policies.

**UNIT II: MAN POWER PLANNING & SELECTION**

Importance of human resource planning – Forecasting human resource requirement –Man power planning techniques - Recruitment and Selection - Sources of recruitment -Selection process - Screening tests – Interviews - Placement - Induction – Orientation.

**UNIT III :TRAINING AND DEVELOPMENT:**

Objectives of training – Training needs - Training methods – Benefits – Executivedevelopment programmes – Common practices – Organisation development –Self-development – Knowledge management.

**UNIT IV: SUSTAINING EMPLOYEE INTEREST:**

Motivation – theories and application – Rewards – Job satisfaction - Job design - Empowerment of employees - Participative Management - Quality of work life-Work place counseling-emotional intelligence–Career management - Development cycle - Need assessment –relationships – Employee Compensation plans - Employee Benefits - Safety and Welfare.

**UNIT V: PERFORMANCE EVALUATIONS AND CONTROL PROCESS**

Job evaluation - Performance Appraisal: process- methods of performance evaluation – feedback – industry practices - Control process: Importance- Methods – Requirement of effective control systems – Career planning – Grievance: causes- handling procedure – Types of industrial disputes - Machinery for settlement of disputes – Computer applications in HRM

**TEXT BOOK**

- 1.Decenzo and Robbins- Human Resource Management-Wilsey- 6th edition- 2001
2. Biswajeet Pattanayak- Human Resource Management- Prentice Hall of India- 2005
3. Human Resource Management-Eugene Mckenna and Nic Beach- Pearson Education Limited- 2002
4. Mamoria C.B. and Mamoria S. Personnel Management- Himalaya Publishing Company- 1997

**REFERENCES**

- 1.Arun Monappa and Mirza S. Saiyadain- “Personnel Management”- New Delhi- Tata McGraw Hill- 1995.
- 2.Robert L. Mathis and John H. Jackson- “Human Resource Management”- 9th Edn.- South Western College Publishing- 1995.
3. Wendell L. French- Cecil H. Bell, Jr “Organization Development”- Prentice Hall of India New Delhi 2008.

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

## **MMB6509 FINANCIAL MANAGEMENT**

**5Hrs& 5 credits**

### **An Introduction**

This course provides a brief introduction to the fundamentals of finance, emphasizing their application to a wide variety of real-world situations spanning personal finance, corporate decision-making and financial intermediation.

### **Objective:**

This course make the scholars to learn the advance financial concepts and scope of Financial Management .To help the scholars to understand the application of tools and techniques of Financial Management in research in issuing securities, acquire financial evaluation technique of leasing and hire purchase.

### **Skills acquired in the course:**

Skills acquired to manage a financial firm, to describe and apply financial concepts, theories, tools and to evaluate the role of technology and the legal, ethical and economic environment as it relates to financial institutions

### **Teaching/Learning Strategy:**

Scholar's will learn through cases, problems, analysis of published accounts of companies, computer based exercises and understanding of real life organizations.

## **SYLLABUS**

### **UNIT I: ADVANCED FINANCIAL ANALYSIS**

Financial Statement Analysis – Ratio Analysis – Fund Flow and Cash Flow Analysis – Cost – Volume - Profit analysis. Advanced Financial Planning: Financial forecasting – Budgeting – Inter firm comparison-Objectives- scope and functions of Financial Management. Financial Planning – meaning and importance of Financial planning.

### **UNIT II: DIVIDEND POLICY**

Types of Dividend – Dividend Theories – Dividend policy and Share Valuation – Factors influencing Dividend policies – Dividend policies in practice.

### **UNIT III: FINANCIAL SERVICES**

Classification- Scope- Some special fund and non-fund based financial services: Leasing- Hire purchase- Factoring- Retail finance- Mutual funds- Credit rating- Merchant banking and venture capital.

### **UNIT IV: CORPORATE VALUATION**

Approaches to Valuation- Stock and Debt Approach – Direct Comparison Approach – Discounted Cash Flow Approach.

### **UNIT V: INVESTMENT & SECURITY ANALYSIS**

Introduction- Characteristics and objectives of Investment Management- Investment vs gambling and speculation- New Issue market and Stock Exchanges- Trading mechanisms in stock exchanges- Risk & Return- Stock Return and Valuation- Bond valuation- Fundamental Analysis and Economic / Industry / Company Analysis- Technical Analysis- Efficient Market Hypothesis-Corporate Governance in Developed Countries and in India.

**TEXT BOOKS:**

1. Prasanna Chandra- 2001 Financial Management: Theory and Practice-5th Ed.- McGraw Hill.
2. Ross-Westerfield- Jaffe- 1999 Corporate Finance-5th Ed.- McGraw Hill.
3. Brigham-Gapenski- and Ehrhardt- 1999 Financial Management: Theory and Practice-9th Ed.- Dryden Press.

**REFERENCES:**

1. Pandey- I.M.- 2006-Financial Management-Vikas Publishing House.
2. Vishwanath- S.R.- 2000 Corporate Finance: Theory and Practice-Response Books.
3. Fred J. Weston-Kwang S. Chung- and Susan E. Hoag- 1997-Mergers- Restructuring and Corporate Control-Prentice Hall of India.
4. M.Y.Khan- Financial Services- Tata McGraw-Hill- 12th Edition- 2012
5. NaliniPravaTripathy- Financial Services- PHI Learning- 2011.
6. Stulz- Risk Management and Derivatives-Cengage Learning- 2nd Edition- 2011.

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

**MMB6511 BANKING AND INSURANCE**

**5Hrs& 5 credits**

**An Introduction**

This course provides the new era of globalization in the banking sector and has witnessed drastic changes at structural and organizational levels. Banks act as an intermediary to transfer the resources from those who spend more than their earning to those who spend less. Banking plays a key role in deciding the best business practices in developing new markets and clients and creates new products for e-commerce and net based technologies.

**Objective:**

This course intends to familiarize the banking theories and practices, grasp how banks raise their sources and how they deploy it and manage the associated risks.

**Skills acquired in the course:**

Skills acquired in this course include the ability to understand the banking practice and credit analysis to a financial firm and critically analyze the loans and clients using e-banking.

**Teaching/Learning Strategy:**

Scholar's will learn through lectures, cases, invited lectures and workshop.

**SYLLABUS****UNIT I: OVERVIEW OF INDIAN BANKING SYSTEM**

Overview of Indian Banking System- Functions of banks- key Acts governing the functioning of Indian banking system- Negotiable Instruments- Banking Regulations Act 1948. Types of Banks- Structure and function of commercial banks- functions of monetary policy- note issue-bankers bank- custodian of foreign exchange- credit control- interest rate and clearing function.

**UNIT II :SOURCES AND APPLICATION OF BANK FUNDS**

Capital adequacy- Deposits and non-deposit sources- Designing of deposit schemes and pricing of deposit services- application of bank funds – Investments and Lending functions- Types of lending – Fund based- non-fund based- asset based – Different types of loans and their features- Major components of a typical loan policy document- Steps involved in Credit analysis- Credit delivery and administration- Pricing of loans- Customer profitability analysis.

**UNIT II CREDIT MONITORING AND RISK MANAGEMENT**

Need for credit monitoring- Signals of borrowers' financial sickness- Financial distress prediction models – Rehabilitation process- Risk management – Interest rate- liquidity-forex-credit- market-Deposit account- types of accounts and demand draft.

**UNIT IV MERGERS- DIVERSIFICATION AND PERFORMANCE EVALUATION**

Mergers and acquisition in banks: Concept- forms of merger-acquisition -Motives for mergers and acquisition- rationale of mergers in banking sector.

**UNIT V HIGH TECH E-BANKING**

Payment system in India – Paper based- e-payments – Electronic banking – advantages – Plastic money- E-money – Forecasting of cash demand at ATMs – Security threats in e-banking and RBI's initiatives.

**TEXT BOOKS:**

1. Padmalatha Suresh and Justin Paul- "Management of Banking and Financial Services- Pearson- Delhi- 2012.

**REFERENCES:**

1. Meera Sharma- "Management of Financial Institutions – with emphasis on Bank and Risk Management"- PHI Learning Pvt. Ltd.- New Delhi 2010.
2. Benson-Commercial banks in india-New Century publication New Delhi 2008

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

**MMB6513 TRADE AND LOGISTICS MANAGEMENT**

**5Hrs& 5 credits**

**AnIntroduction**

This course will explore the elements of integrated business logistics and the role and application of logistics principles to supply/demand/value chain management. Logistics and the supply chain strengthen the business or corporate strategy to achieve the company objectives in sales- market share- share price- returns on shareholder funds- investment and assets.

It also covers transportation, warehousing, inventory management, customer service and purchasing.



**Objective:**

This course intends to familiarize the students with an overview of logistics management in organisations based on the concept of supply chain management, logistical implications in the functions of the organization.

**Skills acquired in this course:**

Skills acquired in this course include the ability to understand with the different areas of the supply chain and their interrelationships, be familiar with the key decisions in the process of Sourcing & Procurement, to organise the Sourcing & Procurement function of the company and know how to apply techniques for supplier evaluation.

**Teaching/Learning Strategy**

Students will learn through various activities which may include lectures, assignments, prescribed readings, case study, researching and analysing specific information.

**SYLLABUS****UNIT 1: INDUSTRIAL POLICY OF INDIA**

Review of Industrial policy and its role in Industrial development; Micro Small and Medium Enterprise Act-2006; Servicesector policy; New Economic policy (1991) and its effect; Competition Act; Public Business Vs. Private Business.

**UNIT II: INTERNATIONAL TRADE**

Modes of International Trade- Significance- Export Import (EXIM) Policy and Procedure – Documentation of International Trade; Balance of Trade and Balance of Payment; Changing Direction of International Trade; FEMA; Regional Co-Operation with emphasis on SAARC- NEFTA and EEC – Export Promotion Council – WTO and its Role.

**UNIT III: TRANSPORT**

Concept- Significance- Means of Transport- Pricing issue In Transport- Transport Competition and Co-ordination- Recent Development in Transport Sector in India.

**UNIT IV: SUPPLY CHAIN AND LOGISTICS MANAGEMENT**

Role in Distribution Management Functions of players in logistics Management- Vendor Development – Present Position.

**UNIT V DISTRIBUTION LOGISTICS**

Elements of Distribution Logistics – Elements of cost in physical distribution system – Distribution Importance Developing Customer Service Strategic & Customer service Logistics- The Economics of Logistics- Cost associated With Logistics- Logistics in International Trade Materials handling packaging and transportation systems

**TEXT BOOKS:**

1. Exim Policy – Govt. of India
2. International Business – Francis Cherunilam – Himalaya Publication- Mumbai.

**REFERENCES:**

1. Keith Flether, Marketing Management and Information Technology Prentice Hall, 1998
2. M.L.Seth - Money, Banking, International Trade and Public Finance, LakshmiNarainAgrawal, Agra.
3. Report on Small Enterprises in India – Ministry of MSE Govt. of India
4. RBI Reports.

**EVALUATION METHODOLOGY**

Maximum - 100 marks                      External - 50 marks

Internal - 50 marks

**MMB6515 OPERATIONS MANAGEMENT****5Hrs& 5 credits****An Introduction**

This course provides the management of resources and activities that produce and deliver goods and services for customers. It focuses on the basic concepts, issues and techniques for efficient and effective operations through operations strategy, product and service design, process design and analysis of capacity planning and quality management.

**Objective :**

This course intends to familiarize with the theories and practices of operation management so as to develop critical managerial way of thinking.

**Skills acquired in this course:**

Skills acquired in this course include the ability to understand the strategic role of operations management in creating and enhancing a firm's competitive advantages and issues of OM in both manufacturing and service organizations.

**Teaching/Learning Strategy**

Students will learn through various activities which may include lectures, assignments, case study and experts from the companies.

**SYLLABUS****UNIT I :PRODUCT MANAGEMENT**

Types of products.Product development – characteristics- duration and cost-challenges.Development Process- Product Planning Process and Steps.Product Life Cycle-Technology Life Cycle - Understanding Customer Needs- Disruptive Technologies- Product Specification - Concept Generation – Activity- Steps-Techniques.Concept Selection – Importance- Methodology- concept Screening- Concept Scoring.Concept Testing. Product Architecture- Definition- Modularity- implication- Establishment- Delayed Differentiation- Platform Planning

**UNIT II :MATERIAL MANAGEMENT**

Operating environment-aggregate planning-master scheduling-manufacturing planning and control system-manufacturing resource planning-enterprises resource planning-making the production plan. Materials requirements planning-bill of materials- resource requirement planning-manufacturing resource planning-capacity management- scheduling orders-production activity control-codification.Policy Decisions-objectives-control-Retail

Discounting Model- Newsvendor Model; EOQ and EBQ models for uniform and variable demand -Quantity discount models and purchase Management.

### **UNIT III:INDUSTRIAL DESIGN AND DESIGN TOOLS**

Industrial Design- Design for Manufacturing-Value Engineering-Ergonomics-Prototyping- Robust Design- Design for X-failure rate curve-product use testing-Collaborative Product development-Product development economics-scoring model- financial analysis.

### **UNIT IV:TOTAL QUALITY MANAGEMENT**

Meaning and scope of TQM-TQM and the management of change-TQM and its implication for Performance Management- Quality control and quality assurance- HRM and quality improvement measures-Introduction to IS/ISO 9004:2000 – quality management systems – guidelines for performance improvements.

### **UNIT V:SCHEDULING AND PROJECT MANAGEMENT**

Project Management – Scheduling Techniques, PERT, CPM; Scheduling - work centers – nature, importance; Priority rules and techniques, shopfloor control; Flow shop scheduling – Johnson’s Algorithm – Gantt charts; personnel scheduling in services.

### **TEXT BOOKS:**

1. J.R.Tony Arnold- Stephen N. Chapman- Lloyd M. Clive- Materials Management- Pearson- 2012.
2. P. Gopalakrishnan- Purchasing and Materials Management- Tata McGraw Hill- 2012
3. A.K.Chitale and R.C.Gupta- Materials Management- Text and Cases- PHI Learning- 2nd Edition-2006
4. ShridharaBhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition 2002.

### **REFERENCES :**

1. A.K.Datla- Materials Management- Procedure- Text and Cases- PHI Learning- 2nd Edition- 2006
2. Karl T. Ulrich- Steven D. Eppinger- Anita Goyal Product Design and Development-Tata McGraw – Hill- Fourth Edition- reprint 2009.
3. Kenneth B.Kahn- New Product Planning- Sage- 2010.
4. A.K. Chitale and R.C. Gupta- Product Design and Manufacturing- PHI- 2008.

### **EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

## **MMB6517 ENTREPRENEURSHIP DEVELOPMENT**

**5Hrs& 5 credits**

### **An Introduction**

This course provides to develop an entrepreneurial mindset that incorporates creativity, innovation, understanding of the nature of entrepreneurship, characteristics of the entrepreneur and the role of the socio-cultural and global economic environment in fashioning innovative entrepreneurship.

### **Objective:**

This course intends to familiarize with the theories and practices of entrepreneurship so as to develop a successful entrepreneur.

### **Skills acquired in this course:**

Skills acquired in this course to understand the entrepreneurial innovation and development within their business, workplace or community. Students will gain knowledge and skills needed to run a business.

### **Teaching/Learning Strategy**

Students will learn through various activities which may include lectures, case study and guest lecture from successful entrepreneur.

## **SYLLABUS**

### **UNIT I: INTRODUCTION TO ENTREPRENEURSHIP**

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful, Entrepreneur – Knowledge and Skills of Entrepreneur.

### **UNIT II :ENTREPRENEURIAL ENVIRONMENT**

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations - International Business- Entrepreneurial Entrepreneurial success and failures.

### **UNIT III: SETTING UP OF A SMALL BUSINESS ENTERPRISE.**

Identifying the Business opportunity - Business opportunities in various sectors formalities for setting up of a small business enterprise. – Environmental pollution Related clearances. Sickness in Small Business Enterprises- Causes of sickness –Government policies on revival of sickness and remedial measures.

### **UNIT IV:PREPARING A BUSINESS PLAN**

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.

### **UNIT V:LAUNCHING THE NEW VENTURE**

Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Venture capital, IT startups- Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of BusinessUnits- Effective Management of small Business.

**TEXT BOOKS:**

1. Charantimath, Entrepreneurship Development Small Business Enterprises-- Pearson
2. Vasant Desai, Small Scale Industries and Entrepreneurship- HPH.
3. Kuratko & Hodgetts, Entrepreneurship in the new Millennium- Cengage

**REFERENCES :**

1. Sahay & Sharma, Entrepreneurship & New Venture Creation- EB
2. Dr. S.S. Kharkha Entrepreneurial Development, Sulthan Chand.
3. Roy, Entrepreneurship, Oxford
4. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2001.
5. S.S. Kharkha, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2001.
6. Mathew Manimala, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis, Biztantra, 2nd Edition, 2005
7. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill, 1996.

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

**MMB6519 INFORMATION TECHNOLOGY**

**5Hrs & 5 credits**

**An Introduction**

**Introduction:** The main objective to guide researcher through choosing, developing and managing information systems to achieve business aims. In modern business, good development and management of business information systems are central to the success or failure of the organisation. Researcher is equipped with relevant business management tools to take on the challenges of the global business scenario.

**Objective:**

Able to develop a critical understanding of the information systems life-cycle, together with an appreciation of issues involved in the design, implementation and management of business information systems from the perspective of the business user.

**UNIT –I Foundation of Information Systems**

Data, information and knowledge from a systems perspective- Information systems strategy and competitive advantage. The impact of IS on organisational forms. Outsourcing and resource management- The value of information systems. IS failures and their implications. The systems life-cycle: feasibility study, system investigation, system analysis and design, systems development and testing, implementation and training, review and maintenance. Systems analysis tools and techniques: data flow diagrams, entity models, process diagrams. The role of the business/systems analyst.

**UNIT- II Web Technology**

Web services- Architecture- Key Technologies- UDDI- WSDL- ebXML- SOAP And Web Services In E-Com- Overview Of. NET And Role Of XML- XML and The Web- XML Language Basics- SOAP- Web Services- Revolutions Of XML -Service Oriented Architecture (SOA).

**UNIT -III DATABASE IMPLEMENTATION**

Query Processing basics and optimization – Heuristic Optimization – Transactions Models – Concurrency Control – Recovery – Security and Authorization – Storage – Indexing and Hashing –ISAM – B-Trees – Kd Trees – X Trees – Dynamic Hashing.

**UNIT-IV SECURITY, CONTROL AND REPORTING**

Security, Testing, Error detection, Controls, IS Vulnerability, Disaster Management, Computer

Crimes, Securing the Web, Intranets and Wireless Networks, Software Audit, Ethics in IT, User

Interface and reporting.

**UNIT-VNEW INITIATIVES**

ERP, e-business, e-governance, Data Mining, Business Intelligence, Pervasive Computing, Cloud computing, CMM.

**TEXT BOOKS**

1. Peter Rob, Carlos Coronel, Database System and Design, Implementation and Management, 7 th edition, Cengage Learning,
2. RamezElmasri and Shamkant B. Navethe, Fundamentals of Database Systems, 4th ,Pearson Education, 2004.
3. Jeffrey A Hoffer et al, Modern Database Management, 10th Edition, Pearson Education, 2012,

**REFERENCES :**

1. Abraham Silberschatz, HenryKorth, S, Sudarshan, Database System concepts' \*, 5 thEdition , (McGraw Hill International)
2. Jiawei nan, MichelineKamber,Data Mining : Concepts and Systems'\*, (MorganKaufmann Publishers)
3. Rob Coronel,Database Systems : "Design implementation and management", ,4th Edition, (Thomson Learning Press)
4. Alexis Leao, Mathews Leon, Database Management System, (leon press)
5. SandeepChatterjee, James Webber, "Developing Enterprise Web Services",Pearson Education, 2004
- 6.S. Tanenbaum, Distributed Operating System - Andrew . 1994, PHI

**EVALUATION METHODOLOGY**

Maximum - 100 marks

External - 50 marks

Internal - 50 marks

## SEMESTER II

### MMB 6600 DISSERTATION & VIVA VOCE

#### 1. THE PREAMBLE

This manual is intended to provide broad guide lines to the students of Management programme at The American College in carrying out an independent scientific inquiry and emphasis on report writing and presentation. The students are expected to carefully read the instructions given in the sequel and meticulously follow then in the preparation of the report. Non-compliance with any of these instructions may lead to the summary rejection of the report submitted.

#### 2. THE CONTENT

The researcher deals with a goal-oriented system of people and other resources like money, equipment, information and material. He sets objectives for the research, which he consciously builds up. In the process of accomplishing these objectives, the researcher will have several alternative courses of action from he has to choose the best one that is optimal. The researcher would be highly effective if he were capable of making an optimum choice every time he makes a decision. The research approach or investigative approach aims at this effectiveness. Since decision making is a problem solving process in an organizational context, research becomes important. In this, the student will identify a decision problem lay down the detailed steps of the investigation, collect accurate data, use statistical or logical procedures to verify the idea or a concept. Thus a student preparing to manage business, not-for-profit, and public organizations – in all functional areas- need building in a disciplined process for conducting an inquiry related to a management dilemma. To encourage them to think in a holistic and strategic mode this module should be beneficial.

#### 3. ACTION PLAN FOR PROJECT WORK

The student identifies a company and has to choose a topic as per the procedures listed below and in consultation with organization guide and finally approved by the faculty guide. In the entire process the student is advised to strictly adhere to the time schedule /deadlines.

#### 4. AN OUTLINE GUIDE FOR THE DESIGN OF RESEARCH PROBLEM

(Based on Russell L. Ackoff, *The Design of Social Research* (Chicago: University of Chicago, 1953) adapted by Delbert C. Miller in *Handbook of Research Design and Social Measurement*, 3<sup>rd</sup> Ed. New York: David McKay Company, Inc. 1977.)

##### *1. The Problem*

1. Present, clear, brief statement of the problem with concepts defined where necessary.
2. Show that the problem is limited to bounds amenable to treatment or test .

##### *2. Describe the significance of the problem with reference to one or more of the following criteria:*

1. It is timely
2. Relates to a practical problem

3. relates to a wide population
4. relates to an influential or critical population
5. fills a research gap
6. permits generalization to broader principles of social interaction or general theory
7. sharpens the definition of an important concept or relationship.
8. has many inflection for a wide range of practical problems.
9. may create or improve an instrument for observing and analyzing data
10. provides opportunity for gathering data that is restricted by limited time available for gathering particular data.
11. provides possibility for a fruitful exploration with known techniques.
3. *The Theoretical Framework*
  1. Describe the relationship of the problem to a theoretical framework.
  2. Demonstrate the relationship of the problem to the previous research
  3. Present alternate hypotheses considered feasible within the framework of the theory.
4. *The Hypotheses*
  1. Clearly state the hypotheses selected for the test. (null and alternate hypothesis should be stated)
  2. Indicate the significance of test hypotheses to the advancement of research and theory.
  3. Define concepts or variables(preferably in operational terms)
    - a. Independent and dependent variables should be distinguished from each other.
    - b. The scale upon which variables are to be measure (quantitative, semi-quantitative, or qualitative) should be specified.
5. *Design of experiment or inquiry*
  1. Describe ideal design or designs with special attention to the control of interfering variables.
  2. describe selected operational design.
    - a. Describe stimuli, subjects, environment, and responses with the objects, events, and properties necessary for their specification.
    - b. Describe how control of interfering variables is achieved.
  3. Specify statistical tests including dummy tables for each test.
    - a. specify level of confidence desired.
6. *Sampling procedures*
  1. Describe experimental and control samples
    - a. Specify the population to which the hypotheses are relevant.
    - b. Explain determination of size and type of sample
  2. Specify method of drawing or selecting sample
    - a. specify relative importance of Type 1 error and type II error.
    - b. Estimate relative costs of the various sizes and types of samples allowed by the theory.
7. *Methods of Gathering data*
  1. Describe measures of quantitative variables showing reliability and validity when these are known. Describe means of identifying qualitative variables.
  2. include the following in description of questionnaires or schedules, if they are used:



- a. Approximate number of questions to be asked of each respondent.
  - b. Approximate time needed for interview
  - c. The schedule as it has been constructed to this time.
  - d. Preliminary testing of interview and results.
3. Include the following in description of interview procedure, if this is used.
    - a. means of obtaining information i.e., by direct interview, all part by mail, telephone or other means.
    - b. Particular characteristics interviewers must have or special training that must be given to them.
  4. Describe use to be made of pilot study, pretest , or trial run.
    - a. Importance of and means for coping with unavailables, refusals, and response error.

#### 8. *Working Guide*

Prepare working guide with time and budget estimates.

- a. planning
- b. pilot study and pretests.
- c. Drawing sample
- d. Preparing observational materials
- e. Selection and training
- f. Trial plan
- g. Revising plans
- h. Collecting data
- i. Processing data
- j. Preparing final report

#### 9. *Analysis of results*

Specify method of analysis

- a. use of tables, calculator, sorter, computer etc.
- b. use of graphic tables
- c. specify type of tables to be constructed.

#### 10. *Interpretation of results*

- Discuss how conclusions will be fed back into theory.

#### 11. *Publication or reporting plans*

- Write these according to department requirements.
- Select for journal publication in the most significant aspects of the problem in succinct form(probably not in excess of fifteen typewritten pages double spaced). Follow style and format specified by the journal to which article will be submitted.

### 5. **THE REPORT**

The whole exercise culminates with a submission of a report by each student. The dissertation submitted should be a report of the research work carried out by the student, leading to the discovery of new facts or to a establishment of a correlation between facts which are already known. The nature of the research work thus carried out may be analytical, experimental or descriptive or case study or a combination of any the one. It is further expected that the work reported be of such quality and nature and adds value to the existing body of knowledge in the discipline where the student specializes.

### 6. **EVALUTION PATTERN**

For dissertation	-	150 marks
For Viva voce	-	50 marks

**THE AMERICAN COLLEGE – COMMUNITY COLLEGE**

**MADURAI – 625 002**

**Diploma in Food Processing and Preservation**

<b>Sem</b>	<b>Course No</b>	<b>Course Title</b>	<b>Hrs/wk</b>	<b>Cr.</b>
<b>I</b>	<b>General Education</b>			
	END 1401	Conversational skills	4	4
	CSD 1401	Fundamentals of Computers	4	4
	LSD 1401	Fundamentals of Life Coping Skills	4	4
	<b>Skill Component</b>			
	DFP 1401	Basics of Food science and Technology	4	4
	DFP 1403	Processing and Preservation of Fruits& Vegetables	4	4
	DFP 1101	Lab – I	10	10
	<b>Job Training</b>			
	DFP 1405	Internship I	120/sem	4
		<b>Total</b>		<b>34</b>
<b>II</b>	<b>General Education</b>			
	END 1402	Reading and Writing skills	4	4
	CSD 1402	Office Automation tools	4	4
	LSD 1402	Performance and Life Coping Skills	4	4
	<b>Skill Component</b>			
	DFP 1402	<b>Processing of Grains</b>	4	4
	DFP 1404	<b>Food Packaging</b>	4	4
	DFP 1102	Lab – II	10	10
	<b>Job Training</b>			
	DFP 1406	Internship II	120/sem	4
		<b>Total</b>		<b>34</b>

- Theory / Lab courses - 1 credit = 15 hours/Semester
- Internship – 1 credit = 30 hours/Semester

**Placed AS ASSISTANT JOB IN ANY FOOD PROCESSING SECTOR**

**DFP 1401                      Basics of Food Science and Technology                      4Hrs/Wk – 4Credits**

To understand the basic aspects of food science and technology

**Unit I: Introduction to Food Science:** Introduction to food-food science- Food chemistry – fats, oil – Food Biochemistry – Proteins, enzymes, carbohydrates, vitamins, minerals and pigments.

**Unit II: Food Microbiology and Fermentation** History – Bacteria, Yeast, Fungi, Algae, physiology of microorganisms – chemical and biological factors influencing the destruction of microorganisms - Types of fermenters and fermented food products.

**Unit III: Introduction to Food Technology:** Units and conversions, Fluid flow – Viscosity, flow measurement, heat transfer – conduction, convection and radiation, mass transfer – diffusion, mass transfer rate.

**Unit IV: Unit Operation in Food Processing** Mixing, drying, evaporation, separation and grinding.

**References:**

1. Fellows, P., 2005, Food Processing Technology: Principles & Practices, CRC Press, Woodhead Publishing Ltd., England.
2. D.J. Rao, Introduction to food process engineering,
3. R. Paul Singh, Introduction to Food Engineering, Wiley publication
4. Potter, N.N., 2002, Food Science, CBS Publishers, ND.
5. Srilakshmi, B., 2001, Food Science, New Age International Pvt. Ltd., ND.
6. Mahendru, S.N., 2000, Food Additives, Tata McGraw Hills, ND.
7. Manay, N.S., 2001, Foods: Facts & Principles, Wiley Eastern Ltd., ND.

**DFP 1403                      Processing and Preservation of Fruits and Vegetables                      4Hrs/Wk – 4Credits**

To understand the post harvest management and processing technology of Fruits and Vegetables

**Unit I: Introduction:** Chemical composition, pre and post-harvest physiology, maturity changes, maturity indices for harvesting, storage disorders and spoilage. Ripening and control measures, Preparing fruits and vegetables for processing.

**Unit II: Methods of processing of Fruits:** Peeling, Dicing, Blanching, Drying/Dehydration, pulping, juice extraction, concentration.

**Unit III: Canning of Fruits and Vegetables,** basic requirements, process, machinery and operation.

**Unit IV: Formulation and preparation of Fruit Juices** - RTS, Squash, Syrups, Jams, jelly, osmo-dried products, pickles, tomato products (sauce), potato chips: principle, processing techniques, product quality standards and quality control measures.

**References:**

1. S. Ranganna, 1986 Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill Education,
2. Srivastava, R.P. and Kumar, S., 1998, Fruit and Vegetable preservation: Principles and Practices, 2<sup>nd</sup> Ed, International Book Distributing Co, Lucknow.
3. Salunkhe, D. K. and Kadam, S.S., 1995, Handbook of vegetable Science and Technology, Production, Composition, Storage and Processing, Marcel Dekker, New York.
4. Dauthy, M.E., 1997, Fruit and Vegetable processing, International book Distributing Co. Lucknow, India.
5. Siddappa, L.G., and Tondon, G. L., 1986, Preservation of Fruit and Vegetables, Indian Council of Agricultural Research, New Delhi.

**DFP 1101****LAB – I****10Hrs/Wk – 10 Credits**

1. To blanch a seasonal fruit or vegetable & assess quality of blanched products.
2. To study the effect of browning on raw fruits & vegetables.
3. Preparation of jams and jellies from different fruits
4. Extraction and preservation of Fruit Juices.
5. To prepare different types of pickles (sweet & sour).
6. Estimation of Ascorbic Acid content in different fruits.
7. Estimation of titratable acidity – demonstration only
8. Determine Brix: Acid ratio of fruits and vegetable products.
9. Testing of pectin in fruit juices and pulp.
10. Drying of fruits and vegetables by tray drying.
11. Preparation of tomato ketch-up, sauce and chutney.
12. Preparation of potato chips and finger chips.

**Reference**

1. S. Ranganna, 1986 Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill Education,

**DFP 1402****Processing of Grains****4Hrs/Wk – 4Credits**

To understand the post-harvest processing technologies of cereals, legumes and millets.

**Unit I: Storage of Grains** Storage of grains - Principles, conditions involved during storage, spoilage and its prevention, storage structures

**Unit II: Primary processing of Grains** Physicochemical properties of grains, Primary processing – drying and milling of grains

**Unit III: Secondary and Tertiary Processing** Development of secondary products from cereals and millets, nutritional composition and quality characteristics.

**Unit IV: Byproduct Utilization** Value addition to byproducts from wheat, rice, legumes and millets

**References:**

1. Chakraverty. 1995. Post harvest technology of cereal, pulses and oilseeds, III Edn. Oxford and IBH publishing co., Pvt. Ltd.,
2. Amalendu Chakraverty, Arun S. Mujumdar, Hosahalli S. Ramaswamy 2003 Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices Marcel Dekker, Inc. New York • Basel
3. Shafiur Rahman. M. 2007. Hand book of food preservation. Second edition. Published by CRC Press, London.
4. Potter, N.N. 2003. Food Science, AVI publishing company, INC, West Port, Connecticut.
5. Desrosier, N.W and Desrosier, J.N. 1997. The Technology of Food Preservation. AVI Publishers, USA.

**DFP 1404****Food Packaging****4Hrs/Wk – 4Credits**

To understand the food packaging technology of various food and the quality control of packing

**Unit I: Introduction and types of Packaging Materials** Packaging – Definitions, functions, importance, properties and selection of packaging materials – tin, glass, plastic, aluminum and papers, characterization of packaging materials – strength, elongation, permeability, migration and solubility

**Unit II: Equipment and Packaging Techniques** Equipments for food Packaging. Heat sealers, Vacuum/Gas, shrink, modified, controlled atmosphere, retort pouch and aseptic packaging.

**Unit III: Fresh and Processed Food Packaging** Active and intelligent packaging. Packaging of food grains and perishables - horticultural produces and animal foods. Packaging of processed foods-Canning.

**Unit IV: Food Quality Changes and Labeling** Deteriorative changes in food stuff and packaging methods - prevention. Physiochemical, microbial and organoleptic changes. Storage conditions for package fresh and processed foods. Shelf life of packaged foods – methods to extend shelf life. Sanitation of food Packaging area – packaging standards and regulations. Labeling – Bar Coding – Package waste and recycling. Eco friendly food packaging.

**References:**

1. Gordon, L., Robertson. 2006. Food Packaging – Principles and Practice, CRC Press.
2. Mahadeviah, M., and Gowramma, R.V. 1996. Packaging Technology Tata McGraw – Hill Publishing Company, New Delhi.
3. Croshy, N.T. 1981. Food packaging materials, Aspects, of analysis and migration of contaminants. Applied Science publisher Ltd., London.
4. Frank, A., Pain and Heather Y. Paine, 1983. Hand book of Food packaging, Leonard hill publications.
5. Raja Ahvenainen. 2003. Novel Food Packaging Techniques, Wood Head Publishing Company Ltd.
6. Shafiur Rahman, M. 2007. Hand book of food preservation. Second Edition. Published by CRC Press, London.
7. Stanley Sacharav and Roger, G. C. 1970. Food Packaging, A guide for the supplier processor and distributor, The AVI Publishing Company.

**DFP 1102****LAB – II****10 Hrs/Wk – 10 Credits**

1. Determination of physical properties of grains
2. Determination of grain moisture content
3. Categorization of different grades of cereals (rice, wheat, maize) and millets (major and minor)
4. Parboiling of paddy, ageing of paddy.
5. Malting of millets
6. Cooking quality of grains
7. Visit to cereal and millet processing units
8. Strength - properties of packaging materials
9. Water vapour transmission rate calculation
10. Identification of packaging materials
11. Pre packaging of fruits and vegetables, food grains, minimally processed foods - Suitable packaging materials and techniques for packaging of snack foods, confectionery, beverages and microwavable foods
12. Physical, nutritional, microbiological and sensory qualities of foods in different packaging materials.

**Reference**

1. Chakraverty. 1995. Post harvest technology of cereal, pulses and oilseeds, III Edn. Oxford and IBH publishing co., Pvt. Ltd.,

**THE AMERICAN COLLEGE – COMMUNITY COLLEGE**

**MADURAI – 625 002**

**Advanced Diploma in Food Processing and Preservation**

<b>Sem</b>	<b>Course No</b>	<b>Course Title</b>	<b>Hrs/wk</b>	<b>Cr.</b>
<b>III</b>	<b>General Education</b>			
	ENA 2401	Study skills	4	4
	CSA 2401	Operating System	4	4
	LSA 2401	Coping with Psychological and Physical Issues	4	4
	<b>Skill Component</b>			
	AFP 2401	<b>Baking and Confectioneries</b>	4	4
	AFP 2403	<b>Food analysis</b>	4	4
	AFP 2101	Lab – III	10	10
	<b>Job Training</b>			
	AFP 2405	Internship III	120/sem	4
		<b>Total</b>		<b>34</b>
<b>IV</b>	<b>General Education</b>			
	ENA 2402	Career skills	4	4
	CSA 2402	Programming Techniques using C	4	4
	LSA 2402	Coping with Social and Environmental Issues	4	4
	<b>Skill Component</b>			
	AFP 2402	<b>Processing and Preservation of Meat &amp; Marine products</b>	4	4
	AFP 2404	<b>Food safety</b>	4	4
	AFP 2102	Lab – IV	10	10
	<b>Job Training</b>			
	AFP 2406	Internship IV	120/sem	4
		<b>Total</b>		<b>34</b>

- Theory / Lab courses - 1 credit = 15 hours/Semester
- Internship – 1 credit = 30 hours/Semester

**Placed as Quality analyst, lab assistant in dairy & poultry industry**

**AFP 2401****Dairy Processing****4 Hrs/Wk – 4Credits**

To understand the processing technology of Milk, and Milk products

**Unit I: Introduction** Chemical composition of milk, unit operations in dairy industry - Filtration, Clarification, Pasteurization, Homogenization and Sterilization

**Unit II: Processing of Milk** Types of processed milk: pasteurized, toned, flavored, fermented, powdered and infant formula milk.

**Unit III: Milk Products** Preparation methods and principles of paneer, cheddar cheese, curd, yoghurt, ice cream,

**Unit IV: Packaging, Storage and Quality Evaluation** Packaging and storage of milk and milk products, Quality evaluation. Food laws and standards of dairy products

**References:**

1. Sukumar, D, 1991, Outlines of Dairy Technology, Oxford Univ. Press, ND
2. Walstra, P., 2005, Dairy Technology, Oxford Univ. Press, ND. Milk & Milk Products, Tata McGraw Hill Publishers, USA.
3. Warner J.N., 1976, Principles of Dairy Processing, Wiley Science Publishers, USA.
4. Robinson, R.K., 1996, Modern Dairy Technology, Vol 1 & 2, Elsevier Applied Science Pub.
5. Herrington, B.L., 1948, Milk & Milk Processing, McGraw-Hill Book Company.
6. Lampert, .L.H, 1970, Modern Dairy Products, Chemical Publishing Company.

**AFP 2403****Food Analysis****4 Hrs/Wk – 4 Credits**

**Unit I:** Quality attributes of foods, size and shape, colour and gloss, texture – visual and objectively measurable attributes

**Unit II:** Aroma of foods – introductory ideas, formation and chemistry-Food additives

**Unit III:** Introductory ideas on taste formation and chemistry

**Unit IV:** Principles of advanced Instrumental technique: GC-MS, HPLC, NMR, RT-PCR.

**References**

1. Pearson, D, “The Chemical Analysis of Foods”. Churchill Livingstone, New York 2002.
2. Sharma, B.K, “Instrumental Methods of Chemical Analysis”. Goel Publishing House, New Delhi 2004.
3. Nielsen, S.S, “Introduction to the chemical analysis of foods”. Jones and Bartlett Publishers, Boston, London 2004.
4. Mahindru, S.N, “Food additives. Characteristics, detection and estimation”. Tata McGraw-Hill Publishing Company Limited, New Delhi 2000



**AFP 2101****LAB III****10 Hrs/Wk– 10Credits**

1. Estimation of acidity in milk by Alizarin – Alcohol test.
2. Determination of specific gravity, SNF % and TS% in milk.
3. Estimation the milk fat by Gerber method.
4. Determination of Casein content in milk.
5. Evaluation of sterility of milk by Turbidity test.
6. Qualitative microbiological analysis of milk by MBRT.
7. Estimation of the purity of ghee by Baudouin test.
8. Preparation of curds, cream and buttermilk
9. Preparation of Ghee
10. Preparation of ice cream
11. Preparation of a chart of physico – chemical properties and microbiological standards of milk and milk products.

**Reference:**

1. Sukumar De – Outlines of Dairy Technology, Oxford University Press-New Delhi

**AFP 2402 Processing and Preservation of Meat and Marine Products 4 Hrs/Wk – 4Credits**

**Unit I: Meat Processing** -Nutritional quality of meat and poultry, structure of muscles-factor affecting quality of fresh meat. Postmortem changes – *Rigor mortis*. Meat products – Ham and Bacon, sausage, quality standards for meat products.

**Unit II: Fish Processing:** Types of fish-shell fish-post fishing change- post – mortem changes in fish, handling, storage and transportation of fish. Low temperature, chilling and freezing, Thermal processing, dehydration, curing and smoking, preservation using antibiotics, preservation by irradiation.

**Unit III: Egg Processing:** Structure and composition of egg, processing of eggs, storage and transportation of egg products. Status of egg industries in Tamilnadu.

**Unit IV: Packaging and Quality** – packaging of meat, poultry and fish products, quality factors during storage, additives used in meat and fish products, contaminants and naturally occurring poisons, byproducts and wastes of meat, fish, poultry.

**References:**

1. Richardson and Mead, 1999, Poultry meat science. CABI Publishing; First edition
2. Pearson A.M. and R.B.Young, 1989, Muscle and Meat biochemistry. Academic press Inc
3. Pearson and Dutson,1994,Quality attributes and their measurement in meat poultry
4. Stadelman, W.J. and Cotterill, O.J., 2002, Egg Science and Technology, CBS Publishers, New Delhi.
5. Romans, J.R., Costllo, W,J. Carlson, W.C., Greaser, M.L. and Jones, K.W., 2004, The Meat We Eat, Interstate Publishers, USA
6. Parkhurst, Poultry Meat and Egg Production.

**AFP 2404****Food Safety****4 Hrs/Wk – 4 Credits**

**Unit I:** Food safety, food additives and food contaminants – their chemical, technological and toxicological aspects.

**Unit II:** Principles of food commodity storage Insect pests their biology and food preference, effect of pests on food commodities. Infestation detection and monitoring techniques in commodities and in storage premises

**Unit III:** Molds – types and role in commodity deterioration, Rodents and other vertebrate pests, behavior and control, Pesticide classification and chemistry, pesticide, formulations, pesticide appliances – sprayers, fogging and aerosol.

**Unit IV:** Insect growth regulators, biopesticides and grain protectants, Fumigants properties, application techniques, fumigation appliances, use of controlled atmosphere for insect control and food protection, control and preventive measures

**References**

1. Food safety and standards regulations, 2010. The Ministry of Health and Family Welfare, The Gazette of India : Extraordinary, Part- III, section
2. General requirements (Food Hygiene) of the Codex Alimentarius, Volume II. Food and Agriculture Organization of the United Nations.

**AFP 2102****LAB IV****10 Hrs/Wk– 10Credits**

1. To process chicken and test quality
2. Determination of egg components
3. Preparation of egg products,boiled,fried,omlet.
4. To determine quality of egg by brine floatation technique
5. Determination of egg density
6. Visit to different meat processing industries
7. Awareness of common adulterants in food samples
8. Test to detect adulterants
9. Awareness of certified marks on food packages
10. Visit to toxicology lab and public health laboratory