B.Voc in Medical Laboratory Technology
First Year

(Diploma in Medical Laboratory Technology)

THE AMERICAN COLLEGE, MADURAI – 625 002

Sem	Course No	Course Title	Hrs/wk	Cr.
I		**General Education**		
	END 1403	Conversational Skills	4	4
	CSD 1403	Fundamentals of Computers	4	4
	LSD 1403	Fundamentals of Life Coping Skills	4	4
		Skill Component		
	DML 1409	Human Anatomy, Physiology & Clinical Pathology	4	4
	DML 1411	Fundamentals of Medical Laboratory Technology	4	4
	DML 1113	Lab – I	10	10
		Job Training		
	DML 1415	Internship I	120/sem	4
		Total		**34**
II		**General Education**		
	END 1404	Reading and Writing Skills	4	4
	CSD 1404	Office Automation Tools	4	4
	LSD 1204	Performance and Life Coping Skills	4	4
		Skill Component		
	DML 1410	Hematology & Blood Bank	4	4
	DML 1412	Clinical Biochemistry& Microbiology	4	4
	DML 1114	Lab – II	10	10
		Job Training		
	DML 1416	Internship II	120/sem	4
		Total		**34**

- **Theory / Lab courses - 1 credit = 15 hours/Semester**
- **Internship – 1 credit = 30 hours/Semester**

SEMESTER - I

END 1403 **Conversational Skills** **(3h/wk) (2Cr)**

[ConSkills]

The Course aims at helping students converse in English on the matters that matter to them in daily life. It provides the learners with ample opportunities and social contexts through conversations so that they can freely and fluently use informal English. It also exposes them to the apt vocabulary of such informal conversations.

Course Outcomes

At the end of the course, student will be able to:

i. articulate spoken utterances clearly and fluently,
ii. speak simple sentences in English with one another in unpredictable situations,
iii. participate in dyadic communication,
iv. use phatic communion, and
v. employ word-stress and intonation in spoken utterances.

Unit 1 : Conversational skills

Unit 2 : Day-to-day matters like eating, emotions, fashion, health, money, romance, housing, job, faith & hope, busy life, memory, shopping, time, Traffic, travelling, vacation, weather

Unit 3 : Social expressions

Unit 4 : English sounds

Unit 5 : English accent and intonation

Text book

Sekar, J. J. (2014). Conversational Skills. Madurai. Department of English, The American College.

	K1	K2	K3	K4	K5	K6
CO 1				3		
CO 2						6
CO 3						6
CO 4						6
CO 5			3			

Mean: 4.8

CSD 1403 **Fundamentals of Computers** **4hrs/Wk – 4 credits**

Course Outcomes

At the end of the course the student will be able to:

i. Classify the Generations of a Computer and its applications.
ii. Recall the components of a Computer.
iii. Analyze Primary and Secondary storage devices.
iv. Use Data representation methods.
v. Develop Data Conversion examples.

Unit I: Introduction to computers Generations of computers –components of computer hardware – software -classification of computers – advantages and limitations – applications of computer

Unit II: Components of the Computer CPU - I/O devices – Types and Features.

Unit III: Computer Memory Primary memory – secondary memory-auxiliary storage devices– cache memory CD – DVD –Pen drive – backup.

Unit IV: Data representation Data – Meaning - Information –Representation - files - Computer words.

Unit V: Number Systems in computer Decimal, Binary, Octal and Hexa Decimal - Representation - Conversions.

Text book:

Alphonse X, ICRDCE publication, December 2011.

Reference:

Curtin, D. P. Foley, K.Kunalsen, Morin.C "Information Technology- The Breaking Wave", TataMcGraw Hill, 2002.

Blooms's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K 1: Remembering		X			
K 2: Understanding	X				
K 3: Applying				X	X
K 4: Analysing			X		
K 5: Evaluating					
K 6: Creating					

FUNDAMENTALS OF LIFE COPING SKILLS

LSD 1403 **2 hrs/Wk – 2 Credits**

Objectives: to prepare the students through the fundamentals of life coping skills for better citizens. To make them sociable and help them develop their personality. Understanding the need for self transformation which will guide them throughout their life in handling relationships and life challenges. To enlighten them with the necessity of learning communication and negotiation skills for achieving greater heights in their personal life and their career.

Unit - I Introduction to Skills

Introduction to skills – Definition of Coping - Social Skills – Four levels: Foundation, Interactive, Affective, Cognitive – Understanding Body Language

Unit - II Personality Development

Definition of Personality – Characteristics of Personality – Ways to develop personality – Personality types – Four basic temperament

Unit - III Self Transformation

Self Identity – Self Concept – Self acceptance – Self discovery – Self Esteem: High & Low Self esteem – Johari Window

Unit - IV Communication Skills

Understanding communication – Types of communication – Patterns of communication – Importance of communication – Effective & Efficient communication

Unit - IV Assertive Skills

Assertive Behaviour – Benefits of being Assertive – Types of Assertion – Assertion rights – Developing assertive skill

Books for Reference:

1. Alphonse, X. 2011, "We shall overcome" A Text book on Life coping skills", ICRDCE Publication, Chennai
2. AIACHE Publication 2014, New Delhi, "Human Values Development"

Course Outcome: At the end of this course the student will be able,

CO1: To demonstrate how to be sociable in all demanding situations
CO2: To prepare themselves a better personality through self transformation
CO3: To identify need and importance of an effective and efficient communicator
CO4: To apply the assertive skill techniques in the appropriate life situations
CO5: To formulate personal principles based on the fundamentals of life coping skills

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering			X		
K2: Understanding		X			
K3: Applying	X				
K4: Analyzing				X	
K5: Evaluating					
K6: Creating					X

DML 1409 Human Anatomy, Physiology and Clinical Pathology 4Hrs/4Cr

This course deals with the basic aspects of human anatomy and physiology of organ and systems like integumentary, digestive, respiratory, circulatory, nervous, endocrine, urinary and reproductive systems. This also deals with importance and methods of examining clinical specimens like urine, stool, sputum, semen and cavity fluids.

At the conclusion of this course, student will be able to:

1. Locate organs and systems in human body
2. Describe the morphology of organs and systems in human body
3. Explain the functions of organs and systems in human body
4. Discuss the importance of examining body fluids.
5. Identify the pathophysiology of organs and systems in clinical conditions and disorders.

Unit I: Digestive, circulatory and respiratory systems

Digestive system – organs and digestion. Circulatory system- heart – circulation- Respiratory system – lungs – physiology of respiration.

Unit II: Urinary and reproductive systems

Urinary system **-** structure and function of kidney, nephron and urine formation. Reproduction – male and female reproductive organs –structure and functions.

Unit III: Endocrine glands and sensory organs

Endocrine glands, hormones and their regulation. Structure and function of eye, ear, nose, tongue and skin.

Unit IV: Clinical Pathology

Physical, Chemical and microscopic examination of urine, stool, sputum, semen and gastric juice.

Unit V: Cavity Fluid Analysis

Physical, chemical and microscopic examination of pleural, peritoneal, synovial, CSF and their clinical significances.

Textbook

1. David N, Jackie S, Butler L, &R Lewis. (2006). *Hole's Human Anatomy and Physiology*. Martin J Lange.
2. Talib VH. (2015). *A Hand Book of Medical Laboratory Technology*.2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

Reference

1. Graff KMV, and Fox SI. (1995). *Human Anatomy and Physiology.* WCB Publication, Toronto.
2. Davies A, Blakeley AGH and Kidd C. (2011),*Human Physiology*. Churchill Livingstone, Toronto.
3. Arora DR.(2010). *Medical Parasitology.* 3rd Ed. CBS Publishers Pvt Ltd, New-Delhi.
4. Cheesbrough M.(2007).*District Laboratory Practice in Tropical Countries.* Part 1&2. Cambridge University Press, United Kingdom.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X				X		X			
CO2	X				X		X			
CO3	X				X		X			
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating				X	X

Mean: 4.5

DML 1411 Fundamentals of Medical Laboratory Technology 4Hrs/4Cr

This course is meant for developing knowledge and skills necessary to collect and handle the clinical samples, chemicals, instruments used in the laboratories. This course also deals with basic sample processing techniques, disposal of clinical waste and sterilization techniques.

At the conclusion of this course student will be able to:

1. Describe the importance of laboratory profession in health sectors.
2. Explain the general safety regulations governing clinical laboratories.
3. Discuss about the activities in various sections in the laboratory.
4. Compare and rate the functions of older and modern instruments.
5. Identify methods in safety disposal and sterilization of biohazards

Unit I: Role of laboratory technologist and personal care: Role of Laboratory technician in health care - code of conduct, personal health care - universal precautions - medical examination and immunization against infectious diseases.

Unit II: Safety measures in the laboratory: Laboratory hazards - preventive and corrective measures- use of protective clothing and personal hygiene- accidentfactors – safety signs and their information - safe working environment practices - First-aid and fire management. Decontamination of infectious material, disposal of laboratory wastes and safety signs.

Unit III: Working principle, handling of apparatus and instruments: Use and handling of glassware and small equipments - microscopes – centrifuges – rotator - vortex - incubators - dry blocks - water bath - hot air oven – autoclaves - photo colorimeters and spectrophotometer - digital balance - pH meter and semi auto analyzer.

Unit IV: Collection of clinical specimens: Blood Collection: Finger prick - venous blood collection: single and double syringe techniques –Vacutainer - aseptic blood collection for blood culture - anti coagulants and their uses and various containers used for blood collection. Urine collection methods - use of urine preservatives. Sputum collection: for AFB. Stool and semen sample. Collection, labeling, handling and storage.

Unit V: Recording and processing of clinical samples: Master and section registers maintenance – collection and recording, preparation and dispatch of reports - processing of EDTA blood – thin and thick blood smear - serum and plasma separation and centrifugation of urine samples. Wet smear for urine, stool, sputum and semen.

Text Book

Cheesbrough M. (2007). *District Laboratory Practice in Tropical Countries.* Part 1&2. Cambridge University Press, United Kingdom.

References:

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1		X				X	X	X	X	X
CO2		X			X	X	X	X	X	X
CO3		X			X	X	X	X	X	X
CO4		X			X	X	X	X	X	X
CO5		X			X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing				X	X
K5: Evaluating	X	X	X	X	X
K6: Creating		X		X	X

Mean: 4.1

DML 1113 **Lab – I** **10Hrs/10Cr**

This course is designed to introduce and train certain basic skills required to collect and process, various sample and handle instruments and to perform simple test in hematology and clinical pathology.

At the conclusion of this course, student will be able to:

1. Identify various clinical samples, equipment, chemicals and instruments used in clinical laboratory.
2. Reason sample requirements, practice sample collection, preservation and storage.
3. Process samples for physical, chemical and microscopic examination on clinical samples.
4. Handle reagents and use important laboratory instruments in routine laboratory.
5. Perform laboratory investigations on urine, stool, sputum and semen samples.

Part – 1

I. Safety in the Laboratory

a. Using hand gloves, apron, masks and washing of hands.
b. Universal precautions, preparation and use of disinfectants and discarding of biohazards.
c. Handling of glassware, and small equipments and instruments.
d. Sterilization techniques: chemical and autoclaving.

II. Sample Collection and storage

a. Finger prick method, venous blood sample collection technique - vacutainer
b. Blood samples: Use of anticoagulants and containers in collecting blood samples.
c. Urine sample: Routine, early morning, twenty four hours sample and culture samples. Use of preservatives for analytes, 24 hrs Samples of biochemical tests and culture.
d. Sputum: Random and early morning and culture sample.
e. Stool Samples for microscopy and culture.
f. Semen Collection - instruction to patient.

III. Sample Processing and identification of blood cells

a. Processing of EDTA Blood - Handling of Sahli pipette for making dilutions.
b. Preparation of blood smear and staining techniques: - Leishman's staining.
c. Fixing of thin blood film and Field A & B staining technique for Malarial parasites
d. Identification of RBCs, WBCs and platelets.
e. Serum Separation.
f. Processing of urine.

Part -2

IV. Laboratory Instruments: Working Principle, handling and maintenance

a. Microscopes – Monocular and binocular microscopes
b. Centrifuges - Angle head & Swing types – Serofuge and Microhematocrit.
c. Bacteriological Incubators. Hot air oven. Water bath.
d. Autoclaves - Vertical & Horizontal types
e. Photo colorimeters and Spectrophotometer.
f. Semi-automated biochemistry analyzer.
g. Analytical Balance, Electrical Balance and Vortex mixer.
h. pH meter.
i. Laminar Air Flow and Colony counter.

Handling of glassware and Preparation Reagents

j. Preparation of % solutions(w/v and v/v): Normal Saline - 3% Sulphosalicylic acid solution – 10% Barium chloride solution – 10% potassium Hydroxide - 28% Zinc sulphate solution - 5% Sulphuric acid – 5% Hydrochloric acid and 25% Sulphuric acid.
k. Preparation of Molar and Equivalent Solutions: 10M NaOH and 0.1N HCl.
l. Preparation of Buffer solution: pH 6.8 for Leishman's staining.

Part- 3

V. Urine Examination

a. Physical examination of urine – using urinometer & pH Paper.
b. Benedict qualitative test for reducing substances.
c. Heat and acetic acid method, sulphosalicylic acid method for urine protein.
d. Identification of Bence - Jone Protein and formaldehyde test.
e. Strip Method: Urocolor -2 for urine Sugar(Glucose) and Protein.
f. Urine acetone (Rothras Test)
g. Urine bile pigments (Fouchet'sTest), Urobilinogen and bile salts (Hay's Test).
h. Urine Microscopy – processing and smear making and focusing under 10x and 45x objectives.
i. Identification of organized and unorganized sediments in the urine.
j. Urine Pregnancy Test(UPT).

Stool Examination

k. Stool Physical, chemical and microscopic examination.
l. Stool occult blood.
m. Stool reducing sugar and fats.

Sputum Examination

n. Sputum – physical and microscopy (Direct, Gram and AFB)

Semen Analysis.

o. Physical,chemical and microscopic examination of semen.

Textbooks:

Cheesbrough M.(2007).*District Laboratory Practice in Tropical Countries.* Part 1&2. Cambridge University Press, United Kingdom.

References:

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1		X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4		X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean : 5.0

DML 1415 **Internship I** **120Hrs/Sem-4Cr**

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.

SEMESTER II

END 1404 **Reading & Writing Skills [RWS]** **(3h/wk) (2Cr)**

The Course aims at improving the learners' productive skills of English. It offers professional guidance on meaningful and aggressive reading experiences by familiarizing them with techniques and micro-skills of reading, comprehension abilities through literary and non-literary reading materials. It also strengthens their writing skills through the forms of writing that are useful to them academically and vocationally.

Course Outcomes

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

i. practise the reading of simple prose texts silently and fast,
ii. produce their comprehension abilities,
iii. write letter of requests, permission and apology,
iv. write paragraphs with topic sentence and supportive sentences, and
v. write five-paragraph essays on simple, contemporary themes.

Unit 1 : Reading and comprehension skills

Unit 2 : Reading at various speeds, skimming & scanning, inferring &interpreting, predicting, reorganizing material, comprehension skills

Unit 3 : Writing leave letters and apology letters

Unit 4 : Paragraph writing, five-paragraph essay writing,

Unit 5 : Types of essay and paragraph writing: descriptive, argumentation, narrative, and expository

Text book

Sekar, John, J. 2014. Reading and Writing Skills. Madurai. Department of English, the American College.

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1			3			
CO 2			3			
CO 3						6
CO 4						6
CO 5						6

Mean: 4.8

CSD 1404 **Office Automation Tools** **(4h/wk) (4Cr)**

Course Outcomes

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

i. Edit and format text data and tables to make a Document.
ii. Design worksheet and manipulate data and represent through graphs
iii. Design a Slide show presentation and show in Multimedia form.

Unit I: Microsoft Word - Working with text **-** Formatting paragraph **-**Numbered and Bulleted lists **-**Working with Tables

Unit II: Mail Merging and Graphics - Spelling and Grammar Checking **-** Page format – Working with graphics

Unit III: Microsoft Excel - Modifying a Worksheet **-** Formatting cells **-** Formula cells

Unit IV: Functions and Charts - Formulae and Functions **-** Sorting and Filtering **–** Graphics – Charts.

Unit V: Power-Point -Working with slides **-**Color Schemes – Graphics – Slide Effects – Master Slides – Presentations-Slide Shows**–**Animations.

Text book

MS-Office 2003 Manual by Microsoft

Reference

Curtin D.P, Kim Foley K, Kunalsen, Morin. C, "Information Technology- The Breaking Wave", TataMcGraw Hill 2002.

PERFORMANCE AND LIFE COPING SKILLS

LSD 1404 **2 hrs/Wk – 2 Credits**

Objectives: To prepare the students better individuals in the society through life coping skills. To make them understand the need for learning life skills which will guide them to face the challenges. Training them to learn stress management and time management skills in order to achieve their life goals.

Unit - I GOAL SETTING

Definition – Importance of Goals – SMART Goal & Time management – Types of Goals - Obstacles – Successful and Meaningful life

Unit - II MOTIVATION SKILL

Introduction to Motivation & Inspiration – Internal and External motivation – Methods of Motivation – Effects of de motivation

Unit - III PROBLEM SOLVING SKILL

Definition of problem – Reasons for problems – Stages of solving problems: Evaluation, Managing, Decision making, Resolving, Results

Unit - IV STRESS MANAGEMENT

Definition of Stress: Positive (Eustress), Negative (Destress) – Stressors: Internal, External – Causes of Stress – Types of Stress – Ways to manage stress

Unit - V TIME MANAGEMENT

Need for time management – Poor Time management – Saboteur Time styles – Techniques for managing time

Books for Reference:

1. Alphonse, X. 2011, "We shall overcome" A Text book on Life coping skills", ICRDCE Publication, Chennai

Course Outcome: At the end of this course the student will be able,

CO1: To plan and set goals for their life
CO2: To assess the need for motivation for successful completion of tasks
CO3: To reflect the problem solving skill in day today life
CO4: To predict stressful situations and causes of stress in order to overcome them
CO5: To identify need for dealing with emotions for positive mental health

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering				X	
K2: Understanding					X
K3: Applying			X		
K4: Analyzing					
K5: Evaluating		X			
K6: Creating	X				

DML 1410 Hematology & Blood Bank 4Hrs/4Cr

This course deals with the technology involved in the routine examination of blood cells, blood parasites and coagulation factors in the diagnosis of clinical conditions. This also deals with the blood bank techniques required for safe blood transfusion.

At the conclusion of this course, student will be able to:

1. Describe the principle, requirements, procedure and interpretation of routine hematology.
2. Define the morphology of common blood parasites and explain coagulation mechanism.
3. Discuss about the formation of major blood groups and types. Define red cell antigen, their antibodies and describe their characters.
4. Explain the formation of major blood groups and types. Define red cell antigen, their antibodies and describe their characters.
5. Compare and analyze the laboratory diagnosis of hemolytic diseases in new born babies, hemoglobinopathies.

Unit I: Hematology

Composition and formation of blood, morphology and functions of blood cells - staining of blood smear - enumeration of Total and Differential leukocyte count - Estimation of Hemoglobin with Sahli's and Cyanmethemoglobin methods - Erythrocyte Sedimentation Rate (ESR) - Packed Cell Volume - Calculation of erythrocyte indices – Reticulocyte, platelet and Eosinophil counts - L.E Cell preparation - Anisocytes and Poikilocytes – Hypo and polychromasia – Red cell inclusions – Grading of blood film – Anaemias and Leukaemias. Morphology, life cycle and investigation of blood parasites.

Unit II: Blood Parasites and Coagulation Studies

Introduction to blood parasites – Life cycle and morphology of different stages of *Plasmodium spp*, *Lieshmaniadonovani* – *Wuchereriabancrofti*. **Coagulation Studies**: Hemostasis – phases – coagulation factors – mechanism of blood coagulation - Regulators of blood coagulation. Bleeding time(Ivy method) - clotting time(Lee and White method) - prothrombin time – activated partial thromboplastin time – thrombin time – clot retraction and clot lysis tests. Laboratory findings in various bleeding disorders.

Unit III: Blood bank techniques

Blood group system - ABO and Rh – antigen and antibody reaction: Agglutination and Hemolysis - Rouleaux formation and Prozone reaction -factors influencing the rate of antigen antibody reaction - formation of blood groups - ABO grouping - sub group of A and Bombay group - Rh(D) Typing slide and tube technique - Rh(Du) testing. Compatibility testing – characteristics of ABO and Rh antibodies - Antibody titre. Coomb'sCroos match.

Unit IV: Blood transfusion

Donor selection, screening and bleeding techniques. Transfusion reactions and its investigation. Storage, separation techniques and use of blood products. Blood donation record book – recording of results – blood donor card – documentation in blood bank activities – blood transfusion request form – Record maintenance.

Unit V: Hemolytic disease of the New Born and Hemoglobinopathies

Definition and pathology of HDN babies – Laboratory Diagnosis of HDN. - Coomb's reaction – Direct Coomb's test - Indirect Coomb's test - Coomb's Cross Match technique for Exchange Blood Transfusion in HDN babies.

Textbook:

Sood R. (1996). *Laboratory Technology (Methods and interpretation).* 4th Ed. J.P. Bros, New Delhi

References

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4		X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

DML 1412 Clinical Biochemistry & Microbiology 4Hrs/4Cr

This course is designed to acquire knowledge on normal and abnormal metabolic reactions in human body; the principles and procedures involved in laboratory diagnosis of various clinical conditions. This also deals with pathogenesity and identification of microbes in clinical samples.

At the conclusion of this course, student will be able to:

1. Explain the contribution of biochemistry in health. Discuss the significance of Diabetic profile, lipid and renal profile.
2. Discuss methods of estimating clinically important compounds, enzymes and electrolytes.
3. Classify the micro organisms and explain the methods identifying them in the laboratory.
4. Compare morphology, pathogenesity and identification methods of fungi, parasites.
5. Analyze the immunity to various viral infections and discuss about the serological methods of identifying antibodies in infections.

Unit I: Introduction to biochemistry

Contribution of biochemical studies on diagnosis - metabolism of carbohydrates, Lipids and bilirubin; Formation of urea, creatinine and uric acid; Laboratory diagnosis on lipid profile, renal, liver and thyroid function tests.

Unit II: Estimation of analytes and interpretation

End point methods: Serum glucose - glucose tolerance test – cholesterol - serum uric acid - total protein - serum albumin - serum total and direct bilirubins; Kinetic methods: Serum urea – creatinine – ALT - AST and ALP. Introduction to electrolytes - laboratory diagnosis and clinical conditions related to electrolyte imbalances.

Unit III: Clinical Bacteriology

Introduction to clinical bacteriology - classification of pathogenic and non-pathogenic bacteria. Bacteria in respiratory, blood, CSF, urinary, intestinal tracts and skin. Growth and colony morphology of bacteria on selective and differential media. Hanging drop, wet mount technique - Gram stain, AFB and Albert's staining techniques –Inoculation technique - Haemolysis - IMVic tests –Bile solubility test and Kirby Bauer antibiotic sensitivity test.

Unit IV: Clinical Mycology and Parasitology

Introduction to mycology - Morphological features of pathogenic fungi - KOH and LPCB and Grams morphology of clinically important fungi - collection of specimen and preparation of smear. Introduction, morphology and pathogenesity of medically important blood and intestinal parasites.

Unit V: Immunology and Serology

Introduction to immunology - Type of immune responses to infection by microorganisms. Structure of immunoglobulin - Windows period – primary and secondary

immune response types of viruses, mode of infection, pathogenesis and serological diagnosis of clinical conditions. Principle of Widal and VDRL (RPR) – HIV Tri Dot,HBsAg and HCV Rapid tests. Dengue IgM and IgG and Chikungunya IgM Rapid Tests - RA, ASO and CRP latex slide tests (semi quantitative).

Text book:

Talib VH. (2015). *A Hand Book of Medical Laboratory Technology*.2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

References:

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5. Arora DR, & Arora B. (2005). Medical parasitology. CBS Publishers.
6.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1		X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4		X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating		X	X	X	X

Mean: 4

DML 1114 **Lab- II** **10 Hrs/ Wk- 10Cr**

This lab course is designed to develop skills to perform routine clinical tests in Serology, Parasitology, Microbiology, hematology and Blood Bank and to run relevant quality control programs.

At the conclusion of this course, student will be able to:

1. Demonstrate qualitative tests like Widal, VDRL,HIV Tri-Dot, HBsAg, HCV, Dengue Ns1, IgG &IgM; R.A factor, ASO and CRP
2. Carry out smear making, staining, inoculation techniques and biochemical identification of bacteria.
3. Demonstrate routine hematological tests like Hb, TLC,DLC, ESR, Platelet count, RBC count, PCV, Clotting Time, Bleeding Time etc.
4. Identify blood groups and check the compatibility of donor blood to the patient.
5. Run routine biochemical tests in end- point and kinetic methods using semi auto biochemistry analyzers.

Part - 1

I. Serology

- **a.** Widal Slide Test- semi-quantitative.
- **b.** VDRL (RPR) – Test &Syphicheckcard Test.
- **c.** HIV Tri Dot, HBsAg and HCV Rapid Tests
- **d.** Dengue IgM and IgG ,and Chikungunya IgM Rapid Tests
- **e.** RA, ASO and CRP Latex Slide Tests – semi-quantitative.
- **f.** Quantitative estimation of CRP, ASO and RA using semi auto-analyzer/ Nephelometry.

II. Parasitology and Microbiology

- **a.** Wet cover slip preparation with normal saline and Lugol's Iodine and identification of intestinal parasites.
- **b.** Preparation of smears from sputum, culture plates and swabs.
- **c.** Staining techniques: simple stain, KOH, Gram and Ziehl- Neelsenand AFB
- **d.** Urine AFB: Processing and staining and examining.
- **e.** Skin slit for Lepra bacilli and cold Staining and identification and grading of smear.
- **f.** Skin Scraping and KOH and LPCB staining.
- **g.** Gram stain morphology: *Candia albicans* and *Cryptococci neoformans*.
- **h.** Hanging Drop preparation.
- **i.** Inoculation techniques – Use and handling of culture plates, tubes, loops, needle and Swab.
- **j.** Preparation of Nutrient Agar, Blood Agar and MacConkey Agar media.
- **k.** Colony morphology of bacteria on Nutrient, Blood and MacConkey Agar plates.
- **l.** Performing and reading of Mannitol, TSI, Indol and Urease.

Part – 2

III. Routine Hematology, coagulation studies

a. Preparation of thin and thick smears, staining of blood smear with Lieshman's stain and identification of blood cells.
b. Fixing, staining of thin and thick smear with Field A&B stains for malarial parasites and identification of parasites.
c. Differential WBC count with Lieshman's stained smear.
d. Estimation of Hemoglobin: Sahli's and Cynmethemoglobin method.
e. Total WBC count: Micro and bulk dilution techniques.
f. Erythrocyte Sedimentation Rate (ESR) – Westergren method.
g. Packed Cell Volume (PCV) -Wintrobes tubes and microhematocrit methods.
h. Reticulocyte count.
i. Identification of Malarial Parasites using Field stain A &B and MP Card test.
j. Examination of night blood for microfilaria on wet cover slip preparation and Lieshman's stain smear and MF card Test.
k. Spotters: Thrombocytosis,Thrombocytopaenia, Platelet aggregation, Leukocytosis,Leukopaenia,Eosinophilia, Neutrophilia,Toxic changes and microfilaria.
l. Anaemias and Leukaemias: Iron deficiency anaemia, Megaloblastic anaemia, HDN.AML, CML, ALL,CLL, Monocytic and promyelocytic leukaemia.
m. Clot retraction and clot lysis
n. Bleeding Time (Duke and Ivy methods).
o. Clotting Time (Capillary tube and Lee –White methods).
p. Prothrobin Time (Uniplastin Kit method).

IV. Blood Bank procedures

a. Blood Grouping and Typing – Front and Back typing.
b. Antibody titre.
c. Saline cross match.
d. Albumin cross match.
e. Direct Coomb's test.
f. Indirect Coomb's test.

Part - 3

V. Biochemistry: End-point Methods

a. Estimation of Serum Glucose and Glucose Tolerance Test.
b. Estimation of Total Cholesterol.
c. Estimation of Serum Uric acid.
d. Estimation of Serum Total Protein and albumin
e. Estimation of Serum Total Bilirubin and Direct Bilirubin.
f. Estimation of HDL, LDL cholesterols and CPK-MB.

Kinetic methods

a. Estimation of Serum Creatinine and Urea.
b. Estimation of Liver enzymes: ALT,AST,ALP and serum amylase

Text book:

Cheesbrough M.(2007).*District Laboratory Practice in Tropical Countries.* Part 1&2. Cambridge University Press, United Kingdom.

References:

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5. Talib VH. (2015). A Hand Book of Medical Laboratory Technology. 2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1		X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4		X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

DML 1416 **Internship II** **120Hrs/Sem-4Cr**

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.

B.Voc in Medical Laboratory Technology
Second Year

(Advanced Diploma in Medical Laboratory Technology)

THE AMERICAN COLLEGE, MADURAI – 625 002

Sem	Course No	Course Title	Hrs/wk	Cr.
III	**General Education**			
	ENA 2403	Study Skills	4	4
	CSA 2403	Operating System	4	4
	LSA 2403	Coping with Psychological and Physical Issues	4	4
	Skill Component			
	AML 2409	Immunohematology &Transfusion Medicine	4	4
	AML 2411	Biomedical techniques, Automation &Quality Control Program	4	4
	AML 2113	Lab – III	10	10
	Job Training			
	AML 2415	Internship III	120/sem	4
		Total		**34**
IV	**General Education**			
	ENA 2404	Career Skills	4	4
	CSA 2404	Programming Techniques using C	4	4
	LSA 2404	Coping with Social and Environmental Issues	4	4
	Skill Component			
	AML 2410	Body Fluid Analysis	4	4
	AML 2412	Histopathology & Cytology	4	4
	AML 2114	Lab – IV	10	10
	Job Training			
	AML 2416	Internship IV	120/sem	4
		Total		**34**

- **Theory / Lab courses - 1 credit = 15 hours/Semester**
- **Internship – 1 credit = 30 hours/Semester**

SEMESTER III

ENA 2403 **Study Skills** **(3h/wk) (2Cr)**
(S S)

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.

Course Outcomes

Upon completion of this course, the student will be able to:

i. practise healthy study habits and homework habits,
ii. organise their academic skills,
iii. apply time management skills,
iv. explain psychological traits, and
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

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1			3			
CO 2				4		
CO 3			3			
CO 4				4		
CO 5						6

Mean: 4

CSA 2403 **Operating Systems** **(4h/wk) (4Cr)**

Course Outcomes

Upon completion of this course, the student will be able to:

i. Understand the role of Operating system as an interface between user and computer.
ii. Understand the basic functionality of Operating system.
iii. Understand the operation of Mobile OS.

Unit I: Introduction to operating system BIOS – DOS – Windows - types of operating system – operating system services - desktop operating system

Unit II: Network operating System - Server operating system – mainframe operating system – embedded operating system.

Unit III: Windows - Features of Windows Operating system – Multiprogramming

Unit IV: Process / Memory Scheduling - Multitasking – Buffering – Spooling – Time sharing – Browser support.

Unit V: Introduction to Android Application of Android – Features of Android **–** Messaging **-**Voice based features**-** Multitasking-Screen Capture**-**Video Calling**-**Multiple Language support.

Text books

1. Alphonse X, 2011 ICRDCE publication, December
2. Silberchatz, Galvin and Gagne, 1999. Operating system concepts, John Wiley and sons.

References

1. Curtin D.P, Foley K, Kunalsen, Morin, C. (2002). Information Technology- The Breaking Wave, Tata McGraw Hill.
2. http://en.wikipedia.org/wiki/List_of_features_in_Android

COPING WITH PSYCHOLOGICAL AND PHYSICAL ISSUES

LSA 2403 **2 hrs/Wk – 2 Credits**

Objectives: To enlighten the students about psychological and physical issues everyone goes through in their life and how to manage them for successful living. To acquaint them about the consequences of fear, shyness, emotions and stress in order to overcome them for maintaining better relationship with others and in their personal and professional life.

Unit - 1 Coping with Fear and Shyness

Understanding Fear - Types of Fear – Overcoming Fear – Shyness – Types – Managing Shyness

Unit - II Coping with Emotions & Stress

Types of Emotions – Managing Emotions – Stress – Types & Need for understanding stress – Ways to manage stress

Unit - III Communication & Failure

Communication – Types & Styles – Ways to improve communication – Failure – Managing Failures

Unit - IV Coping with Addictions

Drug addictions – Causes of addiction – Physical & Societal implications – Internet Addiction – Cyber crime - Types and causes – Managing addictions

Unit - V Coping with Sexuality

Sex and Gender – Understanding Gender discrimination – Coping with gender discrimination – Understanding Sexuality – Consequences of Premarital & Extra martial sexual issues – Managing sexuality

References:

1. "We shall overcome - A Text book on Life coping skills", Indian Centre for Research and Development of Community Education (ICRDCE) Publication, Alphonse, X. 2011, Chennai
2. "Living with Honour", Macmillan Publishers India Ltd., Shiv Khera 2003
3. "Smart Guide to Relieving Stress", Wiley, Carole Bodger, 1999
4. "Managing Stress", National Press Publications, Kristine C. Brewer 1995

Course outcome: At the end of this course the student will be able,

CO1: To understand the types of fear and shyness and the ways of overcoming them
CO2: To manage emotions and stress for better living
CO3: To assess the types and apply the styles of communications in their daily walk of life
CO4: To identify the ways of coping with social media and substance addictions
CO5: To evaluate the distinction between Gender and Sexuality and their significance

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering				X	
K2: Understanding	X				
K3: Applying		X			
K4: Analyzing			X		
K5: Evaluating					X
K6: Creating					

AML 2409 Immunohematology & Transfusion Medicine 4Hrs/4Cr

This course is designed to give basic knowledge on blood cell antigens and to develop skills on blood bank procedures. This also deals with investigation of hemolytic diseases of newborn and blood transfusion medicine.

At the end of this course, student will be able to:

1. Explain the historic context in the discovery of blood group systems in man and the formation of red cell antigens and their antibodies
2. Compare the characteristic features of Rh antigen, HDN diseases. Explain the laboratory investigations of HDN.
3. Enlist criteria for selecting donor for blood transfusion. Evaluate transfusion reaction.
4. Describe the methods of preparing blood products for transfusion in various clinical conditions.
5. Discuss the tissue compatibility for organ transplantation. Explain the role and detection of human leukocyte antibodies.

Unit I: ABO system: Historical context of A, B, AB, O groups, sub group of A. Kell, Duffy and Lewis system. Genetics and biochemical characteristics of blood groups - distribution of red cell antigen and antibody. Antigen-Antibody reaction -naturally occurring antibody and immune antibody reactions - front and back type - anti-H Lectin test - Lectin (A1) test.

Unit II: Rh (D) System: Historical context of D Antigen and its week form (Du). Genetics and formation of Rh(D) antibodies. Rh (D) and Rh (Du) tests **- c**haracteristics of naturally occurring antibodies and antibodies - saline and Coomb's crossmatch. Allo-antibodies. Haemolytic diseases of new born, ABO and Rh incompatibility - Diagnosis of HDN. Crossmatch for neonatal - exchange transfusion. Direct and indirect Coomb's tests.

Unit III: Blood transfusion andcomplication: Clinical importance of blood transfusion, anticoagulants and storage. Donor selection and screening. Donor bleeding procedure and donor care -Transfusion reaction**:** Non Infectious Complication. Acute transfusion reaction and evaluation. Delayed consequences of transfusion. Infectious complication of Blood transfusion: Hepatitis, HIV, Human T- cell Lymphotropic Viruses and Cytomegalovirus.

Unit IV: Transfusion medicine: Haempheresis/Plasmapheresis:Separation devices. Blood component collection - clinical consideration in transfusion practices: RBC, Platelet, Granulocyte transfusion. Transfusion of fresh, frozen and cryoprecipitates, plasma derivatives -neonatal and paediatric transfusion practices.

Unit V: The HLA System: Major histocompatibility complex. Role and detection of HLA in organ and bone marrow transplantation: Autologous and Allogenic transplantation.

Text books

Sood R. (2006). *Laboratory Technology (Methods and interpretation).* 4TH Ed. J.P. Bros, New Delhi

References

6. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
7. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
8. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
9. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
10. Talib VH. (2015). A Hand Book of Medical Laboratory Technology. 2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4		X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	
K4: Analyzing	X	X	X	X	
K5: Evaluating	X	X	X	X	
K6: Creating	X	X	X	X	

Mean: 4.6

AML 2411 Biomedical Techniques, Automation and Quality Control Programme 4Hrs/4Cr

This course emphasizes on various types of advanced technology and instruments used in the clinical laboratory, their working principles, operation techniques, calibration and quality control. This is also designed to give some basic knowledge on instruments in clinician chambers.

At the end of this course, student will be able to:

1. Explain the use of advanced immunotechnologies like Chromatography, ELISA, CLIA, MEIA,RIA in diagnosis.
2. Describe the mechanism and handling of automated instruments in the laboratory.
3. Discuss and rate the importance of biochemical analyzers in health service. Explain various principles used in advanced technology
4. Explain the mechanism of ECG and its patterns. Explain the use of Pacemaker, oximetry, cardiography,doppler scan etc.
5. Define quality control terminologies and method of running internal and external quality control program in laboratory.

Unit I: Advanced technology in the diagnosis of infection

Chromatography techniques. Partition and Adsorption chromatography. Immuno assay: Enzyme linked immunosorbent assay (ELISA) – Chemiluminescence immune assay CLIA) - Auto analyzers based immunoassay – Microparticle Enzyme immune assay (MEIA) - Patented colorimetric detection technique in identification of bacteria - Radioimmunoassay (RIA).

Unit II: Advanced biochemical technique

Biosensors: Blood glucose and hemoglobinometer. Colorimeter and Spectrophotometer. Biochemical analyzers: Multiple and single channel continuous flow analyzers - discretautoanalyzres - component steps in fully automated systems – Batch and stat discretautoanalyzers – centrifugal fast analyzers. Flame emission photometry (FEP) and Ion Selective Electrodes (ISE).

Unit III: Automation in Hematology laboratory

Blood cell counter analyzer: Electrical impedence technology –Flow cytometry technology– Fluorescent flow cytometry technology. Coagulation Analyzers: Mechanical and Photo optical mode. ESR Analyzers: Infrared detection.

Unit IV: Quality management and Quality Control

Introduction – General approach to quality control -Total Quality Management –Internal Quality Control – Two Phases of IQC -Reference Materials and Calibrating Definitive Methods –Quality Control Program – Methods of QC in Clinical Chemistry laboratory –Methods of QC in Hematology Laboratory and Blood Bank – Methods of QC in Microbiology and Serology Laboratory – Reference Range - Preparation of Quality control Chart.

Unit V: ECG and Oximetry

Normal ECG - ECG abnormalities, ECG recorder-single channel, multichannel, Tread mill ECG, ECG monitor - Cardiac defibrillator - Pacemaker, Digital subtraction angiography - Oximetry: transmission, reflection and fingertip pulse oximetry. Echo cardiography - colour doppler - Heart lung machine -Infusion pump - Blood gas analyzer.

Text Book

Veerakumar L. (2015).*Bioinstrumentation*. MJP Publishers, Chennai.

References

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5. Talib VH. (2015). A Hand Book of Medical Laboratory Technology. 2nd Ed. CBS Publishers Pvt Ltd, New Delhi.
6. Gradwohl RBH, Sonnenwirth AC, &L Jarett. (1980). Gradwohl's Clinical Laboratory Methods and Diagnosis. Mosby

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X			X	X	X	X	X	X
CO2	X	X			X	X	X	X	X	X
CO3	X	X			X	X	X	X	X	X
CO4	X	X			X	X	X	X	X	X
CO5	X	X			X	X	X	X	X	

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	
K5: Evaluating	X	X	X	X	
K6: Creating				X	

Mean: 3.5

AML 2113 **Lab – III** **10Hrs/10Cr**

This course is designed to develop skills in the laboratory diagnosis of clinical condition in the field of hematology, coagulation studies, blood bank, biochemistry, and microbiology. This also deals with quality control management and program in the laboratory.

At the end of this course student will be able to:

1. Demonstrate blood grouping and Typing methods ,sub grouping, and Bombay group. Perform Coombs tests and Cross matches.
2. Select donor, screen donor blood for infectious diseases and bleed donor for blood transfusion. Investigate blood transfusion reactions.
3. Estimate various enzymes like ALT,AST ,ALP and serum Amylase and cardiac markers.
4. Demonstrate the method of using Cell counters, Electrolyte analyzers, Fully automated biochemistry analyzers.
5. Run internal and external Quality control programme for hematology, biochemistry and Utilize other instruments used in physician chamber.

I. Blood Bank Procedures.

- **a.** ABO Grouping : Front type and Back typing
- **b.** Rh(D) typing and Rh(Du) testing.
- **c.** Agglutination, hemolysis, rouleaux formation and prozone reaction.
- **d.** Saline Cross Matching.

II. Advanced Blood bank procedures

- **a.** Antibody Titre.
- **b.** Direct Coomb's Test
- **c.** Indirect Coomb's Test
- **d.** Coomb's Cross matching
- **e.** Cross match for exchange blood transfusion.

III. Investigation of transfusion reactions.

Recording and file maintenance.

IV. Separation of blood products and storage.

Blood donor selection, Screening and bleeding.

V. Body Fluid Analysis

- **a.** C. S. F Analysis.
- **b.** Peritoneal and pleural analysis.
- **c.** Synovial Fluid analysis.
- **d.** Semen analsis.
- **e.** Sputum Analysis.
- **f.** Gastric Juice analysis.

Hand book:

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5. Talib VH. (2015). A Hand Book of Medical Laboratory Technology. 2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

AML 2415 **Internship III** **120Hrs/Sem-4Cr**

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

SEMESTER IV

ENA 2404 **Career Skills** **(3h/wk) (2Cr)**

(Ca Skills)

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.

Course Outcomes

Upon completion of this course, the student will be able to:

i. speak and write in English,
ii. practise interview skills,
iii. explain cognitive skills,
iv. produce thinking skills, and
v. understand 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 and recording minutes

Unit 3 : Cognitive Skills - Self- motivation, setting personal goals, problem solving, decision making and delegation skills

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.

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1						6
CO 2			3			
CO 3		2				
CO 4						6
CO 5		2				

Mean: 3.8

CSA 2404 **Programming Techniques using C** **(4h/wk) (4Cr)**

Course Outcomes

Upon completion of this course, the student will be able to:

i. Understand the computer programming in problem solving.
ii. Understand basic programming techniques.
iii. Write simple programs using numeric and non-numeric data.

Unit I: Overview of C Middle level language – compilers versus interpreter – the form of a C program – compiling a C program

Unit II: Primitive Date types Operators: Data types – type conversions – operators – formatted input/output functions.

Unit III: Control statements If, if-else, switch, for, while, do..while, break and continue.

Unit IV: Aggregate Data Types Arrays – strings – functions – call by values – call by reference – passing arrays as arguments – local, global static and external variables.

Unit V: Structure and Union User defined data types – Structures - Union

Text book

Balagurusamy.E (2007). Programming in ANSI 'C', 4th edition, Tata McGrawHill.

COPING WITH SOCIAL AND ENVIRONMENTAL ISSUES

LSA 2404 **2 hrs/Wk – 2 Credits**

Objectives: To make the students comprehend the social and environmental issues they face in the society. To teach them the necessity for understanding the issues and how to manage them for a better society. To kindle their mind about their responsibility to become a useful citizen to protect the society and the environment where they live.

Unit - I Coping with Society

Family and Issues related to Marriage – Building relationships – Conflict management – Cultural alienation

Unit - II Coping with Human Resources

Time management – Money management – Skill management**:** Problem Solving Skills - Social skills - Health management

Unit - III Environmental Issues

Environment Vs Ecology – Pollution: Air, Water, Soil, Sound – De forestation – Exploitation of natural resources – Environmental protection

Unit - IV Coping with Globalization

Globalization – Trends in Education, Employment, Consumerism – Merits and Demerits of Globalization

Unit - V Coping with Technology

Types of Technology – Technology in day today life - Social Media – Impacts of technology in modern society – Managing life with technology

Reference:

1. Alphonse, X. 2011, "We shall overcome" A Text book on Life coping skills", ICRDCE Publication, Chennai

Course Outcome: At the end of this course the student will be able,

CO1: To relate the significance of relationships and need for coping with them
CO2: To demonstrate the skills of managing their time, money and health
CO3: To apply their knowledge in protecting their environment and preserve the resources
CO4: To assess the impact of globalization in our society and adjust their living conditions
CO5: To identify healthy ways to cope up with emerging technologies which affect the life

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					X
K2: Understanding	X				
K3: Applying		X			
K4: Analyzing			X		
K5: Evaluating				X	
K6: Creating					

AML 2410 Body Fluids Analysis 4 Hrs/4Cr

This course is designed to impart knowledge on composition, testing procedures, and the clinical correlation of results for cerebrospinal, peritoneal, pleural, synovial and amniotic fluids.

At the end of this course student will be able to:

1. Explain the movement, functions, physical, chemical and cellular content of cavity fluids in normal and abnormal conditions.
2. Discuss the significance of examining C.S.F, its collection, processing methods, relate and compile reports for diagnosis.
3. Describe the formation of abnormal fluid and Patho-physiology of body cavities.
4. Relate the laboratory finding for the diagnosis of joint diseases like Rheumatoid arthritis, Osteoarthritis and gout etc.
5. Discuss about the need of examining amniotic fluid for safe delivery of baby and mother health.

Unit I: Introduction to body fluids

Types of body fluids and compartments, regulation and functions. Solutes in body fluid. Clinical abnormalities – mechanism involved in the movement of body fluids.

Unit II: Cerebrospinal fluid

Assessment of the patient – preparation of patient for the procedure – Educating the patient for the sampling procedure. Cytological examination and clinical correlation. Procedure and measures for the prevention of infection. CSF formation - CSF pressure - specimen collection and processing – physical, chemical and microscopic examination - immunologic tests. Transudates and exudates.

Unit III: Serous and other body fluids

Formation, collection, physical, chemical and microscopic examination of peritoneal, pleural and gastric fluid. Biomarker evaluation in body fluids for specific therapeutic prognostic and /or diagnostic potential.

Unit IV: Synovial fluid

Formation, composition and function of synovial fluid. physical and microscopic examination. Disorders of joints – laboratory diagnosis and interpretation of Non-inflammatory joint diseases – Osteoarthritis, Traumatic arthritis, Neurogenic joint disease. Inflammatory joint disease – Rheumatoid arthritis and Lupus arthritis.

Unit V: Amniotic fluid

Formation and function of amniotic fluid, Chemical composition, Collection, Testing – Alpha fetoprotein, Acetyl cholinesterase, Neural tube defects, Chromosomal abnormalities, Haemolytic disease of newborn, gestation period and fetal maturation.

Textbook

Elkinton D. (2002) *The Body Fluids*. Williams and Wilkins. Baltimore

References

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5. Talib VH. (2015). A Hand Book of Medical Laboratory Technology. 2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X		X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating		X	X	X	X

Mean: 4.9

AML 2412 Histopathology & Cytology 4Hrs/4Cr

The objective of this course is to provide basic knowledge of normal and abnormal cells in the tissue and to develop skills to carry out histopathological techniques in the laboratory diagnosis of carcinoma. This is also designed to develop skills to perform cytological studies on various clinical samples.

At the end of this course student will be able to:

1. Explain cell, tissue, organelles and the mechanism and use of instruments used in the processing of tissue.
2. Describe the various process of treating tissue before section cutting for microscopic examination.
3. Discuss the use of other advanced technologies like Freezing microtome fixing and staining techniques.
4. Prepare for processing fluids for cytotechniques and staining methods. Explain FNAC and guided FNAC procedures.
5. Identify the use of various fixatives for histopathological and cytological works.

Unit I: Introduction to histology and instruments

Introduction to Histology, the cell, cell Organelles, nucleus, cell division, tissues, fresh & fixed tissues - Use and handling of Microtomes, Knives, embedding bath, tissue flotation bath, Automated tissue processor.

Unit II: Histopathology Techniques

Introduction - Tissue preparation – Fixation - Aims and function of a fixative – Classification. Dehydration, Embedding Media: Paraffin wax. Technique of impregnation – embedding -Blocking –Type of molds –technique of moulding. Decalcification: Decalcifying agents-Selection of the tissue.

Unit III: Frozen Technique

Introduction – Frozen section –Use of Freezing Microtome – Fixation: Fixing sections on slides – Staining of frozen sections(Rapid staining) –Advantages and Disadvantages – Frozen section using Cryostat - Uses - The Cryostat - LEICA CM 1850 Cryostat –component – Set up of instrument– Operation of Cryostat

Unit IV: Cytology

Introduction – Specimen collection - Preparation of smears from the sediments of Cavity fluids (CSF, Pleural,Peritoneal,and Pericardial) - CSF Cytospin smear Preparation - Prepartion of Fixatives and fixing for smears from body fluids - Fine Needle Aspiration Cytology: Procedure for doing FNAC, Differential Quik staining procedure, Guided FNAC, criteria for adequacy of cells - Preparation of Smears from Sputum, urine, Aspiration and Pus, Semen - Collection sample for Buccal Smears staining and examination for Sex Chromatin Bodies.

Unit V: Fixatives and staining techniques

Preparation of fixative and fixing for FNAC smears - Preparation of stock and working solution and staining procedure - May-Grunwald stain - Giemsa Stain - Rapid Hematoxylin and eosin, Papanicolaou stain. Preparation of buffer of pH 6.8-7.2. Preparation of bronchial lavage smears - preparation of Grads of Alcohol (50%, 70%, 80%) - Tissue AFB staining procedure - determination of fetal maturity by cytology- preparation of smear and stain for amniotic fluid - detection of Leukodystrophy metachromatic granules in urine.

Text Book

Sood R. (2006). *Laboratory Technology (Methods and interpretation).* 4th Ed. J.P. Bros, New Delhi

References

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5. Talib VH. (2015). A Hand Book of Medical Laboratory Technology. 2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1		X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4		X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing		X	X	X	X
K5: Evaluating		X	X	X	X
K6: Creating		X	X	X	X

Mean: 4.5

AML 2114 **Lab – IV** **10Hrs/10Cr**

This course is designed to learn laboratory diagnosis of bone marrow related hematological diseases and hemoglobinopathies. This is also deal with techniques practiced in histopathology and cytotechnology in the laboratory diagnosis of carcinoma.

1. Use and hande histopathology instruments. Assist in the collection of cavity fluids with physician, Process and prepare smears for cell counts, bacteriological studies etc.
2. Carry out decalcification,processing the tissue for parafin section.
3. Prepare knives using honing and stropping.
4. Prepare smears, fixatives, stains for Cavity fluids (CSF, Pleural,Peritoneal,and Pericardial). and FNAC smears.
5. Fix, stain and examine smears for Total and differential cell counts and bacteria.
6. Analyze glucose, protein, and albumin, chloride in C.S.F and cavity fluids using semi automated biochemistry and electrolyte analyzers.

I. Handling of Histopathology Instruments.

Use and handling of Microtomes, Knives ,knives shorpenning techniques, embedding bath, tissue floatation bath, Automated tissue processo**r.**

II. Methods of Processing

- **a.** Decalcification.
- **b.** Processing the tissue for Parafin section.
- **c.** Method of Honing and Stropping.
- **d.** Method of cutting of paraffin sections.
- **e.** Mounting of Stained slides.

III. Cytology - Preparation of smears

- **a.** Preparation of smears from the sediments of Cavity fluids (CSF, Pleural,Peritoneal,and Pericardial)
- **b.** Fine Needle Aspiration Cytology: Procedure for doing FNAC,DiffierentialQuik staining procedure,Guided FNAC,criteria for adequacy of cells
- **c.** CSF Cytospinsmear Preparation.
- **d.** Preparation of Bronchial lavage smears.
- **e.** Preparation of Bronchial washing Smears.
- **f.** Preparation of smears from sputum, urine, aspiration and pus, semen.
- **g.** Collection of sample for buccal smears staining and examination for Sex Chromatin Bodies.
- **h.** Preparation of amniotic fluid smear and stain for the detection of foetal maturity.
- **i.** preparation of smears and staining technique for the detection of Leukodystrophy metachromatic granules in urine.

IV. Cytology –Fixation

- **a.** Preparation of fixative and fixing for FNAC smears and PAP smears.
- **b.** Preparation of Fixatives for cytotechniques and fixing of smears from body fluids.
- **c.** Preparation of Buffer water and solution of pH 6.8-7.2.
- **d.** Preparation of 0.5 % HCL.

V. Cytology - Staining Techniques:

- **a.** Erhlic"s Hematoxylin - Eosin Staining technique.
- **b.** May – Grunwald – Giemsa staining technique.
- **c.** Preparation of Papanicolaou stain and staining procedure.
- **d.** Tissue AFB Staining procedure

Hand books:

1. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
2. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
3. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
5. Talib VH. (2015). A Hand Book of Medical Laboratory Technology. 2nd Ed. CBS Publishers Pvt Ltd, New Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1		X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4		X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

AML 2416 **Internship- IV** **120Hrs/Sem-4Cr**

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean:5.0

B.Voc in Medical Laboratory Technology
Third Year

(B.Voc Degree in Medical Laboratory Technology)

THE AMERICAN COLLEGE, MADURAI – 625 002

Sem	Course No	Course Title	Hrs/wk	Cr.
V	**General Education**			
	EVS 3401	Environmental Studies	4	4
	LSV 3401	Entrepreneurship Development	4	4
	CSV 3401	Information and Communication Technology	4	4
	Skill Component			
	VML 3401	Geriatric Care	4	4
	VML 3403	Parasitology	4	4
	VML 3113	Lab - V	10	10
	Job Training			
	VML 3415	Internship - V	120/sem	4
		Total		**34**
VI	**General Education**			
	VEV 3402	Youth In the Global Context – Value Education	4	4
	LSV 3402	Soft Skills	4	4
	CSV 3402	Data Base Management System	4	4
	Skill Component			
	VML 3402	Metabolic Disorder and Molecular Diagnostics	4	4
	VML 3404	Special Hematology	4	4
	VML 3114	Lab - VI	10	10
	Job Training			
	VML 3416	Internship - VI	120/sem	4
		Total		**34**

- **Theory / Lab courses - 1 credit = 15 hours/Semester**
- **Internship – 1 credit = 30 hours/Semester**

SEMESTER-V

EVS 3401 Environmental Studies (4h/wk) (4Cr)

This course is designed to develop environmental awareness to the students. It deals with the natural resources, ecosystems and the impact of human activity on them. This course also imparts the biodiversity and its conservation. It also sensitizes the students on the environmental issues and abatement of pollution and gives suggestion for sustenance.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Discuss the terminology commonly used in environmental science and to identify renewable and non renewable resources and its proper usage and conservation
ii. Explain the concept , structure, function of ecosystem and to analyze the interaction of organism at different ecosystem
iii. Evaluate the adverse human impact on abiotic and biotic community and sustainable strategies to mitigate the impact
iv. Create knowledge on biodiversity and its conservation and utilize advances in environmental science to resolve issues and anticipate implications.
v. Assess the consequences of environmental disasters and its remedy

1. **Introduction to environmental studies:** Concept and Scope – importance of sustainability and sustainable development. The Atmosphere, the Hydrosphere, the Lithosphere and the Biosphere. Concept of Renewable and Non-renewable resources:

2. **Ecology and Ecosystems:** Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession. Characteristic features of the following- Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, lakes, rivers, oceans)

3. **Environmental Pollution:** Pollution -Definition - Causes, effects and control measures of - Air pollution - Water pollution -Soil pollution - Marine pollution -.Noise pollution - Thermal pollution - Nuclear hazards . Solid waste Management: Causes, effects and control measures. Role of an individual in prevention of pollution. Natural Disasters and their Management: floods, earthquake, cyclone and landslides.

4. **Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity. Biogeographical classification of India- values Biodiversity at global, National and local levels. India as a mega-diversity nation - Hot-spots of biodiversity. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.. Conservation of biodiversity: In-situ and Ex-situ method of conservation.

5. **Social Issues and the Environment:** Water conservation- rain water harvesting, watershed management. Wasteland reclamation. Afforestation. Management and Wildlife conservation. Climate change - Greenhouse effect - global warming - acid rain, ozone layer depletion. Environmental Laws : Environment Protection Act, 1986 ; The Water Act, 1974, The Air Act, 1981 and The Wildlife (Protection) Act, 1972 , Forest Conservation Act .Issues involved in enforcement of environmental legislation. Public awareness.

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering	X			X	
K2: Understanding	X	X			
K3: Applying			X		
K4: Analyzing					
K5: Evaluating					X
K6: Creating				X	

LSV 3401 Entrepreneurship Development (4h/wk) (4 Cr)

To give an overview about the real concepts of entrepreneurship and to impart knowledge about the various sources for a small business and hence motivate the students to become a job providers.

Course Outcomes

Upon completion of this course, the student will be able to:

i. Cite the meaning of entrepreneurship and identify the role of entrepreneurs.
ii. Identify different types of entrepreneurs and the problems faced by them
iii. Identify the various sources of small business and capable of starting a business by creating own business plan.
iv. Identify the various institutes and their functions that support entrepreneurs
v. Identify and utilize the various incentives available for small scale business.

1. **Entrepreneur:** Definition - Characteristics - Functions - Competencies - Entrepreneur vs Entrepreneurship - Role of Entrepreneur in Economic Development.

2. **Types of Entrepreneurs:** Innovative - Adaptive - Fabian - Drone; Entrepreneur vs Intrpreneur, Copreneur; Women entrepreneur - Types - Problems.

3. **Strating a small Business:** Steps; **Project Report:** Contents – Importance.

4. **Institutional Support to Entrepreneurs:** SIDCO - TCOs - DIC - TIIC - SIDBI - Commercial Banks.

5. **Incentives for Small Scale Business:** Subsidy - Tax Concessions - Assistance - Export Assistance - Technical Assistance.

Text Book

E. Gordan & K. Natarajan, Entrepreneurship Development, Himalaya Publishing House, 2017.

References

1. Holt, Entrepreneurship: New Venture Creation, Prentice-Hall, 2018.
2. R. V Badi & A. V Badi, Entrepreneurship, Vrinda Publication (p) Ltd, New Delhi 2010
3. K. Ramachandran, Entrepreneurship Development, Tata McGraw Hill, New Delhi, 2017.
4. Dr. Radha, Entrepreneurial Development, Prasanna and Co, Chennai. 2019

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering					
K2: Understanding	X				
K3: Applying					X
K4: Analyzing		X		X	
K5: Evaluating					
K6: Creating			X		

CSV 3401 Information Communication Technology (4hr/wk) (4Cr)

This course aims at enabling the student to know the role of ICT resources in modern applications and presenting its environment. This course also makes a student familiar with Web environment and its applications in providing utilization and communication of Information.

Course outcomes:

At the end of the course the student will be able to:

i. Explain the progress of information and communication technology and their role in modern world.
ii. Identify the difference between Operating Systems and application software.
iii. Examine different kinds of software and their working.
iv. Utilize computer and similar electronic devices suitably for data processing.
v. Use Internet safely and explore different kinds of information available on the Internet.

Unit I: Accessing the web – Introduction to the browser and browsing Accessing the web II – Introduction to the web familiarity with IOT environment – Connections and Connectors – Inputting in Indian Language – Font and Keyboard

Unit II: Creating with ICT – Handling Text – Handling Data – Handling Media – Operating Systems and it Requirement – Bringing together Hardware and Software

Unit III: Internet t access Information – Exploring Web resources – ICT in class room

Unit IV: Hardware and Software – Assistive Technologies – Working with Data I – Exploring spread sheet- Working with Data II – Exploring with spread sheet.

Unit V: E-mail and Web based Forums –Transacting through the web – Exploring E-commerce applications – Execution and peer evaluations –Evaluation and portable submission.

References

1. Brilliant Ideas for using ICT in the inclusive class room, II Edition, Sally McKeown, Angela McGlashon
2. Introducing Computing: A guide for teachers Edited by Lawrence Williams.

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering		X			
K2: Understanding	X				
K3: Applying				X	X
K4: Analyzing			X		
K5: Evaluating					
K6: Creating					

VML 3401 **Geriatric Care** 4hrs/wk 4 Cr

This course is designed to equip students with the knowledge and skills required to meet the unique health care needs of the aged in urban and rural areas. This also deals with intervention methods of government and NGOs in regards to policies, program, social welfare schemes and legislation.

At the end of this course student will be able to:

1. Explain aging and define aging in urban and rural context with psychoanalysis.
2. Discuss about the personality, social and psychological changes, living arrangements and gender discrepancies in elders.
3. Relate and rate diet related degenerative changes in elders and their physical activities.
4. Outline various kinds of physical and mental disorders in elders and explain how they can come out from such conditions.
5. Discuss health risk in old age, intervention methods in acute health crisis. Critique old age care initiative policies and programmes.

Unit – I Geriatrics

Geriatrics: Meaning and need; ageing: Meaning - Ageing categories - Physiology and age related changes - Ageing in rural and urban context – Theories of Ageing: Disengagement theory –Psychoanalytical theory and theory, psychological aspects of ageing.

Unit – II The Plight of the Aged

Psychological theories - Personality and Social changes, gender discrepancies, living arrangement - Depression and coping with psychological changes of ageing - Establishing and maintaining good inter personal relationship and communication with family - Guidance and counseling.

III Nutritional requirements of older adults

Need of dietary alteration, energy needs of old, Formulation of diet for elderly, Diet related degenerative changes and physical activities.

Unit – IV Common conditions/diseases and disorders of the elderly

Fever, Anemia, Syncope, Vertigo, Anorexia, Loss of memory - Respiratory, heart, kidney diseases – Stroke – Metabolic, musculoskeletal disorders – CNS related

health problem, digestive problem – Vision, hearing and sleep problems – Per menopausal and Genitourinary problems – Cancer.

Unit – V Risks and Prevention

Health risk in old age: Smoking, alcohol, Social issues, Abuse/neglect, dependency, physical inactivity, Fall, Accident, Deafness, Low vision - Health promotion: Nutrition, exercise, screening, prevention of accidents, prevention of substance use-alcohol, drugs etc, smoking cessation.

Unit – VI Intervention

Definition and type of intervention - Care in Acute pain, chronic pain, chest pain, Diabetes, Stroke, Dementia, Active intolerance - Role of government and its policies, program, welfare schemes and legislation – Role of NGOs in providing assisted living facilities, Nursing home, Hospices and Old age home.

Reference books:

1. Rao, A. Venkoba (1989) Psychiatry of Old Age in India, Torrent Laboratories Pvt Ltd, Ahmadabad.
2. Biswas, S.K (1987) Aging in Contemporary India, The Indian Anthropological society, Calcutta.
3. Ishwar Modi(2001) Ageing Human Development, Rawat Publication, New Delhi.
4. Sudhir M.A (2005) Ageing in Rural India: Perspective and Prospectus, Indian Publishers Distribution, Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1					X			X		
CO2					X			X		
CO3					X			X		
CO4					X			X		
CO5					X			X		

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating					

Mean: 4.1

VML 3403 **PARASITOLOGY** 4hrs/wk 4 Cr

This course is designed to impart knowledge on diseases caused by parasites in human body and the principles involved in the laboratory diagnosis. This also equips students to develop and create awareness program against parasitic infections.

At the end of this course student will be able to:

1. Explain and classify parasites, host and discuss the distribution of parasites in clinical samples and their pathogenesities.
2. Compare the morphology, life cycle of blood and intestinal parasites and their laboratory findings.
3. Comment on blood, muscle and intestinal nematodes its morphology, life cycle and their pathogenesity.
4. Describe the morphology of eggs, segments, scolexes of tape worm and their pathogenesity.
5. Discuss about the distribution of flat worm infections and their morphology and pathogenesity.

Unit-I Introduction to Parasitological

Definition, types and classification parasites, host and distribution of parasites in clinical samples - Diseases caused by Parasites – Collection, preservation and transportation of clinical samples for examination - Principles and methods employed in the processing of samples - Direct wet saline and Direct wet Iodine smears, concentration technique, flotation technique, microscopy, night blood collection and 2% White saponin concentration technique for malarial parasites and microfilaria and immune techniques.

Unit – II Protozoans

Blood, C.S.F, Bone marrow intestinal Parasites: Morphology , developmental stages, life cycle and pathogenesity of Species: Plasmodium, leishmania and schistosoma, entamoeba histolytica, entamoeba coli - Difference between the amoeba and cystic forms and difference between amoebic and bacillary dysentery – Trophozoite and cystic forms of Giardia lamblia, Chylomastric mesnili, Balandidium coli and Trichomonas vaginalis.

Unit – III Helminths: Nematodes

Blood, muscle and intestinal nematodes: Morphology, stages in the life cycle, larva of Wuchereria bancrofti, Brugia malayi, Loaloa, Onchocerca volulus, Trichenella spiralis, Ascaris lumbricoides, Anchylostoma duodenale, Nicator americanus, Trichuris trichura, Strongyloid stercoralis and Dracunculus medinensis.

Unit – IV Helminths : Cestodes and Trematodes

Cestodes: Scolex, gravid segments, life cycle and pathogenesity of Taenis saginata,Taenia solium, Echinococus granulose and its Hydatid cyst –cisticercus – Hymenolepsisnana and Diphylobothrium latum. **Trematodes**: Morphology of adult worm, its ova, life cycle and pathogenesity of Paragonimus westermani, Fasiola hepatica, Schistosoma mansoni, Schistosoma japonicum and Taxoplasma gondi.

Text Book:

Arora,R and Arora Brij Bala(2013). Medical Parasitology – Fourth edition,CBS Publishers & Distributors Pvt Ltd, Delhi.

Reference Book:

1. Robert, H. Carman (2016) Hand book of Medical Laboratory Technology, CMAI Publication, New Delhi.
2. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
3. Cheesbrough,Monica(2007) District Laboratory Practice in Tropical Countries Part 1&2,Cambridge University Press, United Kingdom
4. Raja, S and Christ Selvi,R(2015) Experimental Procedures in Life Science, CBS Publishers & Distributors Pvt Ltd, Delhi.
5. Talib, V.H(2014)Practical Text Book on Laboratory Medicine, CBS Publishers & Distributors Pvt Ltd, Delhi.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

VML 3115 **Lab – V** 10 hrs/ Wk 10 Cr

This course is designed to impart skill to perform laboratory investigation on clinical samples for the diagnosis of parasitic diseases.

At the end of this course student will be able to:

1. Identify the mental, physical, and social and risk behaviors in elders. Formulate diet and agenda for their healthy life.
2. Assist, programme and advocate for the cause of elders with socio economic and spiritual values.
3. Identify adult worms. Prepare smears and perform microscopy for identifying ova, cysts, flagellates, larva, scolex, segments..
4. Prepare smears and perform staining techniques for identifying malarial parasites, microfilaria and Leishmania specie.
5. Design and demonstrate awareness programmes for prevention and control of parasitic infections.
6.

I. Examination of Faeces for Parasites

1. Saline wet smear preparation for ova, cyst and amoeba
2. Iodine wet smear preparation for ova, cyst and amoeba
3. Formol – Ether Concentration Technique
4. Flotation Technique (28% Zinc Sulphate solution)
5. Perianal swab for pin worms and microscopy

II. Examination of Blood for parasites.

6. Thin smear for malarial parasites
7. Field A & Field B Staining Technique
8. Leishman's Staining technique
9. Wet cover slip preparation from night blood for microfilaria

10. Concentration technique (2% White Saponin) for thick smear – Malarial parasite and microfilaria.

III. Examination of adult worms and their head and segments.

11. Examination of tape worm segments – Indian ink preparation.

IV. Staining techniques in Parasitology

12. Methylene blue staining technique.
13. Wet Urine smear and Methylene blue staining: Trichomonas vaginalis.
14. Indian ink staining smear: Gravid segments of Taenia saginata and Taenia solium.

V. Spotters.

15. Microfilaria of Wuchereria bancrofti .
16. Plasmodium Species
17. Lieshmania Species.

References

1. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
2. Cheesbrough,Monica(2007) District Laboratory Practice in Tropical Countries Part 1&2,Cambridge University Press, United Kingdom
3. Talib, V.H (2014) Practical Text Book on Laboratory Medicine, CBS Publishers & Distributors Pvt Ltd, Delhi.
4. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.

5. Godkar PB and Godkar DP. (2002). A Text Book for Medical Lab Technology, 2nd Ed, Bhalami Publishing House, Mumbai.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

VML 3415 **Internship - V** **120Hrs/Sem-4Cr**

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.

YOUTH IN THE GLOBAL CONTEXT

VAL 3402 **4hrs /4 credits**

Objective: To make the students understand the meaning and implications of globalization. To acquaint them about new challenges world is facing due to globalization. The good side and the sad size of globalization – To enlighten them about the need to learn family values and practice them to cope up with the newly arising challenges.

Unit - I UNDERSTANDING KEY CONCEPTS OF GLOBALISATION

Free market Economy and Global Market Network - Communication and transport - Technology and Global Production System - Global Capital and investments - Culture of over consumption - Human needs - Over exploitation of resources

Unit – II EDUCATION IN GLOBALISED CONTEXT

Differential access to Education at the Primary, Secondary and Tertiary level- Problem of Quality Addressing deficiencies – need for communication and other Social skills - need for equitable and quality universal education

Unit - III GLOBALISATION AND EMPLOYMENT

New aspirations and the demands placed on youth - Changing structure of Employment and working norms related to time and remuneration - New Forms of insecurities - Cultural alienation -Youth and Consumerism - Distinguishing successful and meaningful life

Unit - IV YOUTH AND FAMILY VALUES

Mobility of Youth - Fragmentation of family structure - Issues relating to Marriage and Marital harmony; Addressing the growing rate of divorce and separation - Family related values

Unit - V GLOBALISATION AND OTHER SOCIO POLITICAL ISSUES

Poverty and Marginalization under Globalization – Terrorism - Rise of religious fundamentalis and Cultural Chauvinism – Corruption – Democracy - civil society issues – Social Values: Honesty, Hard Work, Trustworthiness

Books for refer

Study Materials will be provided.

Course outcomes: At the end of this course, the students will be able,

CO1: To explain what is globalization and their important aspects

CO2: To assess the conditions of education in their society

CO3: To predict the new challenges arise in the society due to globalization

CO4: To analyze the emerging trends in employment and cope up with them

CO5: To apply the values in their lives amidst the changing scenario

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
Bloom's Taxonomy	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
K1: Remembering			X		
K2: Understanding	X				
K3: Applying					X
K4: Analyzing				X	
K5: Evaluating		X			
K6: Creating					

LSV 3402 **Soft Skills** **(4h/wk) (4Cr)**

The learner will gain the skills required for the corporate world that would enhance one's employability and to provide an exposure to the students regarding the soft skills required for the job market.

Course outcomes:

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

i. Cite the meaning and define soft skill and also to identify the different types of soft skills.
ii. Identify different types of communication and overcome the barriers for effective communication.
iii. Develop and exhibit a good body language and enhance their personality.
iv. Exhibit a polite behaviour in society or among members of a particular profession or group and enrich their public speaking skill.
v. Enhance their writing skill and face interviews without fear.

Unit I - Soft Skill: Definition - Importance of soft skills - Types of soft skills.

Unit II - Communication: Definition - Process - Types - Verbal, non-verbal - Uses - Barriers of effective communication.

Unit III - Inter Personal Relation Skills: Body Language and personality.

Unit IV- Etiquettes or Manners: Art of Public Speaking - Chracteristics of a good speech - Planning to speak.

Unit V- Writing Skills: Importance - Types **Interview:** Types - Selection - Appraisal - Exit.

Text Book

Rajendra Pal & J. S. Korlahalli, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2016.

References

N.S.Raghunathan & B.Santhanam, Business Communication, Margham Publications, Chennai, 3rd Edition 2018.

Reddy, Appannnaih & Raja Rao, Essentials of Business Communication, Himalaya Publishing House, Mumbai, 2017.

Rizvi, M. Ashraf - Effective Technical Communication, Tata McGraw Hill, 2011

Blundell J. A & Middle N. M. G.: Career – English for the Business and Commercial World, Oxford University Press, 2009

Bloom's Taxonomy	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**
	CO1	**CO2**	**CO3**	**CO4**	**CO5**
K 1: Remembering					
K 2: Understanding	X				
K 3: Applying		X	X		
K 4: Analysing				X	
K 5: Evaluating					X
K 6: Creating					

CSV 3402 Database management system (4h/wk) (4Cr)

This course is intended to familiarize the students with the concept and significance of database maintenance and management. Moreover, the course would orient the students about the various aspects involved need for systematic retention of database involved in their respective vocations.

Course outcomes

At the end of the course the student will be able to:

i. Identify the database approach and the database applications
ii. Apply relational expressions for queries.
iii. Examine the database design by normalization.
iv. Build a table and manipulate the data using SQL Commands.
v. Summarize the transactions, its properties and the concurrency controls.

Unit I: Databases and database users: Introduction – Characteristics of the database approach – Advantages of using the DBMS approach – A brief history of Database Applications.

Unit II: Database System Concepts and Architechture – Data Models, Schemas and Instances.

Unit III: Database Languages and Interfaces: The Database System Environment – Centralized and Client / Server Architecture for DBMSs – Classification of Database Management System.

Unit IV: Relational Model Concepts: Relational model Constraints and Relational Database Schemas, Update Operation, Transaction and dealing with Constraints violations.

Unit V: Database Recovery Concepts - Caching(Buffering) of Disk blocks – Write-ahead Logging, Steal / No-Steal and Force / No-Force - Checkpoints in the System Log and Fuzzy Check pointing – Transaction rollback

References

1. "Database Management System" – Raghu Ramakrishnan and Johannes Gehrke – 3rd edition, McGraw-Hill, 2003.
2. "DBMS a Practical Approach", E.R. Ragiv Chopra, S Chand Publications.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering	X				
K 2: Understanding					X
K 3: Applying		X		X	
K 4: Analysing			X		
K 5: Evaluating					
K 6: Creating					

VML 3402 **Special Hematology** 4 hrs / Wk 4 Cr

This course is designed to provide knowledge on development of various blood cells, alterations in the morphology of red, white blood cells, platelets and abnormal cells in blood and bone marrow. This also deals with various principles pertaining to the diagnosis of abnormal hemoglobin and their clinical significances.

At the end of this course student will be able to:

1. Explain the formation and development of blood cells in normal and abnormal conditions.
2. Discuss about the various staining technique in the diagnosis of anemia, leukemia, abnormal red and white blood cells.
3. Describe the formation of abnormal hemoglobins and their screening techniques.
4. Explain the use of biomolecular techniques in identifying the presence of abnormal hemoglobins.
5. Analyze the laboratory expressions and formulate genotype of patients with hemoglobinopathy.

I. Hemopoiesis and Bone Marrow Examination

Formation of Blood – Development of Red Blood cells – Abnormal maturation of red blood cells – Alteration in red blood cells. Development of white blood cells – Alteration in white blood cells. Bone marrow aspiration, Smear making and May - Grunwald - Giemsa staining and examination of Bone Marrow.

II. Special Staining methods and techniques

Periodic Acid Schiff (PAS) Stain for leukemia – Iron storage staining for Bone Marrow – Leukocyte Peroxidase – Lupus Erythematosis: Methods using defibrinated, clotted blood and staining method. Preparation for Heinz bodies. Kala azar: making of smear for Kala azar –Aldehyde test.

III. Hemoglobinopathies

Synthesis of abnormal hemoglobin (S, C,D and E) and their diseases – Foetal hemoglobin estimation – Screening for sickle cells using reducing agents – Qualitative solubility test for HbS.

IV. HB Electrophoresis

Identification of abnormal hemoglobin by Citrate Agar Gel Electrophoresis – Spectrophptometric estimation of hemoglobins using Phosphate Cellulose Acetate Membrane Electrophoresis (Elusion technique).

V. Chemical Tests in Hematology

Determination of Plasma hemoglobin – Serum Hepatoglobin – Red Cell Pyruvate kinase - Glucose – 6 – Phosphate dehydrogenase (G-6-PD) – Red cell reduced Glutathione – Hams test – Sucrose lysis test.

Reference books:

5. Cheesbrough, Monica (2007).District Laboratory Practice in Tropical Countries Part 1, Cambridge University Press, UK.
6. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
7. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
8. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating		X	X	X	X

Mean: 4.9

VML 3404 **Metabolic Disorders and Molecular Diagnosis** 4hrs/wk 4 Cr

This course is designed to provide Clinical and Laboratory Diagnostic knowledge on metabolic disorders, Cardiovascular Diseases and various Markers used in the diagnosis of cardiac diseases and tumors .This also deals with applications of Molecular Techniques in laboratory diagnosis.

At the end of this course student will be able to:

1. Explain the signs and symptoms of various metabolic diseases and relate laboratory findings.
2. Discuss about the clinical symptoms and laboratory investigations of cardiovascular diseases.
3. Predict the use of cardiac markers in the diagnosis and assessment of treatment.
4. Describe the use of tumor markers in the diagnosis of male and female reproductive systems.
5. Explain the use of methods of various techniques in the field of molecular technology.

I. Metabolic Diseases

Endocrinology and metabolism – Wilson's disease – Porphyria – Alzheimer's diseases –Metabolic encephalopathy – Hyperlipoproteinemia –Osteoporosis – Osteomalacia – Gout.

II. Cardiovascular diseases

Congestive heart failure –Hypertension – Arrhythmias –Valvular heart disease –Congenital heart disease in adult – Infarction endocarditis –Acute Myocardial infarction – Chronic coronary artery disease – Pericardial disease – Cardiomyopathies and myocarditis – Diseases of the Aorta – Peripheral vascular disease.

III. Cardiac Markers

Serial sampling for cardiac markers – Myoglobins – Troponons – Creatine kinase MB – Homocysteine – C-Reactive protein – D-Dimer and Microalbuminuria.

IV. Tumor Markers

Alpha-fetoprotein – Beta Sub unit of Human chorionic gonadotropin – CA-15-3 ; CA-27.29 ; CA-19.9 ; CA125 - Carcino embryonic antigen – Prostate specific antigen (PSA) – Enzyme and Hormone markers.

V. Molecular Techniques

Polymerase Chain Reaction – Southern Blot – Northern Blot – Western Blot – DNA chip technology.

Reference Books:

1. Chatterjee,M.N .Shinde R.(2002)Text Book of Biochemistry,ed 5,Jaypee Brothers Medical Publishers Private Ltd, New Delhi (ISBN -81-7179-991-4)
2. Godkar, P.B and Godkar D.P (2002), A Text Book of Medical Laboratory Technology, ed 2, Balami Publishing House, Mumbai.
3. Scheppler J.A Cassin P.E and Gambier R.M (2002) Biotechnology Exploration-Applying the fundamentals, ASM Press, Washington DC.
4. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO, U.S.A.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2		X	X	X	X	X	X	X	X	X
CO3	X	X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5	X	X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating		X			X

Mean: 4.5

VML 3116 **LAB- VI** **10 hrs/Wk 10 Cr**

This course is designed to develop skills in laboratory investigation in the diagnosis of Cardiac diseases, bone marrow diseases and diseases of the abnormal hemoglobins.

At the end of this course student will be able to:

1. Assist physician in bone marrow aspiration and prepare smears for microscopic examination.
2. Stain and scan bone marrow smears under microscope for assessing cellularity bone marrow. Identify immature, abnormal cells.
3. Examine the stained blood smear under microscope and give impression for anemias, leukaemias and other hematological disorders.
4. Perform certain biomarkers and biochemical tests in the diagnosis of heart diseases.
5. Carryout certain molecular techniques in the assessment of cancers of male and female reproductive organs.

I. Bone Marrow Examination

1. Bone Marrow Aspiration tools and method (Virtual Lab)
2. Bone Marrow Smear making (Virtual Lab).
3. May - Grunwald - Giemsa staining technique.
4. Microscopic examination of Bone Marrow smears.
5. Preparation of defibrinated blood and staining for L.E Cell.

II. Screening for abnormal hemoglobins

6. Sickling Test.
7. Estimation of Foetal Hemoglobin.
8. Demonstration of Electrophoresis units.
9. Preparation of Gel Electrophoresis Buffer.
10. Preparation of stain for electrophoresis.

III. Special chemical test

11. Determination of Glucose - 6 - Phosphate dehydrogenase

IV. Screening for Cardiac diseases

12. Troponin –I Card test.
13. Estimation of Creatine kinase MB.

V. Molecular techniques

14. PCR technique (Virtual Lab).
15. Western Blot (Virtual Lab).
16. ELISA Techniques (Virtual Lab).

Reference books:

9. Godkar, P.B and Godkar D.P (2002), Text Book of Medical Laboratory Technology ed 2, Bhalami Publishing house, Mumbai.
10. Carman, Robert H.(2016).Hand Book of CMAI Medical Laboratory Technology, CMAI Publication, New Delhi.
11. Turgeon, Mary Louise.(2012) Linne & Ringsrud's Clinical Laboratory Science, ed 6, EL-SERVIER Inc MOSBY,MO.
12. Scheppler J.A Cassin P.E and Gambier R.M (2002) Biotechnology Exploration-Applying the fundamentals, ASM Press, Washington DC.

Course Out comes	Program Specific out come (PSOs)									
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	X	X	X	X	X	X	X	X	X	X
CO2	X	X	X	X	X	X	X	X	X	X
CO3		X	X	X	X	X	X	X	X	X
CO4	X	X	X	X	X	X	X	X	X	X
CO5		X	X	X	X	X	X	X	X	X

Revised Bloom's Taxonomy	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X	X	X	X	X
K2: Understanding	X	X	X	X	X
K3: Applying	X	X	X	X	X
K4: Analyzing	X	X	X	X	X
K5: Evaluating	X	X	X	X	X
K6: Creating	X	X	X	X	X

Mean: 5.0

Job Training: A work-based learning experience that enables the student to apply specialized occupational theory, skills and concepts.