Proposed Curriculum plan for Post-Graduate Mathematics from the academic year 2018-19

First year Program **Semester I**

Course No.	Course Title	Hours	Credits	Marks
PGM 4541	Algebra I	6	5	100
PGM 4543	Real Analysis I	6	5	100
PGM 4345	Fuzzy Mathematics	5	3	60
PGM 4347	Number Theory	5	3	60
PGM 4249	Ordinary Differential Equations (ODE)	4	2	40
PGM 43xx	CBCS (NME)*	4	3	60
		30	21	420

Semester II

Course No.	Course Title	Hours	Credits	Marks
PGM 4542	Algebra II	6	5	100
PGM 4544	Real Analysis II	6	5	100
PGM 4446	Graph Theory	6	4	80
PGM 4248	Combinatorics	4	2	40
PGM 4250	Partial Differential Equations (PDE)	4	2	40
PGM 43xx	CBCS (NME)*	4	3	60
		30	21	420

Second Year Program **Semester III**

Course No.	Course Title	Hours	Credits	Marks
PGM 5541	Topology	6	5	100
PGM 5543	Complex Analysis	6	5	100
PGM 5545	Statistics	6	5	100
PGM 5547	Measure Theory	6	5	100
PGM 5349	Programming in C++ with OOPS	4	3	60
PGM 5101	Programming in C++ with OOPS Lab.	2	1	20
		30	24	480

Semester IV

Course No.	Course Title	Hours	Credits	Marks
PGM 5542	Functional Analysis	6	5	100
PGM 5544	Classical Mechanics	6	5	100
PGM 5546	Statistical Inference & Stochastic Processes	6	5	100
PGM 5548	Operations Research	6	5	100
PGM 5450	Project	6	4	80
		30	24	480

*CBCS courses: PGM 4301Programming in C(2T+2L); PGM4303Astronomy through ages PGM4302Mathematics for Career Prospects; PGM 4304 Introduction to Statistical tools

Proposed Curriculum plan for Post-Graduate Mathematics (SF)
from the academic year 2018-19

First year Program **Semester I**

Course No.	Course Title	Hours	Credits	Marks
PSM 4541	Algebra I	6	5	100
PSM 4543	Real Analysis I	6	5	100
PSM 4345	Fuzzy Mathematics	5	3	60
PSM 4347	Number Theory	5	3	60
PSM 4249	Ordinary Differential Equations (ODE)	4	2	40
PSM 43xx	CBCS (NME)*	4	3	60
		30	21	420

Semester II

Course No.	Course Title	Hours	Credits	Marks
PSM 4542	Algebra II	6	5	100
PSM 4544	Real Analysis II	6	5	100
PSM 4446	Graph Theory	6	4	80
PSM 4248	Combinatorics	4	2	40
PSM 4250	Partial Differential Equations (PDE)	4	2	40
PSM 43xx	CBCS (NME)*	4	3	60
		30	21	420

Second Year Program **Semester III**

Course No.	Course Title	Hours	Credits	Marks
PSM 5541	Topology	6	5	100
PSM 5543	Complex Analysis	6	5	100
PSM 5545	Statistics	6	5	100
PSM 5547	Measure Theory	6	5	100
PSM 5349	Programming in C++ with OOPS	4	3	60
PSM 5101	Programming in C++ with OOPS Lab.	2	1	20
		30	24	480

Semester IV

Course No.	Course Title	Hours	Credits	Marks
PSM 5542	Functional Analysis	6	5	100
PSM 5544	Classical Mechanics	6	5	100
PSM 5546	Statistical Inference & Stochastic Processes	6	5	100
PSM 5548	Operations Research	6	5	100
PSM 5450	Project	6	4	80
		30	24	480

*CBCS courses: PSM 4301Programming in C(2T+2L); PSM4303Astronomy through ages PSM4302Mathematics for Career Prospects; PSM 4304 Introduction to Statistical tools

PGM 4541 / PSM 4541 **Algebra I** **6hrs / 5 cr**

Objective: The aim of the course is to introduce the fundamental areas of Algebra namely group theory and Ring theory to the students. This course will provide a strong foundation in the abstract approach for the budding Mathematician. The course deals with the group Theory, Ring Theory and various standard results in these areas.

One of the amazing features of twentieth century Mathematics has been its recognition of the power of abstract approach. Modern algebra has evolved with this abstract approach and is one of the important current research area of Mathematics, and also serves as the unifying thread which interfaces all of Mathematics – geometry, number theory, analysis, topology and even applied Mathematics. The basic ideas in algebra are used in Functional Analysis, Complex Analysis, Operations Research, Computer Science, Physics and Chemistry.

Unit I: Group theory: Introduction to groups, homomorphism and Automorphism, Cayley theorem and Cauchy theorem

Unit II: Permutation groups, Class equation, Sylow theorem, Direct products, finite abelian groups.

Unit III: Solvable groups, Schreier refinement theorem, Jordan Holder theorem.

Unit IV: Ring theory: Introduction to rings, ideals and quotient rings, Field of quotients of an integral domain

Unit V: Euclidean rings, Principal ideal and unique factorization domain, Gaussian integers, Polynomial rings, Polynomials over the rational field, Polynomials over a commutative ring, Noetherian ring, Hilbert basis theorem.

Text Books:

1.I.N.Herstein, Topics in Algebra, Vikas Publishing house, 2002.
Unit I: Chapter 2.1 to 2.9
Unit II: Chapter 2.10 to 2.14
2.Surjeet Singh and Quazi Zameeruddin, Modern algebra, Vikas publishing house, 2006. **Unit III:** Chapter 6
3.D.M.Burton, A first course in rings and ideals, Addison Wesley Publishing house, 1970.
Unit IV: Chapter 2, 5
Unit V: Chapter 6, 7.1- 7.7(upto example 7.7), Chapter 11(upto Hilbert basis theorem)

Reference Books:

M.Artin, Algebra, Prentice Hall of India, 1994.
B.Balumsla and B.Chandler, Theory and problems of group theory, Schuam outline series, Mcgraw Hill, 1980.
J.B.Fraleigh, A first course in Modern algebra, Addison Wesley Publishing house, 1970.

PGM 4543 / PSM 4543 **Real Analysis I** **6hrs/5 cr**

Objective: The aim of the course is to provide every Postgraduate student a comprehensive idea about the principles of Real Analysis. This course will provide such treatment. This course deals with a thorough understanding of convergence, continuity and differentiation. Algebra and Analysis are like the two eyes of a man in the realm of Mathematics. Analysis takes a man into the highlands of Mathematics itself, where these concepts are inseparable in all of pure Mathematics as it is today. This course is the seed, which is primitive in appearance but has the capacity for vast and intricate development for an able mathematician.

Real Analysis is the foundation of pure Mathematics and the ideas of Real Analysis are used in Topology, Functional Analysis, Complex Analysis and Measure Theory. The students can apply the concepts studied in this course in Topology, Functional Analysis, Complex Analysis and Measure Theory.

Unit I: Ordered field, real field, properties of real line, Extended Real number system.

Unit II: Metric spaces, compact sets, connected sets, perfect sets, cantor set.

Unit III: Numerical sequences and series. Convergent sequences, Cauchy sequences, complete metric spaces, series, tests of convergence, conditional and absolute convergence, power series, summation by parts, rearrangement of series.

Unit IV: Continuity, limit of a function, continuity and convergence, continuity and compactness, continuity and connectedness, discontinuity, monotonic functions.

Unit V: Differentiation, derivative of a real function, mean value theorems, the continuity of derivatives, L'Hospital rule, Taylor's theorem, differentiation of vector-valued functions.

Text Book:

W.Rudin-Principles of Real Analysis, McGraw Hill, 2004.
Unit I: Chapter 1
Unit II: Chapter 2
Unit III: Chapter 3
Unit IV: Chapter 4
Unit V: Chapter 5

Reference Books:

M. Apostol-Mathematical Analysis, Addison Wesley Publishing house, 2010.
V.Ganapathy Iyer-Mathematical Analysis, Tata Mcgraw Hill, 1985.
R.R.Goldberg-Methods of Real Analysis, Oxford and IBH publishing house, 1975.

PGM 4345 / PSM 4345 **Fuzzy Mathematics** **5hrs/ 3cr**

Objective: The objective of this course is to introduce to the students all the basic ideas of fuzzy mathematics. The course deals with types of fuzzy sets, operations on fuzzy sets, fuzzy number, fuzzy interval, fuzzy logic, fuzzy relations and various connectives in fuzzy sets.

The learner will be able to appreciate the insufficiency of the Aristotelian logic when we think of artificial intelligence and machine language. The learner would appreciate the complexity of the fuzzy logic. The content of the course will enable him to realize the inherent fuzziness in every human language and find a way out to express in best possible mathematical expression.

Unit I: Introduction – Crisp sets – Fuzzy sets – Basic concepts – Properties of –cuts – Representations of fuzzy sets –Decomposition theorems – – Extension Principle for fuzzy sets.

Unit II: Fuzzy complements – First Characterization Theorem of Fuzzy complements – Second Characterization Theorem of Fuzzy complements – Fuzzy intersections (t – Norms) – Fuzzy union (t-conorms) – Characterization theorem of t-norms, t-conorms – combinations of operations – Aggregation operations.

Unit III: Fuzzy numbers – Linguistic variables – Arithmetic operations on intervals – Arithmetic operations on Fuzzy numbers – Lattice of fuzzy numbers – Fuzzy equations.

Unit IV: Crisp and fuzzy relations – Projections and Cylindrical extensions – Binary fuzzy relations – Binary relations on a single set – Fuzzy equivalence relations – sup- compositions of fuzzy relations – inf compositions of fuzzy relations.

Unit V: Fuzzy relation equations – Partitioning – Solution method

Text Book:

George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy logic, Theory and Applications, Prentice Hall of India, 2005.

Unit I : Chapter 1,2(Sec 1.1 – 1.5 & 2.1 – 2.3)
Unit II : Chapter 3(Sec 3.1 – 3.6)
Unit III: Chapter 4(Sec 4.1 – 4.6)
Unit IV : Chapter 5(Sec 5.1 – 5.5 & 5.9 – 5.10 theorem 5.3 only)
Unit V : Chapter 6,7(Sec 6.1 – 6.3)

Reference Books:

G.J. Klir and T.A. Folger, Fuzzy Sets, Uncertainty and Information, Prentice Hall of India, 2001

H.T. Nguyen and E.T. Walker, A first course in fuzzy logic, Chapman and Hall, 1999

H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied publishers, 1996.

PGM 4347 / PSM 4347 **Number Theory** **5hrs/ 3cr**

Objective: The study of number theory inevitably includes knowledge of the problems and techniques of elementary number theory, however the tools which have evolved to address such problems and their generalizations are both analytic and algebraic, and often intertwined in surprising ways. This course covers topics from classical number theory including discussions of mathematical induction, prime numbers, division algorithms, congruences, and quadratic reciprocity.

On successful completion of the course the student will be able to

prove number theory results rigorously
understand prime numbers and modular arithmetic
solve linear Diophantine equations and linear congruences
describe properties of arithmetical functions, including the Euler phi function
apply methods and techniques of number theory to a range of applications
hone the ability to do reality checks on calculations.

Unit I: Divisibility – properties – division algorithm – G.C.D- related theorems - Euclid's lemma – Euclidean algorithm – primes – fundamental theorem of arithmetic- infinitude of primes.

Unit II: Congruences – properties – Euler's phi function – Fermat's theorem – Euler's theorem – Wilson's theorem- Albert Girard theorem – Fermat theorem on two squares.

Unit III: Solution of congruences - polynomial congruence equation - Chinese remainder theorem – applications – public key cryptography.

Unit IV: Quadratic residues- Euler's criterion- Legendre symbol – properties - Gauss lemma – Gaussian reciprocity law- Jacobi symbol.

Unit V: Greatest integer function – properties – de poligrac's formula – day of the week from the date- arithmetic functions: $\phi(\ )$, $\sigma(\ )$, $\tau(\ )$, $\Omega(n)$ - properties- Mobius inversion formula-Linear Diophantine equation: ax+by=c.

Text Book:

Ivan Niven, H. Zuckerman, and H. Momtgomery, An introduction to the theory of numbers, 5th edition, John wiley and sons, 2013.

Unit I: Chapter 1(sec 1.2- 1.3)
Unit II: Chapter 2(sec 2.1-2.2)
Unit III: Chapter 2(sec 2.3-2.5)
Unit IV: Chapter 3(sec 3.1-3.3)
Unit V: Chapter 4(sec 4.1-4.3), Chapter 5(sec 5.1)

Reference Books:

1.David M. Burton, Elementary Number theory, 7th edition Tata McGraw- Hilleducation private limited, New Delhi, 2012.

2.Tom. M. Apostol, Introduction to analytic number theory, springer international student Edition, 1998.

3. G.H. Hardy and E.M. Wright, An introduction to the theory of Numbers, 6th edition, London oxford university press, 1975.

PGM 4249 / PSM 4249 Ordinary Differential Equations 4hrs/2cr

Objective: This course deals with the basic concepts of Ordinary Differential Equations and apply them to various physical problems.

This course will motivate the students in higher studies and research in applications of ordinary differential equations.

Unit I: Linear equations with variable coefficients, initial value problems for the homogenous equation, Solutions of the homogenous equation, The Wronskian and linear independence, reduction of the order of a homogenous equation.

Unit II: The Non-homogenous equations, Homogenous equations with analytic Coefficients, The Legendre equation, Chebychev's equation, Hermite equation and Justification of the power series method.

Unit III: Linear equations with regular singular points, The Euler equation, Second order equations with regular singular points.

Unit IV: A convergence proof, the exceptional cases, The Bessel equation.

Unit V: Existence and uniqueness of solutions to first order equations: Equations with variables separated, Exact equations, The methods of successive approximations, The Lipschitz condition, Convergence of the successive approximations.

Text book:

E.A.Coddington, An introduction to ordinary differential equations, Prentice Hall of India, 2004.

Unit I: Chapter III: Sections 1, 2,3,4,5 and related problems

Unit II: Chapter III: Sections 6, 7, 8 and related problems

Unit III: Chapter IV: Sections 1, 2, 3 and related problems

Unit IV: Chapter V: Sections 5, 6, 7, 8 and related problems

Unit V: Chapter VI: Sections 1, 2, 3, 4, 5, 6 and related problems

Reference books:

G.F.Simmons, Differential equations with applications and historical notes, Tata McGraw Hill, 1995

2.S.G.Deo and V.Raghavendra, Ordinary differential equations and stability theory, 1996.

3.A.Chakravarty, Elements of ordinary differential equations and special function, Wiley Eastern, 2001

S.G.Deo, V. Lakshmikantham and V.Raghavendra, Text Book of Ordinary differential equations, Tata McGraw Hill Publishing Company Limited,1997.

PGM 4542 / PSM 4542 **Algebra II** **6 hrs / 5cr**

Objective: The course will aim to provide a strong foundation in the abstract approach for the budding Mathematician. In this course the students will be introduced to the third algebraic model, a vector space, field theory, algebra of linear transformation and various types of operators.

One of the amazing features of twentieth century Mathematics has been its recognition of the power of abstract approach. Modern algebra has evolved with this abstract approach and is one of the important current research areas of Mathematics, and also serves as the unifying thread which interfaces all of Mathematics – geometry, number theory, analysis, topology and even applied Mathematics. These are potent and effective tools in all branches of Mathematics. These ideas trace its origin to topics in geometry and physics. The basic ideas in algebra are used in Functional Analysis, Complex Analysis, Operations Research, Computer Science, Physics and Chemistry.

Unit I: Field theory: extension fields, Roots of a polynomial, splitting field of a polynomial.

Unit II: Elements of Galois Theory, solvability by radicals.

Unit III: Introduction to vector spaces, linear transformation, the algebra of a linear transformation, Isomorphism, representation of transformation by matrices, linear functional, double dual spaces, and transpose of Linear transformation. .

Unit IV: Introduction, Characteristic roots and Characteristic vectors, annihilating polynomials, invariant subspaces, simultaneous triangulation and diagnolization, direct-sum decompositions, invariant direct sums and primary decomposition theorem.

Unit V: Inner product spaces, linear functional and adjoints, unitary operators and normal operators.

Text Books:

I.N.Herstein, Topics in Algebra, Vikas Publishing house, 2002.
Unit I: Chapter 5.1 to 5.5
Unit II: Chapter 5.6 to 5.8
K.Hoffman and R.kunze-Linear algebra, Prentice Hall,
2000. **Unit III:** Chapter 3.1 to 3.7
Unit IV: Chapter 6.1 to 6.8
Unit V: Chapter 8.2 to 8.5

Reference Books:

M.Artin-Algebra, Prentice Hall of India, 1994.
J.B.Fraleigh- A first course in Modern algebra, Addison Wesley Publishing house, 1990.
Surjeet Singh and Quazi Zameeruddin-Modern algebra, Vikas publishing house, 1991.

PGM 4544 / PSM 4544 **Real Analysis II** **6hrs/ 5 cr**

Objective: The aim of this course is to provide every Postgraduate student a comprehensive idea about the principles of real analysis. This course will provide such treatment. This course will give a comprehensive treatment of integration, uniform convergence and end up with the three important results of any fundamental course in analysis namely inverse function theorem, implicit function theorem and rank theorem. Algebra and Analysis are the two eyes of a main in the realm of Mathematics. Analysis takes a man into the highlands of mathematics itself, where these concepts are inseparable in all of pure mathematics as it is today. This course is a sea, which is primitive in appearance but has the capacity for vast and intricate development for an able mathematician. If analysis is one of the eyes of a man in the realm of mathematics, differentiation and integration are the two eyes of a man in the realm of analysis.

Real analysis is the foundation of pure mathematics and the ideas of real analysis are used in topology, functional analysis, complex analysis and measure theory. The students can apply the concepts studied in this course in Topology, Functional Analysis, Complex Analysis, Differentiation, Integration, Differential Equations and Measure Theory.

Unit I: The Riemann-Stieltjes integral, definition and properties of integral, integration and differentiation, rectifiable curves.

Unit II: Sequences and series of functions, Uniform convergence and continuity, uniform convergence and integration, uniform convergence and differentiation.

Unit III: Equi continuous families of function, Arzelo Ascoli theorem, Stone-Weierstrass theorem.

Unit IV: Some special functions, power series, exponential and logarithmic functions, trigonometric functions, Algebraic completeness of the complex field, Fourier series, gamma function.

Unit V: Functions of several variable, linear transformations, differentiation, contraction principle, inverse function theorem, implicit function theorem, rank theorem.

Text Book:

W.Rudin-Principles of Real Analysis, McGraw Hill, 2004.

Unit I: Chapter 6

Unit II: Chapter 7 (Sec 7.1 –Sec 7.5)

Unit III: Chapter 7 (Sec 7.6- Sec 7.7)

Unit IV: Chapter 8

Unit V: Chapter 9 (Sec 9.1 –Sec 9.6)

Reference Books:

M. Apostol-Mathematical Analysis, Addison Wesley Publishing house, 2010.

V.Ganapathy Iyer-Mathematical Analysis, Tata Mcgraw Hill, 1985.

R.R.Goldberg-Methods of Real Analysis, Oxford and IBH publishing house, 1975.

PGM 4446 / PSM 4446 **Graph Theory** **6 hrs/ 4cr**

Objective: Graph Theory is an important branch of Mathematics which has plenty of applications in almost all other fields such as Physics, Chemistry, Operations Research, Management, Sociology, Linguistics, Computer Engineering, Electrical Engineering, etc. This course covers all the basic concepts in Graph Theory namely trees, Eulerian and Hamiltonian graphs, Matching, vertex and edge coloring, Planar graphs and Applications of Graph theory in various fields.

The objective of the course is to give a complete introduction to Graph Theory and to cover very recent areas of Graph Theory, so that interested students can continue their research in this area.

Unit I: Fundamental Concepts – Introduction, Graphs, labeled Graphs, weighted Graphs, vertex degrees, isomorphism, paths, cycles, and trails, connectedness, bipartite graphs, Eulerian Circuits, graphic sequences, directed graphs, Eulerian digraphs, radius and diameter, subgraphs, operations on graphs, adjacency, incidence and path matrices.

Unit II: Trees and distances - basic properties, distances in trees and graphs, disjoint spanning trees, enumeration of graphs, decomposition and graceful labeling, minimum spanning trees, shortest paths.

Unit III: Eulerian graphs, Hamiltonian graphs, necessary and sufficient conditions, Hamiltonian sequences, Matching, maximum matching, Hall's theorem, independent sets and covers, Konig's theorem, maximum bipartite matching, weighted bipartite matching, Tutte's theorem, stable matching.

Unit IV: Connectivity and paths – cuts and connectivity, k-connected graphs, connectivity of digraphs, applications of Menger's theorem, maximum network flow.

Unit V: Coloring of graphs – vertex colorings and upper bounds, Brooks' theorem, structure of k-chromatic graphs, extremal problems and Turan's theorem, color-critical graphs. Edge coloring. Planar graphs - Embeddings and Euler's formula – dual graphs, Kuratowski's theorem (without proof), four colour conjecture, five colour theorem for planar graphs, face colouring.

Text Book:

J.A.Bondy and U.S.R.Murty – Graph Theory with Applications, Macmillan Co, 1976

Unit I: Chapter 1.1-1.8
Unit II: Chapter 2.1-2.5
Unit III: Chapter 4.1-4.4, 5.1-5.3
Unit IV: Chapter 3.1-3.3
Unit V: Chapters 6.1, 6.2, 7.1-7.3, 8.1-8.2, 9.1-9.6

Reference Books:

F. Harary – Graph Theory, Addison Wesley publishing house, 1972
R.Balakrishnan and K.Ranganathan – A text book of Graph Theory, Springer Verlag, 2000
G. Chartrand – Introductory Graph Theory, Dover publications, 1985
G. Chartrand and O. R. Oellerman – Applied and Algorithmic Graph Theory, Mcgraw Hill, 1993
M.Murugan – Topics in Graph Theory and Algorithms, Mudali publishing house, 2003,
Narasingh Deo – Graph Theory with Applications to Engineering and Computer science, Prentice Hall of India, 1984
K.R.Parthasarathy – Basic Graph Theory, Tata Mcgraw Hill, 1994
D. B.West – Introduction to Graph Theory, Prentice Hall of India, 2001.

PGM 4248 / PSM 4248 **Combinatorics** **4 hrs / 2cr**

Objective: Combinatorics is the branch of Mathematics studying the enumeration, combination, and permutation of sets of elements and the mathematical relations that characterize their properties. The objective is to introduce large variety of applications and how algorithmic approach can be applied to solve a combinatorial problem. This course will also initiate interest in the students in higher studies and research in applicable mathematics.

After completion of the course, the students will be able to:

Understand the techniques of combinatorial approach in a counting problem.

Explain the fundamental combinatorial structures that naturally appear in various other fields of mathematics and computer science.

Apply algorithmic approach to the solution of the problem.

Develop mathematical maturity.

Describe and solve some real time problems using concepts of combinatorics.

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Unit I: Two basic coutinng principles – Simple arrangement and selections – Arrangement and selection with repetitions.

Unit II: Distributions – Distribution of distinct objects – Distribution of identical objects – Binomial identities.

Unit III: Generating functions – Calculating coefficients of generating functions – Partitions – Exponential generating functions.

Unit IV: Recurrence relation – Solution of linear recurrence relations – Solutions of inhomogeneous recurrence relations.

Unit V: Inclusion and exclusion formula – Derangement – Introduction to rook polynomial.

Text book:

A.W.Tucker, Applied Combinatorics, Wiley, 2011.

Unit I: Section 5.1, 5.2, 5.3

Unit II: Section 5.4, 5.5

Unit III: Section 6.1, 6.2, 6.3, 6.4

Unit IV: Section 7.1, 7.3, 7.4, 7.5

Unit V: Section 8.2, 8.3 (page 335 -341)

Reference Books:

D.Cohen, Combinatorics, Wiley, 1978.

M.Hall, Combinatorial Mathematics, McGraw Hill, 1968.

C.L.Liu, Introduction to Combinatorial Mathematics, 1994.

H.J.Ryser, Combinatorial Mathematics, Carus Mathematical Monograph,1965.

Krishnamurthy, Combinatorics, PHI, 1998.

PGM 4250 / PSM 4250 Partial Differential Equations 4 hrs/ 2cr

Objective: To give an introduction to Mathematical techniques in analysis of Partial Differential Equations. Analyze the Linear and non Linear Partial Differential equations with certain methods. Also Discuss about their applications such as one dimensional wave equations and calculus of variation.

The learners can gain the knowledge about analysis of Partial Differential Equations, their characteristics and its applications.

Unit I :

Linear Equations of the first order – Integral Surfaces Passing through a given curve – Surfaces Orthogonal to a given system of surfaces – Nonlinear Partial Differential Equations of the first order – Cauchy's Method of Characteristics – Compatible systems of first order equations – Charpit's Method.

Unit II:

Linear partial differential equations with constant coefficient- Equations with variable coefficients - Characteristic curve of second order equation - Characteristics of equations in three variables - The solution of linear Hyperbolic Equations.

Unit III:

Separation of variables - Elementary solutions of Laplace equation - Families of equi-potential surfaces - Boundary value problems.

UnitIV:

Separation of variables - Problems with axial symmetry - Kelvin's inversion theorem - Thetheory of Green's functions for Laplace Equations - The Relation of Dirichlet's problem to the Calculus of Variation.

Unit V :

Elementary Solutions of the One – dimensional Wave equation – The Riemann-Volterra solution of the One- dimensional Wave equation – Vibrating Membranes: Application of the Calculus of the variations.

Text Book :

Sneddon IAN., "Elements of Partial Differential Equations", Mc Graw Hill Book Company,New York 1957; Republished by Dover in 2006.

Unit I: Chapter 2: Sec 4-10
Unit II: Chapter 3: Sec 4 – 8
Unit III: Chapter 4: Sec 2 – 4
Unit IV: Chapter 4: Sec 5 – 9
Unit V: Chapter 5: Sec 2 -4

Reference Books :

DennemeyerR.,"Introduction to Partial Differential Equations and Boundary Value Problems", McGraw Hill Book Company, 1968.

2.Pinsky M.A, "Partial Differential Equations and Boundary Value Problems", McGraw Hill Book Company, 3rd Edition, 1998.

3.Coleman P. M.,"An Introductionto Partial Differential Equations with MAT LAB", Chapman & Hall / CRC, 2005.

PGM 5541 / PSM 5541 **Topology** **6hrs/ 5cr**

Objective: The course will enable the students to master the basic concepts of topology. The course deals with various topics in topological spaces like compactness, connectedness, separation axioms, countability axioms and metrizability of topological spaces

The learner will be able to understand and appreciate that the Topological spaces are the generalization of the concept of metric spaces. The inherent complexity of topological spaces as the most abstract human imagination can be appreciated by the learner. The intrinsic and novel methods of proof adopted can be a source of inspiration for solving problems in every walk of life

Unit I: Topological Spaces, bases and sub bases, order topology, subspace topology, product topology, metric topology, closed sets and limit points, closure and interior, continuous functions and homeomorphisms

Unit II: Product topology, Metric topology, connected spaces, path connected spaces, locally connected spaces, components and path components

Unit III: Compact spaces, limit point compact spaces, sequentially compact spaces, count ably compact spaces, equivalence of various compactness in metric spaces, locally compact spaces, Alexandroff one-point compactification

Unit IV: Countability axioms, first countable and second countable spaces, separable and Lindelof spaces

Unit V: Separations axioms-Frechet, Hausdorff, regular, completely regular, normal and completely normal spaces, Uryzohn lemma, Uryzohn metrization theorem, Tietz extension theorem, Tychonoff theorem.

Text Book:

J.R.Munkres- Topology,2nd edition, Pearson New International edition, 2014.
Unit I: Chapter 2 (sec 12,13, 14, 15, 16,17, 18)
Unit II: Chapter 2 (sec 19, 20, 21), Chapter 3 (Sec 23,24 ,25)
Unit III: Chapter 3 (Sec 26, 27, 28, 29)
Unit IV: Chapter 4 (Sec 30, 31, 32)
Unit V: Chapter 4 (Sec 33, 34, 35, 37)

Reference Books:

G.F.Simmons-Introduction to topology and modern analysis, McGraw Hill,1963(2004)
S.T. Hu-Introduction to general topology, Tata McGraw Hill,1979
K.D.Joshi-Introduction to general topology, New Age International Publisher,2014.
J. Dugundji, Topology, William C. Brown Pub.,1966.
J.L.Kelley, General Topology, Van Nostrard,1955.

PGM 5543 / PSM 5543 **Complex Analysis** **6hrs/ 5cr**

Objective: The aim of this course is to gain an in depth knowledge in Complex Analysis, to have an understanding of concepts and techniques used in dealing with functions of complex variables and to facilitate on study of complex integration and series.

The learners will be able to know that how to apply the complex concepts like index and residue in screening tests.

Unit I: Elementary Properties and Examples of Analytic Functions: Power Series, Analytic Functions, Analytic Functions as Mappings, Mobius Transformations.

Unit II: Complex Integration: Power Series Representation of Analytic Functions, Zero's of Analytic Functions, The Index of a Closed Curve,Cauchy's Theorem & Integral Formula.

Unit III: The homotopic version of Cauchy's Theorem and Simple Connectivity, Counting Zeros, The Open Mapping Theorem, Goursat's Theorem.

Unit IV: Singularities: Classification of Singularities, Residues, The Argument Principle.

Unit V: The maximum Modulus Theorem: The maximum Principle, Schwarz's Lemma, Convex functions and Hadamard's Three Circles Theorem, Phragmen-Lindelof Theorem.

Text Book:

J.B.Conway, Functions of one complex variable, Narosa publishing house, 1973 **Unit I**: Chapter3: sections $1, $2, $3
Unit II: Chapter 4: sections $1, $2, $3,$4,$5
Unit III: Chapter 4: sections $6, $7,$8
Unit IV: Chapter 5: sections $1, $2, $3 and related problems
Unit V: Chapter 6: sections $1, $2, $3, $4

Reference books:

L.V.Ahlfors, Comples analysis, Mcgraw Hill, 1979
V.Karunakaran, Complex analysis, Narosa publishing house, 2002
S.Ponnuswamy, Foundations of Complex analysis, Narosa publishing house, 1997.

PGM 5545 / PSM 5545 **Statistics** **6hrs/ 5cr**

Objective: The Objective of this course is to develop an ability in the students to apply Statistical methods to real life problem, to understand the limitation of these methods, to think probabilistically and to generalize the statistical theory to several variables. The course deals with random variable, stochastically independence, distribution functions, conditional probability, standard theoretical distributions, sampling distributions, distributions of functions of random variable and limiting distributions.

Statistical tools are applied in all branches of science and humanities to verify and test various hypothesis, estimation of values of certain unknown parameters, to find the relation between two or more quantities, to find meaningful inferences from raw data. In this course statistics is not dealt as statistical methods, but as the mathematical foundation of interpretation of mathematical data with rigorous mathematical treatment.

Unit I: Probability Set functions – conditional probability, random variables (discrete & continuous), expectation of random variables – Chebyshev's inequality.

Unit II: Distribution of two random variables, conditional distribution and expectations, Correlation coefficient, independent random variables – extension to several random variables.

Unit III: Some special distributions- Binomial, Poisson, Gamma, Chi-square and Beta distributions, Normal and Multivariate normal distributions, t and F distributions.

Unit IV: Unbiasedness, consistency and limiting distributions. Expectation of function, convergence in probability, convergence in distribution – mgf technique, Central limit theorem.

Unit V: Sampling and statistics – Order statistics, confidence intervals for difference in means, confidence intervals for difference in proportions. Introduction to hypothesis testing. Statistical tests – Chi-squre tests.

Text Book:

Robert V. Hogg, Allen Craig, Joseph W. Mckean, Introduction to Mathematical Statistics, 6^{th} ed., Pearson Prentice Hall,2011.

Unit I: Chapter 1: Sec.1.3-1.10
Unit II: Chapter 2: Sec.2.1-2.7
Unit III: Chapter 3: Sec.3.1-3.6
Unit IV: Chapter 4: Sec.4.1,4.2,4.3.3.,4.4
Unit V: Chapter 5: Sec:5.1,5.2.1,5.4,5.5.5.7.

Reference Books:

1.J.E.Freund – Mathematical Statistics, Prentice Hall of India, 2000

2.SS.Wilks – Mathematical Statistics, John Wiley and sons,1962

3.S.C. Gupta and V.K. kapoor – Fundamentals of Mathematical Statistics, Sultan chand and co,2000.

4.T.Veerarajan, Fundamentals of Mathematical Statistics, Yes Dee Publishing Pvt.Ltd.2017.

PGM 5547 / PSM 5547 **Measure Theory** **6hrs / 5cr**

Objective: The aim of the course is to enable the student to understand the basic ideas of measure theory. The course deals with the concepts abstract measure spaces, abstract integration, Lebesgue measure, Lebesgue integration and the relation with Riemann integration and various types of convergence of sequence of measurable functions.Measure theory generalizes the concept of length, area, volume, summation and integration in a general setup. Modern treatment of probability theory and mathematical statistics heavily relies upon measure theory ideas. These ideas are also used in functional analysis. Both ideas from real analysis and topology are needed to understand measure theory.

The learners get ideas in sigma algebras, measure spaces, measurable functions, outer measures, decompositions of measures,product measures.

Unit I: Introduction – Lebesgue outer measure – Measurable sets – Regularity – Measurable functions – Borel and Lebesgue measurability.

Unit II: Integration of non-negative functions – Lebesgue integral – Fatou's lemma – Lebesgue monotone convergence theorem –The general integral– Lebesgue dominated convergence theorem –Integration of series – Riemann and Lebesgue integrals.

Unit III: The four derivates –Continuous Non– differentiable functions– Functions of bounded variation– Lebesgue's differentiation theorem–Differentiation and integration.

Unit IV: Measures and outer measures – Extension of a measure – Uniqueness of the extension– Completion of a measure – Measure spaces – Integration with respect to a measure.

Unit V: Signed measures and the Hahn decomposition – The Jordan decomposition–The Radon–Nikodym theorem (statement only)–Some applications of the Radon –Nikodym theorem.

Text book:

G.Debarra, Measure theory and integration, New age international,1996.
Unit I: Chapter 2 (except section 2.6)
Unit II: Chapter 3
Unit III: Chapter 4 (except section 4.6)
Unit IV: Chapter 5
Unit V: Chapter 8 (except section8.5)

Reference books:

P.R. Halmos, Measure theory, Springer international student edition, 1981
Royden, Real analysis, Macmillan, 1988.
W.Rudin, Real and complex analysis, Tata MC Graw Hill,1966.
Munroe, M.E.,Introduction to measure and integration –Addison Wesley, 1953.
I.K.Rana, An Introduction to measure and integration, Narosa Publishing House, 1997.

PGM 5349 / PSM 5349 Programming in C++ with OOPS 4hrs/ 3cr

Objective: The objective of this course is to enable the students to understand the fundamental concepts of Object - Oriented programming using C++ and to train them to apply these concepts in solving the real world problems.

Students are encouraged to write programs in C++ related to the problems they encounter in day-to-day life and validate in the computer lab.

Unit I: Introduction- Need for object oriented programming-Advantages of OOP-Basic concepts of OOP- Objects- Classes-Inheritance- Reusability- Polymorphism – Overloading-C++ console I/O commands- Tokens –Expressions – Control structures.

Unit II: Function Prototyping- Call by reference-Return by reference-Inline functions-Default arguments - Function overloading- Classes and objects- Static member functions –Arrays of objects- Friend function-Pointers to members- Constructors and Destructors functions.

Unit III: Operator overloading- Overloading unary and binary operators- Overloading binary operators using friend function-Manipulation of strings using operators-rules for overloading operators-Type conversion.

Unit IV: Inheritance- Single Inheritance –Multiple Inheritance –Multilevel Inheritance - Hierarchical and hybrid inheritance- Virtual base classes-Abstract classes-Constructors in derived classes-Nesting of classes.

Unit V: Polymorphism- Pointers- This pointer- Virtual functions-Pure virtual functions-Exception handling-Opening and closing a file- File pointers and their manipulations - Updating a file – Error handling during file operations.

Textbook:

Balagurusamy E., Object Oriented Programming with C++, PHI, 2008 **Unit I:** Sections :1.3-1.8,3.2-3.7, 3.13-3.19, 3.22, 3.24. **Unit II:** Sections : 4.2-4.11, 5.3-5.18, 6.2-6.11.
Unit III: Sections : 7.2-7.8.
Unit IV:Sections : 8.2-8.12.
Unit V: Sections :9.1-9.7, 11.1-11.9,13.2-13.7.

Reference books:

A. Chandra Babu & T. Joshuva Devadoss, Programming with C++, Narosha Publishing House Ltd. 2008

Herbert Schildt, Teach yourself C++, Osborne McGraw Hill, 1994.

Herbert Schildt, C++ Complete Reference, Osborne McGraw Hill, 1995.

Rajaram R, Object Oriented Programming and C++, New Age International Publications, New Delhi, 1997

Robert Latfore, Object Oriented Programming in Microsoft C++,Galgotia Publication, 1993.

PGM 5101 / PSM 5101 Programming in C++ with OOPS Lab 2hrs/ 1cr

Objective: The objective of the course is to learn the fundamental programming concepts and methodologies which are essential to build a C++ programs.

It enables them to write programs using these concepts and to practice them in the C++ programming language via laboratory experiences.

Programs using scanf and printf statements.

Programs using conditional statements.

Programs using looping statements.

Programs using functions (inline function, default arguments etc..)

Programs using the concept of function overloading.

Programs related to classes and objects.

Programs using static member function and arrays of objects.

Programs using the concept of friend and virtual functions.

Programs on Constructors and Destructors.

Programs on Operator overloading.

Programs related to Inheritance.

Basic programs on files.

PGM 5542 / PSM 5542 **Functional Analysis** **6hrs/ 5cr**

Objectives: The aim of the course is to enable the student to understand the basic ideas of functional analysis. The course deals with normed linear spaces, Banach spaces, Hilbert spaces, bounded linear functionals, operators and projections.

Functional analysis is an important area of pure mathematics which has wide range of applications in quantum mechanics, theoretical physics, control theory, approximation theory, and optimization techniques. The learner will be able to appreciate these advanced mathematical structures and its application various fields

Unit I: Normed Spaces, Continuity of Linear Maps, Hahn Banach theorems. Banach spaces.

Unit II: Uniform Boundedness Principle, Closed Graphs and Open Mapping Theorems, Duals and Transpose.

Unit III: Inner Product Spaces, Hilbert spaces, ortho normal sets, Approximation and Optimization, Projections and Riesz Representation Theorems.

Unit IV: Projections, Bounded Operators, Adjoint, Self Adjoint, Normal and Unitary Operators, orthogonal projections.

Unit V: Finite dimensional spectral theory.

Text Books:

B.V. Limaye, Functional analysis, Wiley Eastern 2015
Unit I: Chapter 2 (sec 5,6,7,8)
Unit II: Chapter 3 (sec 9, 10) , Chapter 4 (sec 13)
Unit III: Chapter 6 (sec 21, 22, 23, 24)
Unit IV: Chapter 7 (sec 25, 26)

G.F. Simmons, Introduction to topology and modern analysis, McGraw Hill, 1963(2004)
Unit V: Chapter 11(sec 60, 61)

Reference Books:

S. Ponnuswamy, Foundations of functional analysis, Narosa Publishing house, 2017.
W. Rudin, Functional Analysis, TataMcGraw-Hill Publishing Company, New Delhi, 1991,2nd reprint 2007.
G. Bachman and L. Naric, Functional Analysis, Academic Press, New York, 1966.
E. Kreyszig, Introductory Functional Analysis with Applications, John wiley & Sons, New York, 1978.

PGM 5544 / PSM 5544 **Classical Mechanics** **6 hrs / 5cr**

Objective : The aim of this course is to enable the students to know the basic principles of classical mechanics and its applications. Students have a deep understanding of the mechanics of a particle and the motion of a rigid body.

This course demonstrate knowledge and understanding of the following fundamental concepts in the mechanics of system of particles, motion of rigid body and the equations of motion for complicated mechanical systems using the Lagrangian and Hamiltonian formulation of classical mechanics. Students should acquire thorough knowledge both of the fundamentals and of significant contemporary research developments.

Unit I : Mechanics of a particle-Mechanics of a system of a particles-Constraints-D' Alembert's principle and Lagrange's equations.

Unit II : Hamilton's principle– Derivation of Lagrange's equations from Hamilton's principle.The Euler angles - The Cayley –Klein parameters and related quantities – Euler's theorem on the motion of a rigid body – Finite rotations.

Unit III : The rigid body equations of motion – Angular momentum and kinetic energy of motion about a point – Tensors and Dyadics – The inertia tensor and the moment of inertia. The heavy symmetrical top with one point fixed .

Unit IV : The equations of Canonical transformation - Examples of canonical transformation Poisson brackets and Canonical invariants. Equation of motion in Poisson bracket - Infinitesimal canonical transformation - the angular momentum Poisson brackets relations - Liouville's theorem.

Unit V : The Hamilton - Jacobi equation for Hamilton's principal function. The Harmonic Oscillator problem as example of Hamilton – Jacobi method, Hamilton's characheristic function – Separation of variables in Hamilton –Jacobi equation-Action angle variables – The Kepler Problems in Action-angle variables

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Text Book:

Classical Mechanics – H. Goldstein-Addison Wesley , 2nd edition, 2001.
Unit I : Chapter 1 : sec 1.1 to 1.4
Unit II : Chapter 2 :sec 2. 1 , 2.3 and Chapter 4 : 4.4 to 4.7.
Unit III : Chapter 5 :5.1 to5.3 and 5.7
Unit IV : Chapter 9 :9.1 , 9.2 9.4 9.5, 9.6, & 9.8
Unit V: Chapter 10 : 10. 1 to 10.4, &10.7.

Reference Books:

Principle of Mechanics – J.L.Synge and B.A.Griffith – McGraw Hill, 1949.
Classical Mechanics – D.E.Rutherford, Oliver Boyd Ltd, 1964.

PGM 5546 / PSM 5546 Statistical Inference & Stochastic Processes 6hrs/ 5cr

Objective: The Objective of this course is to develop statistical inference (estimation and testing) based on likelihood methods, to study measures of quality of estimators and its properties, optimal tests of hypotheses and Stochastic process.

This course can develop the knowledge of statistical inferences, stochastic processes, poisson process and related distribution.

Unit I: Maximum Likelihood Estimation, Rao-Cramer Lower Bound and efficiency, Multi parameter case-Estimation.

Unit II: Measures of quality estimators, Sufficient statistic for a parameter, properties of sufficient statistic, Completeness and Uniqueness, the exponential class of distributions, Functions of a parameter, Sufficiency, completeness and independence.

Unit III: Most powerful tests – UMP tests, likelihood ratio tests, the Sequential probability ratio test.

Unit IV: Stochastic processes- Specification of stochastic processes, stationary processes. Markov chains- definition and examples. Classification of states and chains. Determination of higher transition probabilities.

Unit V: Poisson process and related distribution – generalization of Poisson process. Birth and Death process, Markov process with discrete state span – Erlang process.

Text Books:

1.Robert V. Hogg, Allen Craig, Joseph W. Mckean, Introduction to Mathematical Statistics,

6^{th} ed., Pearson Prentice Hall,2011.

Unit I: Chapter 6: Sec.6.1- 6.5

Unit II:Chapter 7: Sec7.1-7.6, 7.9

Unit III: Chapter 8: Sec 8.1-8.4

J.Medhi, Stochastic Processes, Wiley Eastern Limited,1986

Unit IV: Chapter 2: Sec2.1-2.3; Chapter 3: Sec3.1-3.6

Unit V: Chapter 4: Sec.4.1-4.6

Reference Books:

1.J.E.Freund – Mathematical Statistics, Prentice Hall of India, 2000

2.SS.Wilks – Mathematical Statistics, John Wiley and sons,1962

3.S.K.Srinivasan , K.M. Mehata, Stochastic Processes, Tata McGraw Hill, 1988.

4.S.C. Gupta and V.K. kapoor – Fundamentals of Mathematical Statistics, Sultan chand and co,2000.

5.T.Veerarajan, Fundamentals of Mathematical Statistics, Yes Dee Publishing Pvt.Ltd.2017

6.Sheldon.M.Ross, Stochastic Processes, John Wiley & sons.

PGM 5548 / PSM 5548 **Operations Research** **6hrs/ 5cr**

Objective: This course deals with the theory of simplex method network models, dynamic and integer programming, and queuing theory, nonlinear programming and provide the mathematical basis behind these techniques.

The aim of this course is to help the students to understand and apply some of the widely used techniques of Operations Research.

Unit I: Theory of simplex method- Computational aspects of simplex method- Simplex method and transportation problem.

Unit II: Integer programming problem (Pure & mixed)- formulation- branch and bound method cutting plane method. Dynamic programming- Capital budgeting problem-Bellman principle-shortest route problem- knapsack problem.

Unit III: Network models- minimum spanning tree problem- shortest route problem- maximal flow problem- minimum cost capacitated problem.

Unit IV: Queuing theory- Queuing Models-Basic characteristic of queueing system-Steady state solution of morkovian queuing models-M/M/1, M/M/C with limited waiting space, M/G/1 Queuing models.

Unit V: Determining points of extrema for unconstrained and constrained functions (Optimality conditions)- Jacobian method- Lagrangian multiplier techniques- Kuhn Tucker optimality conditions- Nonlinear programming -Quadratic programming problem.

Text books:

Hadley – Linear Programming, Addison-Wesley Publishing Co.,1969.

Unit I: Chapter 3, 4, 9.3

H.A.Taha -Operations Research an introduction. Prentice Hall of India, 7th edition, 2003.

Unit II: Chapter 9.2, 9.2.1, 9.2.3, 10.1, 10.2, 10.3, 10.3.1.

Unit III: Chapter 6.1, 6.2, 6.3.1-6.3.3, 6.4(except 6.4.4), 6.5(except 6.5.4)

Unit IV: Chapter 17.6.6, 17.7, 17.7.1

Unit V: Chapter 20.1.1, 20.2 (pg: 719-729), 21.1.1 to 21.2.2

Reference books:

F.S.Hillier and G.J.Liebermann-Introduction to operations research, Mcgraw hill, 1995.

F.S.Hillier and G.J.Liebermann-Introduction to Mathematical programming, Mc Graw Hill, 1995

S.S.Rao-Optimazation, theory and applications. Wiley eastern,1977.

PGM 5450 / PSM 5450 **Project** **6hrs/4cr**

Objectives: The aim of this course is to train the students in literature collection and to gain experience for research. Students are encouraged to take it as a challenge, so that the result of the project shall be approved for publication in leading scientific journals.

Guidelines & Instructions:

The project work for M.Sc. Mathematics Program is to be undertaken during IV semester.

A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a jointsupervisor from the organization.

The student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

The Project work for M.Sc Mathematics shall be pursued for a minimum of 12 weeks during the final semester.

The deadline for submission of final Project Report is the last working day of the semester in which project / thesis / dissertation is done.

In case of candidates of M.Sc. Programmes not completing of project work successfully, the candidates can undertake again in the subsequent semester.

Evaluation:

The PG-Head of the Department and the supervisor shall constitute the review committee for each branch of study. The evaluation of Project Work for M.Sc. Mathematics shall be done independently in the respective semesters and marks shall be allotted as per the weightages given in tabular column. There shall be two reviews (each 10 Marks) during the semester by the review committee. The student shall make presentation on the progress made by him / her before the committee. The total marks obtained in the two reviews will be 20 Marks. The internal (Guide) will assess for 30 marks (Including the regular discussion, attendance and participation in Seminars/Workshops/Conferences). The project report (thesis / dissertation) shall carry a maximum 10 marks. The viva-voce examination shall carry 40 marks. (Marks are awarded to each student of the project group based on the individual performance in the viva – voce Examination).

Internal Assessment (50Marks)			**End Semester Examination (50 Marks)**			
Review -I	**Review -II**	**Internal (Guide)**	**Evaluation (10 Marks)**	**Viva – Voce (40 Marks)**		
			Internal (Guide)	**Examiner I**	**Examiner II**	**Examiner III**
10	10	30	10	40		

Review Committee members:

PG - Head of the Department
Supervisor/Guide.

PGM 4301 / PSM 4301 Programming in C 4 hrs (2T+2L) / 3cr

Objective: C has become the starting point for learning a course on programming language. This course is mainly designed to use C to learn the art of programming, and to appreciate and understand the C language to creatively write a wide range of programmes and peep into the study of Data Structures.

At the end of the course student will be able to:
Explain the process of problem solving using computer
Design an algorithmic solution for a given problem
Write a maintainable C program for a given algorithm.
Trace the given C program manually.

Unit I: Overview of C- basic structure – executing a C program - character sets – C tokens – keywords – identifiers - constants – variables – data types- declaration of variables.

Unit II: Operators and expressions- arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise, special operators- managing input and output operations- formatted input and output

Unit III: Decision making and branching –simple if – if … Else- nested if – else if ladder – switch statement –Goto statement.

Unit IV: Decision making and looping- while loop – for loop –do while loop – break, continue statements.

Unit V: Arrays - introduction – declaration initialization of one dimensional arrays – initializing two dimensional arrays - character arrays and strings – declaring and initializing string variables – string handling functions.

Text book:

E. Balagurusamy, Programming in ANSI C 6th edition, Tata McGraw Hill, 2013.
Unit I: Chapter 1: sec 1.1-1.10, Chapter 2 sec 2.1-2.10
Unit II: Chapter 3: sec 3.1-3.12, Chapter 4
Unit III: Chapter 5
Unit IV: Chapter 6: sec 6.1-6.5
Unit V: Chapter 7: sec 7.1-7.6, Chapter 8: sec 8.1-8.8

Reference books:

P. Pandiyaraja, Programming in C, S. Viswanathan Pvt Ltd, 2005.
Herbert Schildt, Advanced C programming, Osborne McGraw Hill, 1990.
M. Tim Grady, Turbo C Programming Principles and Practices, McGraw Hill, 1990.

PGM 4302 / PSM 4302 Mathematics for Career Prospects 4hrs/ 3cr

Objective: This course aims at providing necessary logical reasoning part which is required of post graduates, especially from arts disciplines, in order to get through in competitive exams like UGC-NET/SET. This course includes Mathematical reasoning, logical reasoning and Data interpretation ideas. The contents were put in order so that a student who had undergone this course will get enhanced with numerical and logical abilities.

After completion of the course, the students will be able to

Understand the techniques in solving mathematical reasoning problem

Get enhanced in numerical aptitude

Solve logical reasoning problem

Understanding data interpretations

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Unit I: Alphabetic series - Numerical series - odd man out - Inserting a number in a series- Completing a series- Ranking in a series - Time sequence test.

Unit II: Verbal reasoning- Problem solving by substitution - Interchange of signs and numbers- Deriving appropriate conclusions from given set of statements - Logical sequences of words - Venn diagram-based problems.

Unit III: Non-verbal reasoning- inserting the missing character - Five figure series - Analogy - Arithmetical reasoning - Analytical reasoning.

Unit IV: Logical reasoning - Two premise arguments - Three premise arguments - Statements and arguments-Statements and assumptions – Statements and course of actions-Statements and conclusions -Deriving conclusions from passages-Theme deduction -Cause and effect reasoning.

Unit V: Data interpretation- Tabulation - Bar graphs - Pie charts - Line graphs.

Text Books:

1. Dr.R.S.Aggarwal; A Modern Approach To Verbal and Non – Verbal Reasoning ;S.Chand and Company.Pvt.Ltd ,2013

Unit I: Part 1: Section 1. Chapters 1,11&12.

Unit II: Part 1: Section 1. Chapters 13&14.

Unit III: Part 1: Section 1. Chapter 15&16; Part 2: Chapter 1,2 &4.

Unit IV: Part 1: Section 2, Chapters 1 to 8.

2.R.S.Aggarwal, Quantitative Aptitude ,2008.

Unit V: Section 2, Chapters 36 to 39.

References books:

1.Dr.R.S.Aggarwal, A Modern Approach to Verbal Reasoning,S.Chand and Company Pvt.Ltd., 2006.

2.Dr.R.S.Aggarwal; A Modern Approach to Non – Verbal Reasoning S.Chand and Company Pvt.Ltd 2006.

Dr.R.S.Aggarwal; A Modern Approach to logical Reasoning ;S.Chand and Company Pvt. Ltd. 2013.

PGM 4303 / PSM 4303 Astronomy through Ages 4hrs/ 3cr

Objective: The course will concentrate on the celestial objects, various techniques used to fix an object in the sky, and the various parameters that help one to measure the distance of a star. The course also contains the laws governing the celestial bodies discovered by Keplar and Newton. The various phenomenon like eclipses and the waxing and waning of the moon, and the properties of different planets in the solar system, the development of calendar, and the astronomical instruments one uses to measure the celestial bodies are covered in the syllabus.

At the end of the course, the student will be able to admire and appreciate the universe we live in, and will be familiar with the constellations, and various interesting aspects of our universe.

Unit I: Celestial spheres: Celestial coordinates, Diurnal motion

Unit II: The earth: Zones of earth: Terrestrial Latitudes and Longitudes- Dip of Horizon-Twilight

Unit III: Time: Equation of time- Seasons- Calendar- Conversion of time

Unit IV: The Moon: Relation between sidereal and synodic months- Elongation-Phase of moon-Path of the moon with respect to the sun

Unit V: Eclipses: Solar eclipse- Lunar Eclipse-Ecliptic limits- Synodic period of the nodes of lunar orbit

Text book:

S. Kumaravelu, Susheela Kumaravelu,
Astronomy,2007 **Unit I**: Chapter 2-Page number 41-67
Unit II: Chapter 3-Page number 98-106, 113-116, 135-137, 144-146
Unit III: Chapter 7-Page number 220- 230, 237-242,244-255(simple problems)
Unit IV: Chapter 11-Page number 372-384
Unit V: Chapter 11-Page number 397-412

Reference Books:

Michael Zeilik-Astronomy The Evolving Universe- John Wiley & sons-1988
George O.Abell, David Morrison, Sidney C. Wolff- Exporation of the Universe- Saunders College Publishing,1987.

PGM 4304 / PSM 4304 Introduction to Statistical Tools 4 hrs/ 3cr

Objective: The objective of this course is to enable the students to learn about the statistical concepts of data collection, analysis, interpretation, and presentation of data to answer questions about the social world. Also, it includes the basic concept of correlation, regression analysis, hypothesis testing, analysis of variance.

Students will be familiar with the computer-based statistical software SPSS.

Unit I : Introduction to SPSS – Versions of SPSS – Data editor –SPSS viewer – SPSS smart viewer – Saving files and retrieving a file.

Unit II: Introduction to Statistics- Data types – Collection of data – Classification and tabulation of statistical data – Diagrammatic representation- Exploring data with graphs using SPSS.

Unit III: Concept of correlation coefficient – Data entry for correlation analysis using SPSS– Interpreting a simple regression on SPSS.

Unit IV: Introduction to Sampling — Problems related to t-test and chi square test using SPSS.

Unit V: Introduction to analysis of variance –Running one-way ANOVA on SPSS– Output from one-way ANOVA - Two-way ANOVA using SPSS– Output from two-way ANOVA.

Text Book:

Andy Field, Discovering Statistics using SPSS, Third edition, SAGE Publications Ltd, 2009.

Unit I: Chapter 3(sec. 3.1- 3.9)
Unit II: Chapters 1 &4(sec. 1.5 -1.7; 4.3-4.9)
Unit III: Chapters 6 & 7 (sec. 6.3,6.4,6.9; 7.2-7.4)
Unit IV: Chapters 9 & 18 (sec. 9.3-9.5; 18.5)
Unit V: Chapters 10 & 12 (sec. 10.2-10.4; 12.2-12.7).

Reference Books:

Marija.J.Norusis, SPSS for Windows Base system users guide release 6.0, SPSS Inc,'chicago,Illinois,2007.

S.Arumugam & A. Thangapandian Issac, Statistics, New Gamma Publishing House, 2004.

S.C.Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand &sons, 2007.