A.VEERIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE (AUTONOMOUS),
POONDI, THANJAVUR DIST.

Question Pattern for UG and PG Programmes for students to be admitted during 2014 – 2015 and afterwards

Total Marks: 75

QUESTIONS PATTERN

SECTION – A
(Question 1 to 10)

10 x 2 = 20 Marks

1. Short Answer Questions
2. Two Questions from each units (All are answerable)

SECTION – B
(Question 11 to 15)

5 x 5 = 25 Marks

1. 5 Paragraph type questions with "either / or" type choice.
2. One question from each unit of the Syllabus.
3. Answer all the questions.

SECTION – C
(Question 16 to 20)

3 x 10 = 30 Marks

1. 5 Essay type questions – any three are answerable.
2. One questions from each unit of the Syllabus.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
I	**14P1MAC1**	**Core - ALGEBRA**	**6**	**5**

Objectives:

- Group Theory is the fundamental building blocks for the Abstract algebra.
- To study the algebraic aspects of Real and complex numbers.
- Module is a third algebraic Model –Applicable to geometry and physics.

Unit I **18 Hrs**

Group Theory: Sylow's theorem –Direct products-Finite Abelian groups.

Unit II **18 Hrs**

Ring theory: Polynomial Rings-polynomials over the Rational Fields-polynomial Rings over Commutative Rings-Modules.

Unit III **18 Hrs**

Fields: Extension fields-Roots of polynomials-More about roots.

Unit IV **18 Hrs**

Fields: The Elements of Galois theory - Finite fields

Unit V **18 Hrs**

Linear transformations: The Algebra of Linear transformations, Hermition, Unitary and normal transformations-Real Quadratic Forms.

Text Book:

Topics in Algebra. I.N. Herstein 2nd Edition-Wiley Eastern Limited-1975.

Unit I : Chapter 2 (2.12 to 2.14)

Unit II : Chapter 3 (3.9 to 3.11) and Chapter 4(4.5)

Unit III : Chapter 5 (5.1, 5.3, 5.5)

Unit IV : Chapter 5 (5.6) and Chapter 7(7.1)

Unit V : Chapter 6 (6.1 ,6.10, 6.11)

General References:

1. *Algebra: Serge Lang*
2. *Modern Algebra: Vander worden vol.1& vol.2.Objective.*

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
I	**14P1MAC2**	**Core - REAL ANALYSIS**	**6**	**5**

Objectives:
- To introduce the motion of Reimann –stieltjes integral.
- To study the infinite series and infinite sequences of functions.
- To study the multivariate differential calculus.

Unit I **18 Hrs**

Riemann –Stieltjes. Integral: Introduction –Notation-The definition of the Riemann-Stieltjes integral-Linear properties-Integration by parts-Change of variable in a Riemann –integral –step functions as integrators –Reduction of a Riemann–Stieltjes integral to a finite sum-Euler's summation formula-monotonically increasing integrators. Upper and lower integrals –Additive and linearity properties of upper and lower integrals-Riemann's condition-Comparison theorems –Integrations of bounded variation-sufficient conditions for existence of Riemann –Stieltjes integrals-Necessary conditions for existence of Riemann –Stieltjes integral-Mean value Theorems for Riemann-Stieltjes integrals-the integrals as a functions of the interval-Second fundamental theorem of integrals calculus-Change of variable Riemann integral-Second Mean value Theorem for Riemann integrals-Riemann –Stieltjes integrals depending on a parameter-Differentiation under the integral sign-interchanging the order of integration.

Unit II **18 Hrs**

Infinite Series and Infinite Products: Introduction –Convergent and divergent sequences of complex numbers-Limit superior and limit inferior of a real-valued sequence-monotonic sequences of real numbers-Infinite series-inserting and removing parantheses-Alternating series-Absolute and conditional convergence-Real and imaginary parts of a complex series-Tests for convergence of series with positive terms. The geometric series- The integral test –The big oh and little oh notation –The ratio test and the root test-Dirichlet's test and Abel's test –partial sums of the geometric series Σz^n on the unit circle $|z|$.

Unit III **18 Hrs**

Sequences of Functions: -Point wise convergence of sequences of functions – examples of sequences of real –valued functions-Definition of uniforms convergence-Uniform convergence and continuity –The cauchy condition for uniform convergence–Uniform convergence of infinite series of functions-Uniform convergence and Riemann–Stieltjes intergration-uniformly convergent sequences that can be integrated term by term-Uniform convergence and differentiation-sufficient conditions for uniform convergence of a series - Mean convergence.

Unit IV **18 Hrs**

Multivariable Differential Calculus:-Introduction-The directional derivative-Directional derivatives and continuity The total derivative – The total derivative expressed in terms of partial derivatives -The matrix of a linear function –The Jacobian matrix-The chain rule-Matrix form of the chain rule-The mean value Theorem for differentiable functions-A sufficient condition for differentiability –A sufficient condition for equality of mixed partial derivatives Taylor's formula for functions from R^n to R^1

Unit V **18 Hrs**

Implicit Functions and Extremum problems:-Introduction-functions with nonzero Jacobian determinant-The inverse function theorem-The implicit function theorem-Extrema of real-valued functions of one variable-Extreme of real-valued functions of several variables..

Text Book:

Mathematical Analysis TOM M.APOSTOL Second Edition Narosa Publishing House-1985.

Unit I	:	Chapter 7 (7.1-7.25)
Unit II	:	Chapter 8(8.1-8.17)
Unit III	:	Chapter 9(9.1-9.6 , 9.8-9.11, 9.13)
Unit IV	:	Chapter 12 (12.1-12.5 and 12.7-12.14)
Unit V	:	Chapter 13 (13.1-13.6)

General References:

1. *I.I.HIRSCHMAN "infinite series". Holt.Rinehart and Winston, Newyork 1962.*
2. *K.Knopp,"Theory and applications of infinite series", Hafner, newyork, 1948.*
3. *Woll.J.W"functions of several variables Harcourt brace and world, Newyork 966.*
4. *Keotelman.H."Modern Theories of Integration "Oxford university press 1937*

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
I	**14P1MAC3**	**Core – ORDINARY DIFFERENTIAL EQUATIONS**	**6**	**5**

Objectives:

- Teaching the theory and applications to students preparing for advanced training in applied sciences and social sciences.
- Presenting in easy and lucid language the results of oscillations, boundary valued Problems (BVP) and elements of control theory.
- Justifying the inclusion of qualitative theory to students who think that it is out of place.
- Emphasizing the importance of the study of Boundary value problems, both in Mathematics and in the applied sciences.
- Studying about the stability of stationary solutions

Unit I **18 Hrs**

Systems of first order equations –Existence and uniqueness theorem-Fundamental matrix-Non –homogeneous linear systems-linear systems with constant coefficients-linear systems with periodic coefficients. Preliminaries-successive approximations-Picard's theorem –Non uniqueness of solutions-continuation and dependence on initial conditions-Existence of solutions in the large-Existence and uniqueness of solutions of systems.

Unit II **18 Hrs**

Fundamental results-Strurm's comparison theorem–Elementary linear oscillations-comparison theorem of Hille-Winter –Oscillation of $x''+a(t)x=0$ -Elementary nonlinear oscillations .

Unit III **18Hrs**

Introduction-Sturm- Liouville Problem-Green's functions Non-existence of solutions-picard's theorem.

Unit IV **18 Hrs**

n^{th} order equations –Elementary critical points-Critical points of nonlinear systems-linear systems with constant coefficients-linear systems with variable coefficients –second order linear differential equations.

Unit V **18 Hrs**

Introduction –Stability of quasi-linear systems - stability of autonomous systems-stability of non-autonomous systems-a special Lyapanov function.

Text Book:

Ordinary Differential equations and stability theory –S.G.Deo & V.Ragavendra

Unit I : Chapter 4 and 5
Unit II : Chapter 6
Unit III : Chapter 7
Unit IV : Chapter 8
Unit V : Chapter 9

General References:

1. *Differential equations with applications and historical notes –George F Simmons Tata McGraw Hill Ltd New Delhi 1972.*
2. *Theory of ordinary differential equations EA coddington, N .Levinson-tata McGraw Hill New Delhi 1982.*

Semester	Subject Code	Title of the paper	Hours of Teaching /Week	No. of Credits
I	**14P1MAC4**	**CORE - STOCHASTIC PROCESSES**	**6**	**5**

Objectives

- To introduce the basic concepts of Stochastic models.
- To learn the real life models such as Birth- Death processes.

Unit I **18 Hrs**

Notion of Stochastic processes- Specification of stochastic processes- Stationary Processes.

Unit II **18 Hrs**

Definition and Examples- higher Transition Probabilities- classification of states and chains.

Unit III **18 Hrs**

Determination of Higher Transition probabilities- Stability of a Markov System: Limiting Behaviour- Statistical inference for Markov Chains- Markov Chains with continuous state space- Non- Stationary or Non- homogeneous chains.

Unit IV **18 Hrs**

Poisson Process- Poisson process and Related Distributions- Generalisations of Poisson Process.

Unit V **18 Hrs**

Birth and Death process- Markov processes with Discrete state space (Continuous Time Markov Chains)- Erlang Process.

Text Book:

Scope and treatment as in stochastic process by J.Medhi (1982) – 2nd Edition

Unit I : Chapter 2: 2.1 to 2.3
Unit II : Chapter 3: 3.1 to 3.3
Unit III : Chapter 3: 3.4 to 3.8
Unit IV : Chapter 4: 4.1 to 4.3
Unit V : Chapter 4: 4.4 to 4.6

General References:

1. First course in Stochastic process by Samuel karlin.
2. Stochastic process by Srinivasan and Menta.

Semester	Subject Code	Title of the paper	Hours of Teaching/ Week	No.of Credits
I	**14P1MAEL1A**	**Elective - CLASSICAL DYNAMICS**	**6**	**4**

Objectives:
- Classical mechanics afford the student an opportunity to master many of mathematics techniques.
- It is certainly true that classical mechanics today is far from being a closed subject.
- Alternate means exist in the curriculum for acquiring the mathematics needed in other branches.

Unit I **18 Hrs**

INTRODUCTORY CONCEPTS: The mechanical systems-Generalized Coordinates-Constraints –Virtual work Energy and Momentum.

Unit II **18 Hrs**

LAGRANGE'S EQUATIONS: Derivation of Lagrange's Equations –Examples – Integral of the motion-Small Oscillations.

Unit III **18 Hrs**

SPECIAL APPLICATIONS OF LAGRANGE'S EQUATIONS: RAYLEIGH'S Dissipation Function-impulsive motion-Gyroscopic systems-Velocity-Dependent potentials.

Unit IV **18 Hrs**

HAMILTON'S EQUATIONS: Hamilton's principle –Hamilton's equations-other variational principles-Phase space.

Unit V **18 Hrs**

Hamilton's Principal function –The Hamilton-Jacobi Equation.

Text Book

"CLASSCIAL DYNAMICS" – DONALD T.GREENWOOD, Prentice Hall of India Private Ltd New Delhi - 110001(1979)

Unit I : Chapter 1-sec 1.1,1.2,1.3,1.4,1.5
Unit II : Chapter 2-sec 2.1,2.2,2.3,2.4
Unit III : Chapter 3 –sec 3.1,3.2,3.3,3.4,
Unit IV : Chapter 4 –sec 4.1,4.2,4.3,4.4
Unit V : Chapter 5-sec 5.1,5.2

General References:

Herbert Goldstein" Classical Mechanics" Second Edition Narosa Publishing House-New Delhi.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
I	**14P1MAEL1B**	**Elective – FLUID DYNAMICS**	**6**	**4**

Objectives:
- To introduce the behavior of fluid in motion.
- To study the application of complex analysis in the analysis of flow of fluids.

Unit I **18 Hrs**

Real fluids and ideals fluid –velocity of a fluids at a point-Streamlines and path lines: steady and unsteady flows-the velocity potential-The velocity vector-local and particle rates of change -The Equations of continuity –Worked examples –Accelerations of a fluids –Pressure at a point in a fluid at rest-Pressure at a point in moving fluids-Conditions at a Boundary of two invisid immiscible fluids –Euler's equations of motions-Bernoulli's equation-worked examples.

Unit II **18 Hrs**

Some flows involving axial symmetry –some special two-Dimensional Flows-impulsive Motion. Some three-dimensional flows: Introductions –sources, sinks and doublets –images in a rigid infinite plane- Axi-symmetric Flows: stokes stream functions.

Unit III **18 Hrs**

Some two-Dimensional Flows: meaning of a two-Dimensional flow-Use of cylindrical polar coordinates –The steam function –The complex potential for two Dimensional, irrotational, incompressible flow –complex velocity potentials for standard two-dimensional flows-some worked examples –The Milne-Thomson circle theorem and applications –The theorem of Blasius.

Unit IV **18 Hrs**

The use of conformal transformation and Hydro dynamical Aspects –stress components in real fluids –relations between Cartesian components of stress-Transnational motion of fluid element –The rate of strains Quadric and principal stresses-Some further properties of the rate of strains quadric-stress Analysis in fluid motion-Relations between stress and rate of strain-The coefficient of viscosity and laminar flow – the Navier-stokes equation of motion.

Unit V **18 Hrs**

Some solvable problems in viscous flow-steady viscous flow in tubes of uniform cross section –Diffusion of vorticity –Energy. Dissipation due to viscosity –steady flow past a fixed sphere –Dimensional Analysis; Reynolds Number-prandtl's Boundary layer.

Text Book: *Fluids dynamics by F.Chorlton (CBS publisher & Distributors, Delhi-110032) 1985.*

Unit I : Chapter 2.sec 2.1 to 2.9 and chapter 3.sec 3.1 to 3.6
Unit II : Chapter 3.sec 3.9 to 3.11 and chapter 4.sec 4.1, 4.2,4.3,4.5
Unit III : Chapter 5 sec 5.1 to 5.9 except 5.7
Unit IV : Chapter 5 sec 5.10 and chapter 8:Sec 8.1 to 8.9
Unit V : Chapter 8 sec 8.10 to 8.16

General References:

Fluids Dynamics –shanti swarup, Krishna prakasan mandir Meerut 1984

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
II	**14P2MAC5**	**Core – COMPLEX ANALYSIS**	**6**	**5**

Objectives:

- To introduce the students to the fascinating world of complex analysis which is different from analysis of real variable.
- To introduce the concepts of harmonic functions and elliptic functions.

Unit I **18 Hrs**

Harmonic functions: Definition and Basic properties –Mean-value property-Poisson's formula-Schwartz's theorem: Power series Expansion: weiertrass's theorem-Taylor series –Laurent's series:

Unit II **18 Hrs**

Partial fractional and Factorization: partial fractions–infinite products. Canonical products–Gamma function-Entire Functions: Jensen's formula–Hadamard's theorem. The Riemann zeta function: Products development-Extension of $\zeta(s)$ to the whole plane –Functional Equation –zeros of the zeta function.

Unit III **18 Hrs**

NORMAL FAMILIES:- Equi.-continuity-Normality and compactness –Arzela's theorem–Families of analytic functions-classical Definition. The Reimann mapping theorem–statement and proof-Boundary behaviour-Use of the Reflection principle-Analytic arcs. Conformal Mapping of Polygons; Behavior at an angle-Schwarz-Christoffel formula-Mapping on a Rectangle-Triangle functions of Schwarz.

Unit IV **18 Hrs**

Functions with the mean value property–Harnack's principle-The Dirichlet problem and Analytic Continuation Sub harmonic Functions-solution of Dirichlet's problem.

Unit V **18 Hrs**

Elliptic Functions:-Simply Periodic Functions-Representation by exponentials –Fourier Development-Functions of finite order. Doubly Periodic functions: period module unimodular transformations –canonical Basis-General properties of Elliptic Functions. The Weisertrass theory–weierstrass p-function. Functions $\zeta(z)$ and $\sigma(z)$ –differential Equation.

Text Book:

Lars V.AHLFORS,(1979),"complex Analysis–An Introduction to the theory of Analytic Functions of one complex variables"-third Edition –McGraw-Hill book company-New Delhi.

Unit I : Chapter 4-sec6:
Unit II : Chapter 5-sec2 (2.1-2.4): sec3 and sec 4
Unit III : Chapter 5-sec 5 chapter6- sec 1 and sec2
Unit IV : Chapter 6 Sec 3 and 4.
Unit V : Chapter 7 sec1, sec 2,sec3 (3.1 to 3.3)

General References:

1. *John B.Conway (1980)"Functional of one complex variable"-Narosa Publishing House; New Delhi.*
2. *Thomas m. Macrobert (1966),"Functional of a complex variable"-Macmillan and Co.,Let.,New York.*

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
II	**14P2MAC6**	**Core - PARTIAL DIFFERENTIAL EQUATION**	**6**	**5**

Objectives:
- To introduce notion of partial differentiated equations.
- To give an awareness about methods of integral transforms.
- To study boundary value problems

Unit I **18 Hrs**

Partial Differential Equations –Cauchy's problem for First –order Equations-linear Equations of the first Order-Integral surfaces passing through a given curve-surfaces orthogonal to a given system of surfaces-compatible systems of First-order Equations-Charpit's Method-Jacobi's method.

Unit II **18 Hrs**

Linear Partial Differential Equations with constant coefficients-Equations with Variable coefficients –Characteristic Curves of second-order Equations-Separation of Variables –The method of Integral Transforms.

Unit III **18 Hrs**

Elementary Solutions of Laplace's Equation-Families of Equipotential Surfaces – Boundary Value Problems-Separation of Variables-Kelvin's inversion Theorem-The theory of Green's Function for Laplace's Equations.

Unit IV **18 Hrs**

The occurrence of the wave equation in Physics-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 variations-General solutions of the wave equation.

Unit V **18 Hrs**

The resolution of Boundary value problems for the Diffusion Equation-Elementary solutions of the Diffusion Equation-Separation of Variables –The use of Integral transforms –The use of Green's functions.

Text Book:- Elements of Partial Differential equations-Ian Sneddon, International Student edition

Unit I : Chapter 2:secs 2.1,2.3 to 2.6,2.9,2,10,2.13
Unit II : Chapter 3:secs 3.4,3.5,3.6,3.9,3.10
Unit III : Chapter 4: Sec 4.2, to 4.5 ,4.7,4.8
Unit IV : Chapter 5:5.1 to 5.4,5.6
Unit V : Chapter 6:secs 6.2 to 6.6

General References :

1. *Partial Differential Equation* 3rd Edition, John F., Narosa 1979.
2. Introduction to partial Differential Equation second Edition, K.Sankara Rao, Prentice-Hall of India 2005.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
II	**14P2MAC7**	**Core –MATHEMATICAL METHODS**	**6**	**5**

Objectives:

- To introduce the notion of Fourier Transform and to study its properties
- To discuss the calculus of variations.
- To discuss linear integral equation and its application.
- To discuss some of the applications of ordinary differential equations.

Unit I **18 Hrs**

Fourier transform–integral formula–complex transform–cosine–sine–transform property–linearity change of scale, shifting– modulation theorem – Finite Fourier Transforms – Finite Fourier sine and cosine transform–Inversion formula for sine and cosine transform.

Unit II **18 Hrs**

Calculus of Variations – Euler's equation – Euler'sequation for more general case – variational problems in Parametric form – Some Applications - Elementary problem with moving boundaries and special functional.

Unit III **18 Hrs**

Linear integral equations – Definition Regularity conditions – special kinds of kernels – Eigenvalues and Eigen functions – convolution integral – The inner or scalar product of two functions – Notation – reduction to a system of Algebraic Equations – Examples – Fredholm Alternative – Examples.

Unit IV **18 Hrs**

Method of successive approximations – Iterative scheme – Examples – Volterra integral Equation – Examples – some results about the Resolvent Kernel. Classical Fredholm Theory – The method of solution of Fredholm – Fredhom's first theorem.

Unit V **18 Hrs**

Application to ordinary differential equations–Initial value problems-boundary value problems – examples – singular integral equations – The Abel integral equations– Examples.

Textbook:

1. *For unit I, Integral transforms – A.R. Vasistha and R.K. Gupta, Krishna Prakashan media (P) Ltd, Meerut (2002)*
2. *For unit II, Differential Equations and Calculus of variations – L. Elsgolts, Mir Publications, Moscow.(1980)*
3. *For unit III,IV,V, Linear Integral Equations Theory and Techniques – Ram Kanwal, Academic Press (1971).*

Unit I :Chapter 6 (sections 6.3 to 6.15), Chapter 7 (sections 7.1 to 7.4)
Unit II : Chapter 6, 7(sections 7.1 and 7.2 only)
Unit III : Chapter 1 and 2 (Sections 2.1 to 2.4 only)
Unit IV : Chapter 3 and 4 (sections 4.1, 4.2, 4.3 only)
Unit V : Chapter 5 (sections 5.1, 5.2, 5.3) Chapter 8 (sections 8.1 , 8.2).

General References:

Mathematical methods, M.C.Potter and J.Goldberg, Prentice Hall of India, New Delhi. 1988.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
II	**14P2MAC8**	**CORE OPTIMIZATION TECHNIQUES**	**6**	**5**

Unit I **18 Hrs**

Integer programming problem: Gomory's All-IPP method – Gomory's mixed integer method – Branch and Bound method.

Unit II **18 Hrs**

Dynamic programming: The recursive equation approach – characteristics of Dynamic programming – Dynamic programming algorithms – The solution of L.P.P. by Dynamic programming.

Unit III **18 Hrs**

Non Linear Programming Problem: General Non-LPP – Problems of Constrained maxima and minima – graphical solution – Kuhn Tucker Condition (non negative constraints) – Quadratic Programming – Wolfe's modified simplex method.

Unit IV **18 Hrs**

Queuing Theory: Queuing system – characteristic of queuing system – symbols and notations – Poisson process of exponential distribution – classification of queues – definition of transient and steady states – Poisson queues – non-Poisson queuing systems – the M/G/1 Queuing system

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Unit V **18 Hrs**

Inventory Control: Reasons for Carrying Inventory – Types of Inventory – The Inventory Decisions – Economic Order Quantity – Deterministic Inventory Problem – EOQ Problem with Price-Breaks – Multi-item – Deterministic Problem

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Text Book:

Problem in operations Research: PK Gupta & ManMohan (Relevant portions only)

Reference:

Operations Research: Kantiswarup, PK. Gupta and ManMohan.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
II	**14P2MAEL2A**	**Elective – MATHEMATICAL PROBABILITY**	**6**	**4**

Objectives:

- A property constructed course in probability should in deed make substantial use of these and other allied disciplines.
- Probability is still distinct from its tools and it's applications not only in the final results achieved but also in the manner of proceeding.
- A basic course in probability should offer a broad perspective of study and research.
- Students acquire knowledge of ideas and practice in methods and dwell with them long and deeply enough to reap the benefits.

UNIT I **18 Hrs**

Measure theory-Classes of sets. Singular distributions Probability measures and their distribution functions.

UNIT II **18 Hrs**

Random Variables –Expectation-Independence-General Definitions-Properties of mathematical expectation-Independence.

UNIT III **18 Hrs**

Convergence concept-Various modes of convergence –Almost sure convergence – Borel-Cantelli lemma-Vague convergence-continuation –Uniform integrability – convergence of moments.

UNIT IV **18 Hrs**

Law of large numbers and random series-simple limits theorem's –weak law of large numbers-convergence of series –strong law of large numbers.

UNIT V **18 Hrs**

Characteristic function-General properties-convolutions-Uniquess and inversion-convergence theorems.

Text Book

A course in Probability Theory-Second Edition-by Kai Lai Chung, Academic Press, New York *(1974)*

Unit I : Chapter 2
Unit II : Chapter 3
Unit III : Chapter 4
Unit IV : Chapter 5(sec 5.1 to 5.4 only)
Unit V : Chapter 6(sec 6.1 to 6.3 only)

General Reference:

Modern Probability theory –BR.Bhat, Willy Eastern Limited (1989).

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
II	**14P2MAE2B**	**Elective** **MATHEMATICAL MODELLING**	**6**	**4**

Objectives:

- To discuss population Models.
- To. Study mathematical models for epidemic diseases.
- To discuss mathematical models for genetics behavior.
- To discuss mathematical models in Pharmacokineties.

Unit I **18 Hrs**

Microbial population models, single-species, non –age-structured population models.

Unit II **18 Hrs**

Age-structured population models.

Unit III **18 Hrs**

Epidemic models.

Unit IV **18 Hrs**

Models in genetics.

Unit V **18 Hrs**

Mathematical models in Pharmacokinetics

Text Book:

Mathematical models in Biology and Medicine By J.N Kapur, Affiliated East –West Press Pvt. Ltd., New Delhi

Unit I : Chapter 2,3
Unit II : Chapter 4
Unit III : Chapter 8
Unit IV : Chapter 9
Unit V : Chapter 10

General References:

1. *Mathematical Modelling J.N Kapur Wiley Eastern Ltd New Delhi.*
2. *Theory of Ordinary Differential Equations with Equations with applications in biology and Engineering Ahmad & Mohana Rao Affiliated East-West Pvt Ltd New Delhi, (1999).*

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
III	**14P3MAC9**	**Core - GENERAL TOPOLOGY**	**6**	**5**

Objectives:

- The subject of topology is of interest in its our right and it also serves to lay the foundations for future study in analysis, in Geometry and in Algebraic Topology.
- To develop the students abilities through hard thinking.
- To train the students to develop analytical thinking.

Unit I **18 Hrs**

Topological spaces –Basis for a Topology –order Topology –Product topology on XxY –subspace Topology-closed sets and limits points-continuous functions.

Unit II **18 Hrs**

Product topology- Metric Topology-Metric Topology (continued)-Connected Spaces.

Unit III **18 Hrs**

Compact Space-Compact sets in the real line-Limit point Compactness.

Unit IV **18 Hrs**

Countability axioms-Separation axioms-Urysohn lemma.

Unit V **18 Hrs**

Urysohn metrization theorem-Tychonoff theorem-Complete metric Spaces**.**

Text Book:

"Topology-A First Course - James R. Munkres Prentice-Hall of India Private limited New Delhi (1975)

Unit I : Chapter 2 (Section 2.1 to 2.7)

Unit II : Chapter 2 (Sections 2.8, 2.9, 2.10) Chapter 3 (sections 3.1)

Unit III : Chapter 3 (Sections 3.5 to 3.7)

Unit IV : Chapter 4 (sections 4.1 to 4.3)

Unit V : Chapter 4 (Section 4.4), Chapter 5 (Sec 5.1),Chapter 7 (Sec 7.1)

General References:

Introduction to general topology S.T.Hu Tata Mcgraw hill Company New Delhi 1979.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No. of Credits
III	**14P3MAC10**	**Core - PROGRAMMING IN C++**	**6**	**3**

Objectives:

- C++ is an extension of C language that is widely used on many machines.
- It is a powerful modern language that combines the power, elegance and flexibility of C and the features of object oriented programming.
- With its object-oriented capabilities such as data abstraction, inheritance and Polymorphism, C++ offers significant software engineering benefits over C.

Unit I **18 Hrs**

Beginning with C++ What is C++ ? -Applications of C++.A simple C++ program-Structure of C++ program –creating the source file-compiling and linking-tokens, Expressions and controls structures –introduction-Tokens -keywords-identifiers-Basic data types-User defined data types-Derived data types-declaration of variables –reference variables.

Unit II **18 Hrs**

Operation in C++-Manipulators-Type cast Operator-Expressions and implicit conversions-operator overloading-Operator precedence-control structures. Functions in C++ Introduction-.The main function-Functions prototyping call by reference –return by reference-function overloading-Friend and virtual functions.

Unit III **18 Hrs**

Class and object- Introduction- C structures revisited- A C++ program with class-Arrays with in a class- static member function-Arrays of objects- Returning objects-constant Member functions-pointers to members

Unit IV **18 Hrs**

Constructors and Destructors-Introduction - constructors - parameterized constructors - Multiple constructors in a class – Copy constructors-dynamic constructor – constructing Two-dimensional arrays-Destructors-operators overloading and type conversions-Introduction-Defining operator over loading-manipulation strings using operations - type conversions.

Unit V **18 Hrs**

Inheritance: Extending classes-Introduction-Defining derived classes-Single inheritance-Multiple inheritance-virtual base classes-Abstract classes-Member classes: nesting of classes.

Text Book:

Object Oriented Programming with C++ by E.Balagurusamy, Tata Mcgraw Hill Publishing Company Ltd., New Delhi (1995).

Unit I : Chapter 2 (2.1-2.8) and Chapter 3 (3.1-3.12)
Unit II : Chapter 3 (3.13-3.22) and Chapter 4 (4.1-4.10)
Unit III : Chapter 5 (5.1-5.18)
Unit IV : Chapter 6 (6.1-6.10) and Chapter 7 (7.1-7.8)
Unit V : Chapter 8 (8.1-8.12)

General References:

The C language trainers with C graphics and C++ J.Jayasri-willey eastern Ltd Madras 1993.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
III	**14P3MAC11**	**Core - DIFFERENTIAL GEOMETRY**	**6**	**4**

Objectives:
- Presenting the fundamental conceptions of the theory of curves and surfaces
- Stressing the properties of a surface in relation to the surrounding space.
- Real praising the general theory of surfaces.
- Studying the intrinsic properties of the surfaces.

Unit I **18 Hrs**

Analytic representation –Arc length, tangent –Osculating plane-Curvature – Torsion-Formulas of Frenet-contact-Natural Equations –Helices.

Unit II **18 Hrs**

General Solution of the natural equations-Evolutes and involutes –Analytical representation –First fundamental Form-Normal, tangent plane.

Unit III **18 Hrs**

Developable surfaces-second fundamental form, Meusnier's theorem-Euler's theorem –Dupin's indicatrix-Some surfaces –A Geometrical interpretation of asymptotic and curvature lines-conjugate directions.

Unit IV **18 Hrs**

The equations of Gauss Wiengarten –The theorem of Gauss and the equations of Codazzi-curvilinear coordinates in space-Some applications of the Gauss and the codazzi equations-The fundamental theorems of surface theory. (Proof of the theorem is omitted)

Unit V **18 Hrs**

Geodesic (tangential) curvatures – Geodesics - Geodesic coordinates.

Text Book:

Lectures on Classical Differential Geometry – D.J. Struik, Addition – Wesley Publishing company

Unit I : Chapter 1 (Section 1.1 to 1.9)
Unit II : Chapter 1 (Section1.10.1.11, 2.1 to 2.3)
Unit III : Chapter 2 (Sections 2.4 to 2.10)
Unit IV : Chapter 3 (Sections 3.1 to 3.6)
Unit V : Chapter 4 (Section: 4.1-4.3)

General References:

1. *An introduction to differential geometry T.J.willmore Oxford University press Bombay 1989.*
2. *Three dimensional differential geometry PP.Gupta & G.S. Malik, pragti prakasan. Meerut 1981.*

Semester	Subject code	Title of the paper	Hours of Teaching / Week	No.of Credits
III	**14P3MACPL**	**Core – Programming in C++ Practical**	**6**	**2**

1. Write a function in C++ to generate a Fibonnaci Series of n Number.

2. Develop a program in C++ to find the largest of any three numbers Using Marco Definition.

3. Create a class called time that separate in member data for hours, minutes and seconds .one constructors should initialize data to 0,and another should initialize it to fixed values. A member function should display in 11:59:59 format. The final member function should add two objects of type passed as arguments. A main() program should create two initialized time objects and one that is initialized. Then it should add the two initialized values together ,leaving the result in the third time variable. Finally it should display the value of this third variable.

4. Develop an object oriented program in C++ to create a database of the following items of the derived class.
   a. Ward number b. Name of the patient
   c. Sex d. Age
   e. Bed Number f. Nature of the illness
   g. Date of Admission.

   Design a base class consisting of the data members namely, name of the patients, sex and age. Another base class consists of ward numbers, bed number and nature of illness .The derived class consists of the data member date of Admission. Design a virtual class for the data member ,namely, name of the patient, sex and age.

5. Create a generic base class called building that stores the number of floors of a building has the numbers of rooms, and its total square footage. Create a derived class called house that inherits building and also stores the number of bedrooms and the number of Bathrooms.Next, create a derived class called office that inherits building and also stores the number of fire extinguisher and the number of telephones.

6. Write a program in C++ using function overloading to read two matrices of different data such as integers and floating-point numbers. Find out the sum of the above two matrices separately and display the total sum of these arrays individually.

7. Create a class FLOAT that contains one float data member. Overload all the four Arithmetic operators so that they operated on the objects of FLOAT.

8. Write an object-oriented program in C++ to read an integer number and find the sum of all digits until it reduces to a single digit using constructor, Destructor, Default Constructor and inline member functions.

9. Write a C++ program to add two complex numbers and display all the three number.

Semester	Subject Code	Title of the paper	Hours of Teaching/ Week	No. of Credits
IV	**14P4MAC12**	**Core - FUNCTIONAL ANALYSIS**	**7**	**5**

Objectives:

General knowledge- Banach spaces and Factor spaces – Hahn Banach theorem
To study about convergences, Hilbert spaces and Bessel's inequality.
To study about complete orthonormal sets.
To study about convergences in L(X,Y)–Uniform bounded ness and closed graph Theorem and Banish Algebra.

Unit-I **21 Hrs**

Banach spaces, equivalent norms, and Factors spaces: The Holdr's and Minkowski inequalities-Banach spaces and Examples-The completion of Normed Linear spaces-Generated Subspaces and Closed Subspaces- Equivalent norms and Reisz theorem.

The Hahn-Banach theorem: The Hahn-Banach theorem - Bounded Linear Functionals - The Conjugate Spaces.

Unit II **21 Hrs**

Commutative Convergence, Hilbert spaces and Bessel's Inequality. Commutative convergence-Norms and inner products on Cartesian products of normed and Inner products spaces – Hilbert Spaces – A Non Separable Hilbert space – Bessel's inequality - some results from L2 $(0, 2\pi)$ and the Riesz –Fischer Theorem – Complete Orthonormal sets – Parseval's identity- A complete Orthonormal set for L_2 $(0, 2\pi)$

Unit III **21 Hrs**

Complete orthonormal sets: Complete orthonormal sets and parseval's identity – the cardinality of complete orthonormal sets-A Note on the structure of Hilbert spaces – closed subspaces and the projection theorems on Hilbert spaces.

Unit IV **21 Hrs**

Weak convergence and Bounded linear transformation: Weak convergence – Bounded linear transformation. **Convergence in L(x, y) and the principle of uniform Bounded ness** - Closed Transformation and The closed graph Theorem. Convergence in L(x, y) - The Principle of Uniform Boundedness - some Consequences of uniform Bounded ness.

Unit V **21 Hrs**

Introduction to Banach Algebras – Analytic Vector Valued Functions – Normed and Banach Algebras – Banach Algebras with identity – An Analytic Function - The Resolvent operator – Spectral Radius and The Spectral Mapping Theorem for polynomials.

Text Book:

"Functional Analysis"-George Bachman and Lawrence Narici Academic press, New york – 1966.

Unit I : Chapter Chapter 8 (8.1 to 8.5), Chapter 11 (11.1 to 11.3)

Unit II : Chapter 9(9.1 to 9.9)

Unit III : Chapter 10 (10.1 to 10.4)

Unit IV : Chapter14(14.1 and 14.2) Chapter 15(15.1 to 15.3)

Unit V : Chapter 19(19.1 to 19.5)

General References:

1. Bose,S.C. Introduction to functional Analysis, Macmillan India Limited, Delhi, 1992.
2. Walter Rudin: Functional Analysis.Tata McGraw Hill Publishing Co., News Delhi, 1995
3. Simmons G.F: Introduction to Topology & Modern Analysis, International Student Edition McGraw Hill Kogakusha Ltd., 1963.

Semester	Subject	Title of the paper	Hours of Teaching/ Week	No. of Credits
IV	**14P4MAC13**	**Core - Number Theory**	**6**	

Unit I **18 Hrs**

Fundamentals of Congruences: Basic properties of Congruences – Residue – Riffling. Solving Congruences: linear Congruences – the Theorems of Fermat and Wilson Revisited – the Chinese remainder Theorem – Polynomial Congruences.

Unit II **18 Hrs**

Arithmetic functions: Combinatorial Study of ϕ (n) – Formulae for d(n) and σ (n)- Multiplicative arithmetic functions – The Mobius inversion formula. Primitive roots: Properties of reduced residue systems – Primitive roots modulo p.

Unit III **18 Hrs**

Quadratic residues: Euler's Criterion-the Legendre symbol - the quadratic Reciprocity law – Applications of the Quadratic reciprocity law. Distribution of Quadratic residues: Consecutive residues and non residues-consecutive triples of Quadratic residues

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Unit IV **18 Hrs**

Sums of squares: Sums of two squares - Sums of four squares. Elementary partition theory: Introduction - graphical representation – Euler's partition theorem – searching for partition identities.

Unit V **18 Hrs**

Partition generating functions: Infinite products as generating functions - Identities between infinite series and products. Partition identities: History and introduction – Euler's Pentagonal number theorem - The Roger's Ramanujan identities - series and product identities.

Text Book:

Scope and treatment as in "Number Theory" by George E.Anderews, Hindustan Publishing Corporation(India) Delhi - 110 007 (1989).

Unit I : Chapters IV and V

Unit II : Chapters VI and VII

Unit III : Chapters XI and X

Unit IV : Chapters XI and XII

Unit V : Chapters XIII and XIV

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No.of Credits
IV	**14P4MAC14**	**Core - CRYPTOGRAPHY**	**7**	**5**

Objectives:

- To provide Techniques for keeping information secret.
- To provide Techniques for determining that information has not been tampered With.
- To provide Techniques for determining who authored pieces of information.
- To provide various principles, techniques and algorithms of interest in cryptographic practice.
- To provide techniques for non- reputation in message transmission.

Unit I **21 Hrs**

Simple Cryptosystems-Enciphering Matrices

Unit II **21 Hrs**

Idea of Public Key Cryptograph-RSA-Discrete Log.

Unit III **21 Hrs**

Knap- sack Pseudoprimes- Rho method.

Unit IV **21 Hrs**

Fermat factorization and factor bases- Continued Fraction Method.

Unit V **21 Hrs**

Basic Facts- Elliptic curve Cryptosystems-Elliptic curve factorization.

Text Book:

N. Koblitz, " A Course in Number Theory and Cryptography", Springer-Verag, New York, 1987.

Unit I : Chapter III, Sec 1-2
Unit II : Chapter IV, Sec 1-3
Unit III : Chapter IV - Sec 4 and Chapter V Sec 1 and 2
Unit IV : Chapter V –Sec 3 and 4
Unit V : Chapter VI Sec 1-3

General References:

1. *D.R.Stinson, "Cryptography", CRC Press, New York, 1995.*
2. *A.J Meneze, P.R.Oorche and S.A Vans ton " hand book of applied Cryptography", Crc Press New York, 1995.*

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
IV	**14P4MAEL3A**	**Elective - ADVANCED NUMERICAL ANALYSIS**	**6**	**4**

Unit I **18 Hrs**

Transcendental Polynomials equations: Introduction; methods based on first and second degree equation: secant method – Newton Raphson method – Muller method – Chebyshev method – Rate of convergence. Polynomials Equations: Birge-vieta method – Bairstow method – Graeffe's root squaring method.

Unit II **18 Hrs**

System of linear algebraic equation and Eigen values problems:Jacobi iteration method, Gauss – seidel iteration method Successive over relaxation method. Eigen values and vectors.

Unit III **18 Hrs**

Interpolation and approximation – Hermite Interpolation – Bivariate interpolation – Lagrange bivariate interpolation – Newton's bivariate Interpolation for equispaced points - approximations – least squares approximation – Gram-Schmidt orthogonalizing process – Chebyshev polynomials.

Unit IV **18 Hrs**

Numerical integration; methods based on interpolation – Newton-cotes methods – trapezoidal rule – Simpson's rule - methods based on undetermined coefficients – Gauss-Legendre integration methods – Labotto integration method – Radau integration method and Gauss-Chebyshev integration methods.

Unit V **18 Hrs**

Ordinary Differential equations: Numerical methods – Euler method – Backward Euler method – midpoint method – Taylor series method – Runge-kutta methods – implicit Runge-kutta methods.

Text Book:

Numerical methods for Scientific and Engineering computation By M.K.Jain, S.R.K.Iyengar, R.K.Jain III – Edition.

Unit I : Chapter – 2 Sections 2.3, 2.4, 2.5, 2.8

Unit II: Chapter– 3 Sections 3.4, 3.5, 3.6.

Unit III : Chapter – 4 Section 4.5, 4.7, 4.8.

Unit IV : Chapter - 5 Section 5.6, 5.7, 5.8.

Unit V : Chapter – 6 Section 6.2, 6.3, 6.4.

Semester	Subject Code	Title of the Paper	House of Teaching / Week	No.of Credits
IV	**14P4MAEL3B**	**Elective – DESIGN AND ANALYSIS OF ALGORITHMS**	**6**	**4**

Objectives:

- To impart the students the knowledge of design analysis of algorithms which is the core of computer science.
- To make students thinks logically and organize sequentially these algorithms.

Unit I **18 Hrs**

Introduction: What is an algorithm?-Algorithm specification- Performance analysis- Randomized algorithms.

Unit II **18 Hrs**

Elementary data structures: Stacks and Queues- Trees- Dictionaries- Priority Queues- Graph representations.

Unit III **18 Hrs**

Design of algorithm methods: Divided- And- Conquer- General method- Binary search- finding the maximum and minimum in a set of items- Merge sort- Quick sort.

Unit IV **18 Hrs**

Design of algorithm methods continuation: The Greedy method- The general method- Tree vertex Splitting Problem- Tree traversal and search techniques- Techniques for Binary trees- Techniques for Graphs- Breadth first search and depth first search traversal- Connected components and spanning trees- Backtracking- General method- the 8- Queens Problem- Branch and Bound method- Travelling sales person algorithm.

Unit V **18 Hrs**

Algebraic problems: Algebraic problems- The general method- Evaluation and Interpolation- The Fast Fourier transform- Modular arithmetic- Even faster evaluation and interpolation.

Text Book:

1. *Eills Horowitz, Sartaj Shani and Sanguthevar Rajasekaran- Fundamentals of Computer Algorithm- Galgotia Publications Pvt Ltd 2000.*
   Unit I : Chapter 1 (sections; 1.1, 1.2, 1.3.1 to 1.3.4, 1.4.1 to 1.4.3)
   Unit II : Chapter 2 (section: 2.1 to 2.4, 2.6)
   Unit III : Chapter 3 (sections 3.1 to 3.5)
   Unit IV : Chapter 4 (sections 4.1, 4.3) Chapter 6 (sections 6.1 to 6.3) Chapter 7 (sections 7.1, 7.2) Chapter 8 (sections 8.1, 8.3)
   Unit V : Chapter 9 (sections 9.1 to 9.5)

Books for Reference:

1. *Aho A.V., Hopcroft, J.E. and Ullman, J.D.: The Design and Analysis of Computer Algorithms. Additor Wesley Reading Mass (1974)*
2. *Goodman, S.E and Hedetniemi, S.T.: Introduction to the design and analysis of algorithms (McGraw Hill international Edition 1987).*