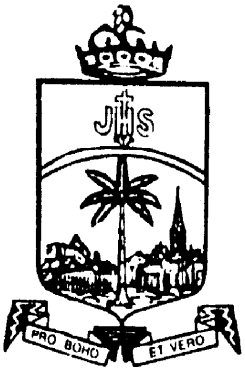
M.Sc. MATHEMATICS

SYLLABUS : 2012

CHOICE BASED CREDIT SYSTEM (CBCS)



St. JOSEPH'S COLLEGE (Autonomous)

Re-accredited with 'A' Grade (3rd Cycle) by NAAC

College with Potential for Excellence by UGC

TIRUCHIRAPPALLI - 620 002, INDIA.

FEATURES OF CHOICE BASED CREDIT SYSTEM

PG COURSES

The Autonomous (1978) St. Joseph's College, accredited with Five Star status in 2001, Re-accredited with **A⁺ Grade** from **NAAC (2006),** Re-accredited with **A Grade** from **NAAC (3rd cycle)**, had introduced the Choice Based Credit System **(CBCS**) for PG courses from the academic year 2001-2002. As per the guidelines of Tamil Nadu State Council of Higher Education (TANSCHE) and the Bharathidasan University, the College has reformulated the CBCS in 2008-2009 by incorporating the uniqueness and integrity of the college.

OBJECTIVES OF THE CREDIT SYSTEM

- To provide mobility and flexibility for students within and outside the parent department as well as to migrate between institutions
- To provide broad-based education
- To help students learn at their own pace
- To provide students scope for acquiring extra credits
- To impart more job oriented skills to students
- To make any course multi-disciplinary in approach

What is credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following Table shows the relation between credits and hours.

Sem.	Specification	No. of Papers	Hour	Credit	Total Credits
I – IV	Core Courses (Theory & Practical)	14	6	14 x 5	70
	Project	1	--	1 x 5	05
I – IV	3 – Core Electives 1 – Soft Skill Course (Common) (IDC-1)	3	4	3 x 4	12
	1 – Inter Dept. Courses (IDC-2)	2	4	2 x 4	08
I – IV	SHEPHERD – Extension Activity	~	70	5	05

Total Minimum Credits **100**

Other Additional Credits (Dept. Specific) **....**

However, there could be some flexibility because of practicals, field visits, tutorials and nature of project work.

For PG courses a student must earn a minimum of 100 credits. The total number of courses offered by a department is 20. However within their working hours a few departments can offer extra credit courses.

Course Pattern

The Post Graduate degree course consists of three major components. They are Core Course, Elective Course and Inter Departmental Course (IDC). Also 2 compulsory components namely Project / Project related items and SHEPHERD, the extension components are mandatory.

Core Course

A core course is the course offered by the parent department, totally related to the major subject, components like Practicals, Projects, Group Discussions, Viva, Field Visits, Library Record form part of the core course.

Elective Course

The course is also offered by the parent department. The objective is to provide choice and flexibility within the department. The student can choose his/her elective paper. Elective is related to the major subject. The difference between core course and elective course is that there is choice for the student. The department is at liberty to offer three elective courses any semester. It must be offered at least in two different semesters. The staff too may experiment with diverse courses.

Inter Departmental Course (IDC)

IDC is an inter departmental course offered by a department for the students belonging to other departments. The objective is to provide mobility and flexibility outside the parent department. This is introduced to make every course multi-disciplinary in nature. It is to be chosen from a list of courses offered by various departments. The list is given at the end of the syllabus copies. Two IDC s must be taken by students which are offered in Semester II & III. In

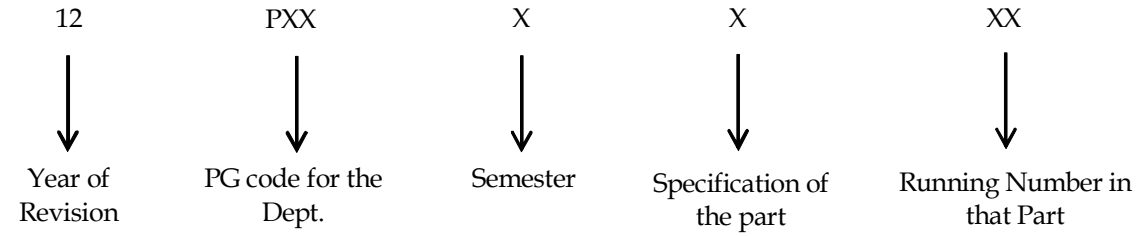
semester II, a common IDC, Soft Skills is to be offered by JASS (Joseph Academy of Soft Skills).

Day College (Shift-I) student may also take an IDC-2 from SFS (Shift-II) course and vice versa

The IDC are of application oriented and inter-disciplinary in nature.

Subject Code Fixation

The following code system (9 characters) is adopted for Post Graduate courses:



01 – Core Courses: Theory & Practical
02 – Core electives
03 – Additional Core Papers (if any)
04 – Inter Departmental Courses
05 – Project
06 – SHEPHERD

CIA Components

The CIA Components would comprise of two parts: (1) Test Components conducted by Controller of Examination (COE) and (2) Teacher specific component. The two centralized tests will be conducted by the COE (Mid-Semester Test & End-Semester Test) for 30% each administered for 2 hours duration. The remaining 40% would comprise of any three components as listed below and will be carried out by the faculty concerned for that paper.

* Assignment, Quiz (Written / Objective), Snap Test, Viva-Voce, Seminar, Listening Comprehension, Reading Comprehension, Problem Solving, Map Reading, Group Discussion, Panel Discussion, Field Visit, Creative Writing, Open Book Test, Library Record, Case Study, etc.

* As a special consideration, students who publish papers in referred journals would be exempted from one of the teacher specific internal components in one of the papers. At the beginning of each semester, the four internal components would be informed to the students and the staff will administer those components on the date specified and the marks acquired for the same will be forwarded to the Office of COE.

Evaluation

For each course there are formative continuous internal assessment (CIA) and semester examinations (SE) in the weightage ratio 50:50.

Once the marks of CIA and SE for each course are available, the Overall Percentage Mark (OPM) for a student in the programme will be calculated as shown below:

$$\text{OPM} = \frac{\sum_i C_i M_i}{\sum_i C_i}$$ where C_i is the credit earned for that course in any semester and M_i is the marks obtained in that course.

The Scheme of Over-all Results is as follows:

	PG	
Class	**Arts (OPM)**	**Science (OPM)**
SECOND	50 to 59.99	50 to 59.99
FIRST	60 to 74.99	60 to 79.99
DISTINCTION	75 & Above	80 & Above

Declaration of Result

Mr./Ms. _____ has successfully completed M.Sc./M.A. degree course in _____. The student's overall average percentage of marks is _____ and has completed the minimum 100 credits. The student has also acquired _____ (if any) additional credits from courses offered by the parent department.

M.Sc. Mathematics - Course Pattern

Sem	Subject Code	Title	Hrs / Week	Credit
I	12PMA1101	Real Analysis I	6	5
	12PMA1102	Linear Algebra	6	5
	12PMA1103	Ordinary Differential Equations	6	5
	12PMA1104	Classical Dynamics	6	5
	12PMA1105	Graph Theory	6	5
		TOTAL FOR SEMESTER I	**30**	**25**
II	12PMA2106	Real Analysis II	7	5
	12PMA2107	Algebra	7	5
	12PMA2108	Complex Analysis	6	5
	12PMA2109	Partial Differential Equations and Integral	6	5
		Transforms		
	12PSK2401	IDC – I: Soft Skills	4	4
		TOTAL FOR SEMESTER II	**30**	**24**
III	12PMA3110	Topology	7	5
	12PMA3111	Measure and Integration	7	5
	12PMA3112	Stochastic Processes	6	5
	12PMA3201A	Elective: Design and Analysis of Algorithms		
	12PMA3201B	Elective: Differential Geometry	4	4
	12PMA3402	IDC – II: Operations Research	4	4
		TOTAL FOR SEMESTER III	**28**	**23**
IV	12PMA4113	Functional Analysis	7	5
	12PMA4114	Fluid Dynamics	7	5
	12PMA4202A	Elective: Automata Theory		
	12PMA4202B	Elective: Fuzzy Theory	4	4
	12PMA4203A	Elective: Algebraic Number Theory		
	12PMA4203B	Elective: Optimization Techniques	4	4
	12PMA4501	Project Work	8	5
		TOTAL FOR SEMESTER IV	**30**	**23**
II-III	12PMA4601	Shepherd		5
	TOTAL CREDIT FOR ALL SEMESTERS			100

Sem I *Hours/Week: 6*

12PMA1101 *Credits: 5*

REAL ANALYSIS - I

Objectives

- To give the students a thorough knowledge of the various aspects of Real line and Metric Spaces which is imperative for any advanced learning in Pure Mathematics.
- To train the students in problem-solving as a preparatory to NET/SET.

Unit I: The Real and Complex Number Systems

Introduction - Ordered Sets - Fields - The Real Field - The Extended Real Number System - The Complex Field - Euclidean Spaces. (Chapter 1)

Unit II: Basic Topology

Finite, Countable and Uncountable Sets - Metric Spaces - Compact Sets - Perfect Sets - Connected Sets. (Chapter 2)

Unit III: Numerical Sequences and Series

Convergent Sequences - Subsequences - Cauchy Sequences - Upper and Lower Limits - Some Special Sequences - Series - Series of non-negative terms - the number e. (Chapter 3 [3.1 - 3.32])

Unit IV: Convergence of Series

The Root and Ratio Tests - Power Series - Summation by parts - Absolute convergence - Addition and Multiplication of Series - Rearrangements. (Chapter 3 [3.33 - 3.54])

Unit V: Continuity

Limits of Functions - Continuous functions - Continuity and Compactness-Continuity and Connectedness - Discontinuities - Monotonic functions - Infinite Limits and Limits at Infinity. (Chapter 4)

Note: Questions should cover 80% theory and 20% problems.

Book for Study

Principles of Mathematical Analysis, **Walter Rudin**, Third Edition, McGraw-Hill International Book Company, New York, 1976.

Books for Reference

1. Mathematical Analysis, **Tom M Apostol**, Addison-Wesley Publishing Company, London, 1974.
2. Methods of Real Analysis, **Richard R Goldberg**, Oxford & IBH Publishing Company, New Delhi, 1970.

Sem I *Hours/Week: 6*

12PMA1102 *Credits: 5*

LINEAR ALGEBRA

Objectives

- To give the students a thorough knowledge of the various aspects of Linear Algebra.
- To train the students in problem-solving as a preparatory to NET/SET.

Unit I:

Systems of linear Equations - Matrices and Elementary Row operations - Row-reduced echelon Matrices - Matrix Multiplication - Invertible Matrices-Bases and Dimension. (Only revision of Vector spaces and subspaces). (Chapter 1 [1.2 - 1.6] and Chapter 2 [2.3])

Unit II:

The algebra of linear transformations - Isomorphism of Vector Spaces - Representations of Linear Transformations by Matrices - Linear Functionals - The Double Dual - The Transpose of a Linear Transformation. (Chapter 3)

Unit III:

The algebra of polynomials - Lagrange Interpolation - Polynomial Ideals - The prime factorization of a polynomial - Commutative rings - Determinant functions. (Chapter 4 [4.1 - 4.5] and Chapter 5 [5.1 - 5.2])

Unit IV:

Permutations and the uniqueness of determinants - Classical Adjoint of a (square) matrix - Inverse of an invertible matrix using determinants - Characteristic values - Annihilating polynomials. (Chapter 5 [5.3,5.4] and Chapter 6 [6.1 - 6.3])

Unit V:

Invariant subspaces - Simultaneous triangulation and simultaneous Diagonalization Direct-sum Decompositions - Invariant Direct sums - Primary Decomposition theorem. (Chapter 6 [6.4 - 6.8])

Book for Study

Linear Algebra, **Kenneth Hoffman, Ray Alden Kunze**, Second Edition, Prentice Hall of India Private Limited, New Delhi, 1975.

Books for Reference

1. Linear Algebra: A Geometric Approach, **S. Kumaresan**, Prentice-Hall of India Ltd, 2004.
2. Introduction to Linear Algebra, **V. Krishnamurthy, V.P.Mainra, J.L. Arora**, East West Press Ltd, 1985.
3. Linear Algebra, **A.R. Rao, P. Bhimashankaram**, Second Edition, Tata McGraw Hill, 2000.
4. Linear Algebra : an introductory approach, **Charles W. Curtis**, Springer Verlag, 1984.
5. Topics in Algebra, **I.N. Herstein**, Wiley Eastern Limited, New Delhi, 1992.
6. Algebra, **M. Artin**, Prentice Hall of India, New Delhi, 1994.

Sem I *Hours/Week: 6*

12PMA1103 *Credits: 5*

ORDINARY DIFFERENTIAL EQUATIONS

Objectives

- To give an in-depth knowledge of solving differential equations that we encounter frequently in various walks of life.
- To introduce existence and uniqueness theorems in Differential equations.

Unit I: Solution in power series

Legendre Equation and Legendre polynomials - Bessel Equation when the index is not an integer - Properties of Bessel functions. (Chapter 3, Sections 3.3, 3.4(Relevant portions only))

Unit II: Existence Theorems

Existence and uniqueness theorem - Fundamental matrix - Groanwall Inequality - Successive Approximations - Picard's Theorem - Some examples. (Chapter 4, Sections 4.4, 4.5, Chapter 5, Sections 5.1 to 5.5)

Unit III:Analysis and Methods of Nonlinear Differential Equations

Introduction - Existence Theorem - Extremal Solutions - Upper and Lower Solutions - Variation of Parameters (A Nonlinear Version) (Chapter 6, Sections 6.1-6.4,6.7)

Unit IV:Boundary Value Problems

Sturm - Liouville problem - Green's Function - Sturm's comparison theorem. (Chapter 7, Sections 7.2, 7.3, Chapter 8, Section 8.2)

Unit V:Stability of Linear and Nonlinear Systems

Introduction - Elementary Critical Points - System of Equations with Constant Coefficients - Linear Equation with Constant Coefficients - Lyapunov Stability - Stability of Quasi-linear systems. (Chapter 9,Sections 9.1-9.6)

Book for Study

Textbook of Ordinary Differential Equations, **S.G. Deo, Lakshmikanthan, V. Raghavendra**, Second Edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1997.

Books for Reference

1. Differential Equations with Applications and Historical Notes, **George F. Simmmons**, Tata McGraw-Hill Publishing Company Ltd., 1972.
2. An Introduction to Ordinary Differential Equations, **Earl A. Coddington**, Prentice-Hall of India, New Delhi, 1992.
3. Elementary Differential Equations and Boundary Value Problems, **William E. Boyce, Richard C. DiPrima**, 10th Edition, John Wiley and Sons, NY., 2012.

Sem I *Hours/Week: 6*

12PMA1104 *Credits: 5*

CLASSICAL DYNAMICS

Objectives

- To give a detailed knowledge about the mechanical system of particles.
- To study the applications of Lagrange's equations and Hamilton's equations as well as the theory of Hamilton Jacobi Theory.

Unit I: Introductory Concept

The mechanical system - Generalized coordinates - Constraints - Virtual work - Energy and momentum. (Chapter I: Sections 1.1 to 1.5)

Unit II: Lagrange's Equations

Derivation of Lagrange's equations - examples - Integrals of motion. (Chapter II: Sections 2.1 to 2.3)

Unit III: Special Applications of Lagrange's Equations

Rayleigh's Dissipation function - Impulsive motion - Velocity dependent potentials. (Chapter III: Sections 3.1, 3.2 & 3.4)

Unit IV: Hamilton's Equations

Hamilton's principle, Hamilton equations, other variational principles. (Chapter IV: Sections 4.1 to 4.3)

Unit V: Hamilton - Jacobi Theory

Hamilton's Principal function - The Hamilton - Jacobi equation, separability. (Chapter V: Sections 5.1 to 5.3)

Book for Study

Classical Dynamics, **Donald T. Greenwood**, Prentice Hall of India Pvt. Ltd, New Delhi, 1985.

Books for Reference:

1. Classical Mechanics, **Herbert Goldstein, Charles P. Poole, JohnL. Safko**, Addison-Wesley Press Inc., 2002.

2. Principles of Mechanics, **John L. Synge, Byron A. Griffith**, Third Edition, McGraw-Hill Book, New York, 1959.

Sem I *Hours/Week: 6*

12PMA1105 *Credits: 5*

GRAPH THEORY

Objectives

1. To give a rigorous introduction to the basic concepts of Graph Theory.
2. To give applications of Graph Theory in other disciplines.

Note: Theorems, Propositions and results which are starred are to be omitted.

Unit I: Basic Results

Basic Concepts - Subgraphs - Degrees of Vertices - Paths and Connectedness - Operations on Graphs - Directed Graphs: Basic Concepts - Tournaments (Chapter I: 1.1 to 1.4, 1.7, Chapter II: 2.1, 2.2)

Unit II: Connectivity

Vertex Cuts and Edge Cuts - Connectivity and Edge - Connectivity, Trees: Definitions, Characterization and Simple Properties - Counting the Number of Spanning Trees - Cayley's Formula. (Chapter III: 3.1, 3.2, Chapter IV: 4.1, 4.3.1 to 4.4)

Unit III: Independent Sets and Matchings

Vertex Independent Sets and Vertex Coverings - Edge Independent Sets - Matchings and Factors - Eulerian Graphs - Hamiltonian Graphs. (Chapter V: 5.1 to 5.4, Chapter VI: 6.1, 6.2)

Unit IV: Graph Colorings

Vertex Coloring - Critical Graphs - Triangle - Free Graphs - Edge Colorings of Graphs - Chromatic Polynomials. (Chapter VII: 7.1 to 7.4, 7.7)

Unit V: Planarity

Planar and Nonplanar Graphs - Euler Formula and Its Consequences - K_5 and $K_{3,3}$ are Nonplanar Graphs - Dual of a Plane Graph - The Four-Color Theorem and the Heawood Five-Color Theorem. (Chapter VIII: 8.1 to 8.5)

Book for Study

A Textbook of Graph Theory, **R.Balakrishnan, K.Ranganathan**, Springer International Edition, New Delhi, 2008.

Books for Reference

1. Graph Theory with Applications, **J. A. Bondy, U. S. R. Murty**, Mac Milan Press Ltd., 1976.
2. Invitation to Graph Theory, **S. Arumugam, S. Ramachandran**, Scitech Publications (India) Pvt. Ltd., Chennai, 2001.

Sem II *Hours/Week: 7*

12PMA2106 *Credits: 5*

REAL ANALYSIS - II

Objectives

- To give the students a thorough knowledge of the various aspects of Real Line and Metric spaces in general which is imperative for any advanced learning.
- To introduce a complete Topological approach in all aspects of Analysis and make them to solve problems.

Unit I: Differentiation

The Derivative of a Real Function - Mean Value Theorems - The Continuity of Derivatives - L'Hospital's Rule. (Chapter 5 [5.1 - 5.13])

Unit II: Di erentiation and Integration

Derivatives of Higher Order - Taylor's Theorem - Differentiation of Vector-valued Functions - Definition and Existence of the Integral. (Chapter 5 [5.14 - 5.19], chapter 6 [6.1 - 6.11])

Unit III: R-S Integral

Properties of the integral - Integration and Differentiation - Integration of Vector-valued functions - Rectiable curves. (Chapter 6 [6.12 - 6.27])

Unit IV: Sequence and Series of Functions

Discussion of Main Problem - Uniform Convergence - Uniform Convergence and Continuity - Uniform Convergence and Integration - Uniform Convergence and Differentiation. (Chapter 7 [7.1 - 7.18])

Unit V: Functions of Several Variables

Linear Transformations - Differentiation - The Contraction Principle - The Inverse Function Theorem - The Implicit Function Theorem - The Rank Theorem. (Chapter 9 [9.1 - 9.32])

Note: Questions should cover 80% theory and 20% problems.

Book for Study

Principles of Mathematical Analysis, **Walter Rudin**, Third Edition, McGraw-Hill International Book Company, New York, 1976.

Books for Reference

1. Mathematical Analysis, **Tom M Apostol**, Addison-Wesley Publishing Company, London, 1974.
2. Methods of Real Analysis, **Richard R Goldberg**, Oxford & IBH Publishing Company, New Delhi, 1970.

Sem II *Hours/Week: 7*

12PMA2107 *Credits: 5*

ALGEBRA

Objectives

- To give foundation in group theory.
- To train the students in problem-solving as a preparatory to NET/SET.

Unit I:

Normal subgroups and Quotient groups - Homomorphism - Conjugacy - Sylow's theorem. (Chapter 2: 2.6, 2.7, 2.11 and 2.12)

Unit II:

Ideals and quotient rings - More Ideals and quotient rings - Euclidean rings - A particular Euclidean ring. (Chapter 3: 3.4, 3.5, 3.7 and 3.8)

Unit III:

Polynomial Rings - Polynomials over the Rational Field - Polynomial Rings over commutative rings. (Chapter 3: 3.9, 3.10 and 3.11)

Unit IV:

Field Extension - Extension Fields - Roots of Polynomials - More about roots. (Chapter 5: 5.1, 5.3, 5.5)

Unit V:

The elements of Galois Theory - bounded on the size of G (K, F) - Funda-mental theorem of Galois theory - Finite Fields. (Chapter 5: 5.6 and Chapter 7: 7.1)

Book for Study

Topics in Algebra, **I.N. Herstein**, Wiley Eastern Limited, New Delhi, 1992.

Books for Reference

1. Algebra, **Serge Lang**, Third Edition, Springer Graduate Texts in Mathematics, New York, 2002.

2. University Algebra, **N.S. Gopala Krishnan**, Second Edition, John Wiley & Sons (Asia) Pvt. Ltd., 1986.

Sem II *Hours/Week: 6*

12PMA2108 *Credits: 5*

COMPLEX ANALYSIS

Objectives

- To learn the various intrinsic concepts and the theory of Complex Analysis.
- To study the concept of Analyticity, Complex Integration and Infinite Products in depth.

Unit I: Fundamental Theorems

Line Integrals - Rectifiable arcs - Line integrals as Functions of Arcs - Cauchy's Theorem for Rectangle - Cauchy's Theorem in a Disk. (Chapter: 4 sections 1.1 - 1.5 Pages 101 - 114)

Unit II: Cauchy's Integral Formula

The index of a point with respect to a closed curve - The integral formula - Higher Derivatives - Removable Singularities - Taylor's Theorem - Zeroes and Poles. (Chapter: 4 sections 2.1 - 2.3, 3.1, 3.2 Pages 114 - 130)

Unit III: Calculus of Residues

The Local mapping - The Maximum principle - The Residue theorem - The argument principle - Evaluation of Definite Integrals. (Chapter: 4 sections 3.3 - 3.4, 5.1 - 5.3 Pages 130 - 137, 148 - 161)

Unit IV: Harmonic Functions

Definitions and Basic properities - The Mean Value Property - Poisson's Formula - Schwarz's Theorem - The Reflection Principle. (Chapter: 4 sections 6.1 - 6.5 Pages 160 - 174)

Unit V: Power Series expansion

Weierstrass's Theorem - The Taylor series - The Laurent series - Partial Fractions - Infinite products. (Chapter: 5 sections 1.1 - 1.3, 2.1, 2.2 Pages 175 - 193)

Book for Study

Complex Analysis: An Introduction to the Theory of Analytic Functions of One Complex Variable, **Lars V. Ahlfors**, Third Edition, McGraw Hill Book Company, New York, 1979.

Books for Reference

1. Functions of one Complex Variable, **John B. Conway**, Second Edition, Springer Graduate Texts in Mathematics, New York, 1978.
2. Foundations of Complex Analysis, **S.Ponnusamy**, Second Edition, Narosa Publishing House, India, 2005.

Sem II *Hours/Week: 6*

12PMA2109 *Credits: 5*

PARTIAL DIFFERENTIAL EQUATIONS AND INTEGRAL TRANSFORMS

Objectives

- To give an in-depth knowledge of solving partial differential equations that we encounter frequently in various walks of life.
- To introduce existence and uniqueness theorems in Differential equations.

Unit I: First Order Partial Differential Equations

Partial Differential Equations - Origins of partial Differential Equations - Integral surfaces passing through a given curve - Surfaces orthogonal to a given system of surfaces - Non Linear Partial Differential Equations of the first order - Compatible Systems of First order Equations - Charpit's Method-Special types of first order equation. (Book 1: Chapter 2, Sections 1, 2, 5, 6, 7, 8, 9, 10, 11)

Unit II: Second Order Partial Differential Equations

Origin of second order equation - Higher Partial Differential Equations with constant coefficients - Equations with variable coefficients reducible to Elliptic, Parabolic and hyperbolic forms - Problems. (Book 1: Chapter 3, Sections 1, 4, 5)

Unit III: Fourier Transforms

Fourier Transforms - Defn. inversion theorem - Fourier cosine transforms - Fourier sine transforms - Fourier transforms of derivatives - Fourier transforms of some simple functions - Fourier transforms of rational functions - The convolution integral - convolution theorem - Parseval's relation for cosine and sine transforms - solution of PDE by Fourier transform. Laplace's equation in half plane - Laplace's equation in an infinite strip - The linear diffusion equation on a semi-infinite line - The two-dimensional diffusion equation. (Book 4: Relevant sections)

Unit IV: Integral Equations

Introduction; integral equations with separable kernels - Reduction to a system of algebraic equations, Fredholm alternative, an approximate method, Fredholm integral equations of the first kind, method of successive approximations - iterative scheme, Volterra integral equation, some results about the resolvent kernel, classical Fredholm theory - Fredholm's method of solution- Fredholm's first, second, third theorems. (Book 2: Relevant sections)

Unit V: Calculus of Variation

Introduction - Variation of a functional, A necessary condition for an extremum. The simplest variation problem - Euler's equation, The case of several variables, A simple variable end point problem, The fixed end point problem for n unknown functions, variational problems in parametric form, functionals depending on higher order derivatives. (Book 3: Relevant sections)

Books for Study

1. Elements of Partial Differential Equations, **Ian.N.Snedden**, Dover Publications , 2006.
2. Linear Integral Equations Theory and Technique, **R.P.Kanwal**, Second Edition, Birkhauser, Boston, 1997.
3. Calculus of Variations, **I. M. Gelfand and S. V. Fomin**, Dover, New York, 2000.
4. The Use of Integral Transforms, **Ian N. Snedden,**McGraw-Hill Book Co., New York, 1972.

Books for Reference

1. Advanced Differential Equations, **M.D. Raisinghania**, S. Chand and Company Ltd, New Delhi, 2001.
2. Analytic Methods for Partial Differential Equations, **G. Evans, J. Blackledge, P. Yardley**, Springer International Edition, 2011.

SEM-II *Hours/Week - 4*
12PSK2401 *Credits - 4*

IDC-I: SOFT SKILLS

Unit 1: Effective Communication & Resume Writing 12 Hours

Effective Communication

Definition of communication, Process of Communication, Barriers of Communication, Non-verbal Communication, Johari Window, The Art of Listening, Kinesthetic, Production of Speech, Organization of Speech, Modes of delivery, Conversation Techniques, Dialogue, Good manners and Etiquettes.

Resume Writing

What is Resume? Types of Resume? Chronological, Functional and Mixed Resume, Steps in preparation of Resume.

Unit II: Group Discussion, Interview Skills & Team Building 18 hours

Group Discussion (GD)

Group Discussion Basics, GD Topics for Practice, Points for GD Topics, Case-Based and Article based Group Discussions, Points for Case Studies, and Notes on Current Issues for GD.

Interview Skills

Common interview questions, Attitude, Body Language, The mock interviews, Phone interviews, Behavioral interviews.

Team Building

Team Vs Group – synergy, Stages of Team Formation, Dabbawala-Case Study-PPT, Broken Square-Exercise, Group dynamics, Win as much as you win- Exercise, Leadership – Styles, Work ethics.

Unit III: Personality Development, Attitude & Motivation 18 hours

Personality Development

Self awareness, Assertiveness, Goal setting, Problem-solving, Conflict and Stress Management, Decision-making skills, Positive and Creative thinking, Lateral thinking, Time management.

Attitude

Concept, Significance, Factors affecting attitudes, Positive attitude, Advantages, Negative attitude, Disadvantages, Ways to develop positive attitude, Difference between Personalities having positive and negative attitude.

Motivation

Concept of motivation, Significance, Internal and external motives, Importance of self-motivation, Factors leading to demotivation.

Unit IV: Numerical Ability **8 hours**

- Average, Percentage
- Profit and Loss**,** Simple Interest, Compound Interest
- Time and Work, Pipes and Cisterns
- Time and Distance**,** Problems on Trains**,** Boats and Streams
- Calendar**,** Ratios and Proportions.

Unit- V: Test of Reasoning **8 hours**

Verbal Reasoning

- Series Completion, Analogy
- Data Sufficiency, Assertion and Reasoning
- Logical Deduction

Non-Verbal Reasoning

- Series
- Classification

References

* Aggarwal, R.S. *Quantitative Aptitude*, S.Chand & Sons.
* Aggarwal, R.S. (2010). *A Modern Approach to Verbal and Non Verbal Reasoning*, S.Chand & Co., Revised Edition.
* Alex, K. (2009). *Soft Skills*, New Delhi, S. Chand & Company Ltd.

* Covey, Stephen. (2004). *7 Habits of Highly effective people,* Free Press.

* Egan, Gerard. (1994). *The Skilled Helper* (5th Ed), Pacific Grove, Brooks/Cole.

* Khera, Shiv (2003). *You Can Win.* Macmillan Books, Revised Edition.

* Murphy, Raymond. (1998). *Essential English Grammar*, 2nd ed., Cambridge University Press.

* Prasad, L. M. (2000). *Organizational Behaviour*, S.Chand & Sons.

* Ravindran, G., Elango, S.P.B., Arockiam, L. (2009). *Success through Soft skills*, IFCOT Publications.

* Sankaran, K. & Kumar, M. *Group Discussion and Public Speaking*, M.I. Pub, Agra, 5th ed., Adams Media.

* Schuller, Robert. (2010). *Positive Attitudes*, Jaico Books.

* Thamburaj, Francis (2009). *Communication Soft skills*, Grace Publications.

* Trishna's (2006). *How to do well in GDs & Interviews*, Trishna Knowledge Systems.

** Yate, Martin. (2005). H*iring the Best: A Manager's Guide to Effective Interviewing and Recruiting**

Sem III *Hours/Week: 7*

12PMA3110 *Credits: 5*

TOPOLOGY

Objectives

- To study the concepts concerned with properties that are preserved under continuous deformations of objects.
- To train the students to develop analytical thinking and the study of continuity and connectivity.

Unit I: Topological spaces

Topological spaces - Basis for a topology - The order topology - The product topology on XxY - The subspace topology - Closed sets and limit points - Continuous functions. (Chapter II: Section 12 to 18)

Unit II: Metric topology and connectedness

The product topology - The Metric Topology - Connected Spaces - Connected Subspaces of the Real line - Components and local connectedness. (Chapter II: Sections 19-21, Chapter III: Sections 23, 24, 25)

Unit III: Compactness

Compact spaces - Compact subspaces of the real line - Limit point compactness. (Chapter III: Sections 26, 27, 28)

Unit IV: Separation axioms

The Countability axioms - The Separation axioms - Normal spaces. (Chapter IV: Sections 30 - 32)

Unit V: Complete Metric Spaces

The Urysohn lemma - The UrysohnMetrization Theorem - The Tietze extension Theorem. (Chapter IV, Sections 33 - 35)

Book for Study

Topology, **James R. Munkres**, Second Edition, PHI Learning Pvt. Ltd., New Delhi, 2009.

Books for Reference

1. Topology, **James Dugundji**, Allyn& Bacon, 1966.
2. Elements of General Topology, **Sze-Tsen Hu**, Holden-Day Series in Mathematics, 1964.

Sem III *Hours/Week:7*

12PMA3111 *Credits: 5*

MEASURE AND INTEGRATION

Objectives:

- To generalize the concept of integration using measures
- To develop the concept of analysis in abstract situations.

Unit I: Lebesgue Measure

Outer measure - Definition & properties - Lebesgue measure - measurable sets - properties - non-measurable set - measurable functions - Little wood's three principles.

(Proofs of Egoroff 's theorem and Lusin's theorem to be omitted) (Chapter 3 Sec. 1 - 6)

Unit II: Lebesgue Integral

Lebesgue Integral of simple function - bounded measurable function - of a nonnegative function - Fatou's lemma - Monotone convergence theorem - General Lebesgue integral - Lebesgue convergence theorem - Convergence in measure. (Chapter 4 Sec. 1 - 5)

Unit III: Differentiation and Integration

Differentiation of monotone functions - Vitali's lemma - Integral of derivative - Functions of bounded variation - Differentiation of an integral - absolute continuity - Convex functions - Jensen's inequality. (Chapter 5 Sec. 1 - 5)

Unit IV: General measure and Integration

Measure spaces - Measurable functions - Integration - Signed measure - Hahn decomposition theorem - Jordan decomposition theorem - Radon-Nikodym theorem - Lebsgue decomposition theorem. (Chapter 11 Sec. 1 - 6)

Unit V: Measure and outer measure

Outer measure and Measurability - Extension theorem - Product measures - Fubini's theorem - Tonnelli's theorem. (Chapter 12 Sec. 1, 2 and 4)

Book for Study

Real Analysis, **H.L. Royden**, Third Edition, PrenticeHall of India, New Delhi, 2001.

Books for Reference

1. Measure Theory and Integration, **G. de Barra**, New Age International Publishers, New Delhi, 2008.
2. Real and Complex Analysis, **Walter Rudin**, Mc-Graw Hill Book Company, New York, 1970.

Sem III *Hours/Week: 6*

12PMA3112 *Credits: 5*

STOCHASTIC PROCESSES

Objectives

- To understand the stochastic models for many real life probabilistic situations.
- To learn the well known models like birth-death and queueing to reorient their knowledge of stochastic analysis.

Unit I: Elements of Stochastic processes and Markov chains

Stochastic processes - Specification of Stochastic processes - Stationary processes - Markov chain - Transition probabilities - Random walk - Higher transition probabilities. (Chapter 2: Sections 2.1, 2.2, 2.3, Chapter 3: Section 3.1, 3.2)

Unit II: Classication of states and stability of markov system

Classification of states - Transient and recurrent states - Stability of a Markov system. (Chapter 3: Sections 3.4, 3.6)

Unit III: Markov process with discrete state space

Poisson process - Generalizations of Poisson process - Pure birth process - Yule-Furry process - Birth and death process. (Chapter 4: Sections 4.1, 4.3(omit 4.3.5 - 4.3.7), 4.4(omit 4.4.1))

Unit IV: Renewal processes

Renewal process in Discrete time - Renewal process in continuous time - Renewal equation - Renewal theorems - Residual and current life times. (Chapter 6: Sections 6.1.1 - 6.1.3, 6.2(omit example 2(b)), 6.3, 6.5(omit 6.5.2), 6.7)

Unit V: Stochastic processes in queueing

Queueing processes - Steady state behaviour of M/M/1 queueing model - Non-Markovian queueing models - Queues with Poisson input (M/G/1) – GI/M/1 queueing model.

(Chapter 10: Sections 10.1(omit 10.1.4), 10.2(omit 10.2.3.1), 10.7(omit examples 7(a), 7(b) and Sections 10.7.3, 10.7.4), 10.8 (omit example 8(a)).

Book for Study

Stochastic Processes, **J. Medhi**, New Age International Publishers, Second Edition, New Delhi, 1994.

Books for Reference

1. Elements of Applied Stochastic Processes, **U. Narayan Bhat**, Second Edition, John Wiley & Sons, New York, 1972.
2. Stochastic Processes, **N.V. Prabhu**, MacMillon, New York, 1970.

Sem III *Hours/Week: 4*

12PMA3201A *Credits: 4*

CORE ELECTIVE-I: DESIGN AND ANALYSIS OF ALGORITHMS

Objectives

- To impart the students the knowledge of design and analysis of algorithms which is the core of computer science.
- To give importance to finding the complexity(order) of algorithms.

Unit I: Introduction

Algorithm - Algorithm specication - Performance analysis. (Sections 1.1, 1.2, 1.3.1 to 1.3.4.)

Unit II: Elementary data structures

Stacks and Queues - Trees - Dictionaries - Priority Queues. (Sections 2.1 to 2.4.)

Unit III: Design of algorithm methods

Divide and conquer - General method - Binary search - Finding the maximum and minimum in a set of items - Merge sort - Quick sort. (Sections 3.1 to 3.5)

Unit IV: Design of algorithm methods continuation

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 - Traveling sales person algorithm (LCBB algorithm - problem only). (Sections 6.1 to 6.3, 7.1, 7.2, 8.1, 8.3)

Unit V: Algebraic problems

Algebraic problems - The general method - Evaluation and Interpolation - The Fast Fourier transform (recursive algorithm only). (Sections 9.1 to 9.3)

Book for Study

Fundamentals of Computer algorithms, **Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran**, Galgotia Publications Pvt. Ltd., 2004.

Books for Reference

1. The Design and Analysis of Computer Algorithms, **A.V. Aho, J.E. Hopcroft, J.D. Ullman**, Addison-Wesley Publ. Comp., 1974.
2. Introduction to the design and analysis of algorithms, **Seymour E.Goodman, S.T. Hedetniemi**, McGraw Hill International Edition, 2002.

Sem III *Hours/Week: 4*

12PMA3201B *Credits: 4*

CORE ELECTIVE-I: DIFFERENTIAL GEOMETRY

Objectives

- To explain briefly the various intrinsic concepts and theories of Differential Geometry.
- To enlighten the students with many applications of this subject.

Unit I:

Analytical representation - Arc length - Tangent - Oscillating plane - Torsion - Formulae for Frenet contact. (Chapter I: sections 1.1 - 1.7)

Unit II:

Natural equations - Helices - General solution of natural equations - Evolutes and involutes - Imaginary curves - Ovals. (Chapter I: sections 1.8 -1.13)

Unit III:

Analytical representation - First fundamental theorem - Normal, tangent plane - Developable surfaces- Second fundamental form - Meusrier's theorem - Euler's theorem. (Chapter 2: sections 2.1 - 2.6)

Unit IV

Dupin's indicatrix - Some surfaces - A geometrical interpretation of asymptotic and curvature lines conjugate directions - Triply orthogonal system of surfaces. (Chapter 2: sections 2.7 - 2.11)

Unit V:

Gauss - The equations of Gauss-Weingarten - The theorem of Gauss and the equations of Codazzi curvilinear coordinates in space - Some applications of the Gauss and the Codazzi equations - The fundamental theorem of surface theory. (Chapter 3: Sections 3.1 - 3.6)

Book for Study

Lectures on Classical Differential Geometry, **Dirk J. Struik**, Addison Wesley Publishing Company, 1950.

Books for Reference

1. An introduction to Differential Geometry, **T.J. Willmore**, Oxford University Press, New York, 1959.
2. Elementary Differential Geometry, **Barrett O'Neill**, Second Edition, Academic Press, 2006.

Sem II *Hours/Week: 4*

12PMA3402 *Credits: 4*

IDC-II: OPERATIONS RESEARCH

Objectives

- To enlighten the students in the field of operations research which has many applications in management techniques.
- To help the students to find optimum solution in business management problems.

Unit I: Transportation

Introduction - finding initial basic feasible solution - North-west corner rule - least cost or matrix minima method - Vogel's approximation method - moving towards optimality - unbalanced transportation problems. (Sections 6.1, 6.5, 6.6, 6.9)

Unit II: Assignment and LPP

Assignment algorithm, Linear programming formulation and graphical method. (Sections 7.3 full, Sections 2.1 to 2.3)

Unit III: Decision analysis

Introduction - decision making environment - the maxmin or minmax criterion - the savage regret criterion - the Hurwitz criterion. (Sections 16.1 to 16.3)

Unit IV: Replacement problem

Introduction - Replacement of equipment or asset deteriorating gradually - replacement of equipment that fails suddenly. (Sections 19.1 to 19.3, no proof of theorems, problems only)

Unit V: Network Scheduling by PERT/CPM

Network and basic components - numbering the events - time calculations in networks - critical path method - PERT/CPM, PERT calculations. (Sections 21.2 to 21.7)

Book for Study

Operations Research, **KantiSwarup, P.K. Gupta & Man Mohan**, Eigth Edition, Sulltan Chand & Sons, New Delhi, 1997.

Books for Reference

1. Operations Research: An Introduction, **Hamdy A. Taha**, Ninth Edition, Prentice Hall, New Delhi, 2011.
2. Resource Management Techniques, **V.Sundaresan, K.S.Subramanian, K. Ganesan**, New Revised Edition, A.R. Publications, Sirkali, 2002.

Sem IV *Hours/Week: 7*

12PMA4113 *Credits: 5*

FUNCTIONAL ANALYSIS

Objectives

- To study the three structure theorems of Functional Analysis viz., Hahn-Banach theorem, Open mapping theorem and Uniform boundedness principle.
- To introduce Hilbert spaces and operator theory leading to the spectral theory of operators on a Hilbert space.

Unit I: Normed Linear Spaces

Normed linear spaces - Schauder Basis - Bounded Linear maps - Equivalent norms - Finite dimensional normed spaces - Dual spaces. (Chapter 3)

Unit II: Hahn Banach Theorem

General form - Continuous extension form- Second dual - Reflexive spaces - Dual of C[0; 1] - Separation form of Hahn- Banach theorem. (Chapter 4: sections 1 – 7)

Unit III: Uniform Boundedness Principle and Open Mapping Theorem

Uniform boundedness principle - Weak Convergence - The Open Mapping Theorem and Applications - The Closed Graph Theorem. (Chapter 5: Sections 1, 3 and Chapter 6: Sections 1, 3)

Unit IV: Inner Product Spaces

Parallelogram law - Orothogonality - Orthonormal sets - Complete Orthonormal sets - Riesz Representation Theorem. (Chapter 7)

Unit V: Hilbert Space Operators

Adjoint of an operator - Isometric operator - Unitary Operator - Self-Adjoint operator - Normal operator - Projection operator and its properties - Spectral Theory - preliminaries and Basic Results (Chapter 8: Sec 9.0, 9.1, 9.2)

Book for Study

Introduction to Functional Analysis, **S.C. Bose**,MacMillan Publishers India, Delhi, 2000.

Books for Reference

1. A First Course In Functional Analysis, **D. Somasundaram**, Narosa Book Distributors Private Ltd., 2008.
2. Introduction to Topology and Modern Analysis, **G.F.Simmons**, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2006.
3. Functional Analysis, **Walter Rudin**, Tata McGraw-Hill publishing Co. Ltd., New Delhi, 2006.

Sem IV *Hours/Week: 7*

12PMA4114 *Credits: 5*

FLUID DYNAMICS

Objectives

- To give the students an introduction to the behaviour of fluids in motion.
- To give the students a feel of the applications of Complex Analysis in the analysis of the flow of liquids.

Unit I: Kinematics of fluids in motion

Real fluids and Ideal fluids - Velocity of a fluid at a point - Stream lines and path lines - Steady and Unsteady flows - The Velocity Potential - The Vorticity Vector - Local and Particle Rates of Change - The Equation of Continuity - Worked Examples - Acceleration of a Fluid. (Chapter 2: Sections 2. - 2.9)

Unit II: Equations of Motion of a Fluid

Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Euler's equations of Motion - Bernoulli's equation - Worked Examples - Discussion of the case of steady motion under Conservative Body Forces -Some flows involving axial symmetry. (Chapters 3: Sections 3.1, 3.2, 3.4 - 3.7, 3.9)

Unit III: Some Three-Dimensional Flows

Introduction - Sources, Sinks and Doublets Images in rigid infinite plane - Images in solid spheres - Axisymmetric flows - Stoke's Stream Function. (Chapter 4: Sections 4.1 - 4.5)

Unit IV: Some Two-Dimensional Flows

The Stream Function - The Complex Velocity Potential for Two Dimensional Irrotational, Incompressible Flow - Complex Velocity Potentials for Standard Two-Dimensional Flows - Some Worked Examples - Two Dimensional Image Systems - The Milne-Thomson Circle Theorem. (Chapter 5: Sections 5.3-5.8)

Unit V: Viscous Fluid

Stress components in a real fluid - Relation between Cartesian Components of Stress - Translational motion of fluid element - The Coefficient of Viscosity and Laminar flow - The Navier-Stokes equation of a viscous fluid - Some solvable problems in viscous flow - Steady motion between parallel planes only. (Chapter 8: Sections 8.1-8.3, 8.8, 8.9, 8.10.1)

Book for Study

Textbook of Fluid Dynamics, **Frank Chorlton**, CBS Publishers & Distributors, 2004.

Books for Reference

1. Theoretical Hydrodynamics, **L.M. Milne-Thomson**, Macmillan, London, 1955.
2. An Introduction to Fluid Dynamics, **G.K. Batchelor**, Cambridge Mathematical Library, 2000.

Sem IV *Hours/Week: 4*

12PMA4202A *Credits: 4*

CORE ELECTIVE-II: AUTOMATA THEORY

Objectives

- To make the students understand the nuances of Automata and Grammar.
- To make them understand the applications of these techniques in computer.

Unit I: Finite Automata and Regular expressions

Definitions and examples - Deterministic and Nondeterministic finite Automata - Finite Automata with-moves. (Book 1, Chapter 2: Section 2.1-2.5)

Unit II: Context free grammar

Regular expressions and their relationship with automation - Grammar - Ambiguous and unambiguous grammars - Derivation trees - Chomsky Normal form. (Book 1, Chapter 2, Section 2.5, Chapter 4, Sections 4.1-4.3, 4.5, 4.6)

Unit III: Pushdown Automaton

Pushdown Automaton - Definition and examples - Relation with Context free languages. (Book 1, Chapter 5: Section 5.2, 5.3, Chapter 6: Section 6.1)

Unit IV: Finite Automata and lexical analysis

Role of a lexical analyzer - Minimizing the number of states of a DFA - Implementation of a lexical analyzer. (Book 2, Chapter 3: Section 3.1-3.8)

Unit V: Basic parsing techniques

Parsers - Bottomup Parsers - Shift reduce - operator precedence - Topdown Parsers - Recursive descent - Predictive parsers. (Book 2, Chapter 5: Section 5.1-5.5)

Books for Study

1. Introduction to Automata theory, Languages and Computations, **JohnE. Hopcroft, Jeffrey D. Ullman**, Narosa Publishing House, Chennai, 2000.
2. Principles of Compiler Design, **A.V. Aho, Jeffrey D. Ullman**, Narosa Publishing House, Chennai, 2002.

Books for Reference

1. Elements of the Theory of Computation, **Harry R. Lewis, ChristosH. Papadimitriou**, Second Edition, Prentice Hall, 1997.
2. Compilers: Principles, Techniques, and Tools, **A.V. Aho, Monica S. Lam, R. Sethi, J.D. Ullman**, Second Edition, Addison-Wesley, 2007.

Sem IV *Hours/Week: 4*

12PMA4202B *Credits: 4*

CORE ELECTIVE-II: FUZZY ANALYSIS

Objectives

- To make the students understand the nuances of Fuzzy Analysis.
- To make them understand the applications of these techniques in computer.

Unit I

Crisp sets and fuzzy sets - basic concept of fuzzy set - fuzzy logic - operations on fuzzy sets - general discussion fuzzy complements. BOOK 1: chapter 1 - 1.4, 1.6 & chapter 2-2.1 & 2.2.

Unit II

Fuzzy union - fuzzy intersection - combinations operations. BOOK 1: chapter 2 - 2.3, 2.4, 2.5.

Unit III

Fuzzy relations and fuzzy graphs - fuzzy relation on sets and fuzzy sets - composition of fuzzy relations - properties of the min-max composition - fuzzy graphs - special fuzzy relations. BOOK 2: chapter 6 - 6.1, 6.1.1, 6.1.2, 6.2, 6.3.

Unit IV

Fuzzy measures - general discussion - belief and plausibility measures - probability measures - possibility and necessity measures. BOOK 1: chapter 4 - 4.1, 4.2, 4.3, 4.4.

Unit V

Fuzzy decision making - individual decision making - fuzzy ranking methods - fuzzy linear programming. BOOK 3: chapter 4 - 4.1, 4.2, 4.3, 4.4.

Books for Study

1. Fuzzy sets, uncertainty and information, **George J. Klir, Tina A. Folger**, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.

2. Fuzzy set theory and its applications, **H.J. Zimmermann**, Second Edition, Springer New Delhi, 2006.

3. Fuzzy sets and fuzzy logic theory and applications, **George J. Klir and Bo Yuan**, Prentice-Hall of India private limited, New Delhi.

Book for Reference

Fuzzy logic with Engineering Applications, **Timothy J. Ross**, McGraw-Hill, Inc. New Delhi, 2000.

Sem IV *Hours/Week: 4*

12PMA4203A *Credits: 4*

CORE ELECTIVE-III: ALGEBRAIC NUMBER THEORY

Objectives

- To expose the students to the charm,niceties and nuances in the world of numbers.
- To highlight some of the Applications of the Theory of Numbers.

Unit I: Congruences

Elementary Properties of Congruences - Complete Residue System - Reduce Residue System - Some Applications of Congruences. (Sec 2.1 - 2.3 Pages 49 - 70)

Unit II: Algebraic Congruences

Solutions of Congruences - Algebraic Congruences - Solutions of the Problems of the Type ax + by + c = 0 - Simultaneous Congruences. (Sec 2.4 - 2.7 Pages 71 - 97)

Unit III: Primitive Roots

Algebraic Congruence - Primitive Roots - Theory of Indices. (Sec 3.1,3.3,3.4 Pages 98 - 100,108 - 128)

Unit IV: Quadratic Residues

Quadratic Residues - Legendre's Symbol. (Sec 6.1 - 6.2 Pages 218 - 232)

Unit V: Jacobi's Symbol

Reciprocity Law - Quadratic Residue for Composite Modules - Jacobi's Symbol. (Sec 6.3 - 6.4 Pages 233 - 246)

Book for Study

A First Course in Theory of Numbers, **K.C. Chowdhury**, Asian Books Pvt. Ltd., New Delhi, 2004.

Books for Reference

1. Basic Number Theory, **S.B.Malik**, Second Edition, Vikas Publishing House Pvt. Ltd., Noida, 2009.
2. Number Theory, **George E.Andrews**, Courier Dover Publications, 1994.

Sem IV *Hours/Week: 4*

12PMA4203B *Credits: 4*

CORE ELECTIVE-III: OPTIMIZATION TECHNIQUES

Objectives

- To expose the students to the new technique of optimization.
- To highlight some of the Applications of the optimization techniques.

Unit I: Local theory

Optimisation of functional - Gateaux and Frechet Differentials - Frechet derivatives - Extrema - Euler-Lagrange Equations - Problems with variable end points. (Sec 7.1 - 7.6 Pages 169 - 184)

Unit II: Global theory

Convex and concave functionals - Conjugate convex, concave functionals - Dual optimization problems - Min-Max theorem of game theory. (Sec 7.8, 7.10 - 7.13 Pages 190, 191, 195 - 208)

Unit III: Local theory of constrained optimisation

Lagrange multiplier theorem - Inverse function theorem - Equality and Inequality constraints - Kuhn-Tucker theorem. (Sec 9.1 - 9.4 Pages 239 -253)

Unit IV: Iterative methods of optimization

Methods of solving equations - Successive approximation - Newton's method - Descent methods - Steepest descent. (Sec 10.1 - 10.5 Pages 271 - 289)

Unit V: Conjugate direction methods

Conjugate gradient method - Methods for solving constrained problems - Projection method - The Primal-Dual method - Penalty Functions. (Sec 10.8 - 10.11 Pages 294 - 307)

Book for Study

Optimization by Vector Space Methods, **David G. Luenberger**, Wiley Professional Paperback series, 1997.

Books for Reference

1. A Vector Space Approach to Models and Optimization, **C.Nelson Dorny**, Robert Krieger Publishing Co., 1986.
2. Optimization Techniques, **Chander Mohan, Kusum Deep**, New Age International, 2010.

INTER DEPARTMENTAL COURSE – IDC

BIOCHEMISTRY

12PSK2401	SOFT SKILLS
12PBI3402	FIRST AID MANAGEMENT

BIOTECHNOLOGY

12PSK2401	SOFT SKILLS
12PBT3402	APPLIED BIOTECHNOLOGY

BOTANY

12PSK2401	SOFT SKILLS
12PBO3402	HORTICULTURE & LANDSCAPING

CHEMISTRY

12PSK2401	SOFT SKILLS
12PCH3402	HEALTH CHEMISTRY

COMMERCE

12PSK2401	SOFT SKILLS
12PCO3402	FINANCIAL ACCOUNTING FOR MANAGERS

COMMERCE (CA)

12PSK2401	SOFT SKILLS
12PCC3402	CAREER PLANNING AND MANAGEMENT

COMPUTER APPLICATIONS

12PSK2401	SOFT SKILLS
12PCA3402	COMPUTER APPLICATIONS FOR SOCIAL SCIENCES
12PCA3403	FUNDAMENTALS OF PROGRAMMING

COMPUTER SCIENCE

12PSK2401	SOFT SKILLS
12PCS3402A	FLASH
12PCS3402B	WEB DESIGN

ECONOMICS

12PSK2401	SOFT SKILLS
12PEC3402	INDIAN ECONOMY

ELECTRONICS

12PSK2401	SOFT SKILLS
12PEL3402	COMPUTER HARDWARE

ENGLISH

12PSK2401	SOFT SKILLS
12PEN3402	ENGLISH FOR MEDIA STUDIES

HISTORY

12PSK2401	SOFT SKILLS
12PHI3402	INDIAN CONSTITUTION

HUMAN RESOURCE MANAGEMENT

12PSK2401	SOFT SKILLS
12PHR3402	FUNDAMENTALS OF HRM

INFORMATION TECHNOLOGY

12PSK2401	SOFT SKILLS
12PIT3402A	FLASH
12PIT3402B	WEB DESIGN

MATHEMATICS

12PSK2401	SOFT SKILLS
12PMA3402	OPERATIONS RESEARCH

PHYSICS

12PSK2401	SOFT SKILLS
12PPH3402	MODERN PHOTOGRAPHY

TAMIL

12PSK2401	நுண்வகைமைத்திறன்கள்
12PTA3402	அரசுப்பணித்தேர்வுத் தமிழ் - I