M. Sc.
MATHEMATICS

SYLLABUS (2007-2010)

under
CHOICE BASED CREDIT SYSTEM
(CBCS)

ST. JOSEPH'S COLLEGE (AUTONOMOUS)
(Nationally Reaccredited with A+ Grade/
College with Potential for Excellence)
TIRUCHIRAPPALLI - 620 002

FEATURES OF CHOICE BASED CREDIT SYSTEM (PG COURSES)

The Autonomous St. Joseph's College (1978) Reaccredited with A+ Grade from NAAC (2007) has introduced the choice based credit system (CBCS) for UG and PG courses from the academic year 2001-2002.

OBJECTIVES of Credit System:

* To provide mobility and flexibility for students within and outside the parent department
* 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. However, there could be some flexibility because of practicals, field visits and tutorials. The following Table shows the relation between credits and hours.

Hours in a week	Hours (2-3)	Hours (4)	Hours (5-6)
Theory Credits	1	3	4
Practicals Credits	1	2	3

For PG courses (2 years) a student must earn a minimum of 100 credits. For MCA course (3 years) the student must earn 140 credits to get a pass. For a two year PG degree course the minimum number of papers offered by a department is 18.

COURSE PATTERN

The Postgraduate degree course consists of three major components. They are Core Course, Optional Course and Extra Department Course (EDC).

Core Course

A core course is the course offered by the parent department, totally related to the major subject, components like Practicals, Projects, Group Discussion, Viva, Field Visit, Library record form part of the core course. All the students of the course must take the core courses.

Optional Course

The optional 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 optional. The optional is related to the major subject. The difference between core course and optional course is that there is choice for the student. The department is at liberty to offer optional course every semester or in any two semesters. It must be offered at least in two semesters. The staff too may experiment with diverse courses.

Extra Department Course (EDC)

EDC is an interdepartmental 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 EDCs must be taken by students.

Day College student may also take an EDC from PG SFS Course and *vice versa.* This provision enables students to earn extra credits. The EDCs are offered in the II and III semesters. For the day college student it is offered in the last hour and for the PG SFS course students in the first hour or zero hour. The EDCs are expected to be application oriented and inter-disciplinary.

For Two Year Degree Programme

	Credits	
Core	- 84	
Optionals	- 8	(2 semesters)
EDC	- 6	
Shepherd	- 2	
Total	- 100	

For Three Year MCA Programme

	Credits	
Core	- 121	
Optionals	- 8	(2 semesters)
EDC	- 9	
Shepherd	- 2	
Total	- 140	

Credit System Codes:
The various papers in the different courses are coded. The following code system is adopted.
Each code indicates the following particulars

1) The year of introduction/revision of syllabus (07)
2) Whether it is undergraduate or postgraduate course (U or P)
3) The discipline's name is indicated by two letters as shown below:

Sl. No.	Course	Subject Code
1.	Biochemistry	BI
2.	Biotechnology	BT
3.	Business Administration	BU
4.	Chemistry	CH
5.	Commerce	CO
6.	Computer Applications	CA
7.	Computer Science	CS
8.	Economics	EC
9.	English	EN
10.	English - General	GE
11.	Electronics	EL
12.	Foundation Course	FC
13.	French	FR
14.	Hindi	HI
15.	History	HS
16.	Human Resource Management	HR
17.	Information Technology	IT
18.	Mathematics	MA
19.	Physics	PH
20.	Plant Biology & Plant Biotechnology	PB
21.	Personnel Management & Industrial Relations	PM
22.	Sanskrit	SA
23.	Statistics	ST
24.	Tamil	TA
25.	Tamil - General	GT
26.	Transport Management	TM
27.	Journalism (EDC)	JO
28.	Law (EDC)	LA
29.	Short Hand (English) (EDC)	SH

4) The semester number (1 or 2 or 3 or 4 for 2-year course)
5) The paper number: The courses in the discipline fall into three categories
   Core papers-numbers : 20 to 39
   Optional papers - numbers : 41 to 49
   EDC's : 61 to 70
   For MCA course offered by Department of Computer Science, the following paper numbers used:
   Core papers : 51 to 80
   Optional Papers : 81 to 90

The following examples illustrate the above concept.
The first semester Core papers in Chemistry is given the code 07PCH121
The EDC offered by Chemistry department in Semester III is given the code 07PCH362

Evaluation:
For each course there is formative continuous internal assessment (CIA) and semester examinations (SE) in the weightage ratio 50:50. The following table illustrates how one evaluates the Overall Percentage Marks (OPM) for a student in Chemistry PG course in the all papers put together
OPM= $(a_1b_1+a_2b_2+ .. a_{23}b_{23}) / (b_1+b_2+ \ldots + b_{23})$
Where a_1 ,a_2 ... a_{23} indicate the marks obtained in the 4 semesters for 23 papers and b_1 ,b_2 … b_{23} indicate the corresponding credits for the 23 courses.
For example if total credit points in 23 papers is 6860 then the OPM is given by
OPM = 6860/total number of credits = 6860.0/98=70.0

If OPM is between 50 and 60, the student gets II class. If OPM is 60 and more, then the student is placed in I class. If the OPM score is 75 and more the student gets first class with distinction.
The performance in shepherd programme is indicated by a pass and is not taken into account for computing OPM.

Declaration of result

———————— has successfully completed M. Sc. degree course with FIRST CLASS. The student's overall average percentage of marks is 70. The student has acquired 2 more credits in SHEPHERD programme.

M. Sc. MATHEMATICS - COURSE PATTERN

Sem	Subject code	Subject Title	Hrs/ Week	Credits
I	07PMA121	Real Analysis	7	6
	07PMA122	Methods of Applied Mathematics	7	6
	07PMA123	Differential Equations	7	6
	07PMA141	Classical Dynamics /(or)		
	07PMA142	Differential Geometry	7	5
		Library	2	
		Total Credit for Semester I	**30**	**23**
II	07PMA224	Algebra	6	6
	07PMA225	Measure and Integration	6	6
	07PMA226	Complex Analysis	6	6
	07PMA243	Programming with C++		
	07PMA244	Computer Practical in C++ / (or)		
	07PMA245	Internet Programming	6	4
	07PMA246	Computer Practical in Internet Programming	2	1
	*	EDC	4	3
		Total Credit for Semester II	**30**	**26**
III	07PMA327	Topology	6	6
	07PMA328	Graph Theory	6	6
	07PMA329	Design and Analysis of Algorithms	6	6
	07PMA347	Fuzzy Analysis / (or)		
	07PMA348	Automata Theory	6	5
	*	EDC	4	3
		Library	2	
		Total Credit for Semester III	**30**	**26**
IV	07PMA430	Functional Analysis	7	6
	07PMA431	Fluid Dynamics	7	6
	07PMA432	Probability & Stochastic Process	7	6
	07PMA433	Project Work	7	5
		Library	2	
		Total Credit for Semester IV	**30**	**23**
		SHEPHERD		2
		Total Credit for All Semester	**120**	**100**

* The code for EDC (Extra Departmental Course) will depend on the choice of the students (see in the last two pages of the syllabus copy)

Sem - I Hours/Week: 7
07PMA121 Credit : 6

REAL ANALYSIS

Objectives:

1. 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.
2. To introduce a complete Topological approach in all aspects of Analysis.

Unit-I Basic Topology

Metric spaces- Neighbourhood - Open sets - Closed sets - Compact sets-Perfect sets-the Cantor set-Connected sets.
(Chapter 2, Sections 2.15 to 2.47)

Unit-II Continuity

Limits of functions-Continuous functions-Continuity and Compactness-Continuity and Connectedness-Discontinuities-Monotonic functions.
(Chapter 4, Section 4.1 to 4.30)

Unit-III Differentiation

The Derivative of a Real function-Mean Value Theorems-The Continuity of Derivatives-L'Hospital's Rule-Derivatives of HigherOrder-Taylor's theorem.
(Chapter 5, Sections 5.1 to 5.15)

Unit-IV R-S Integral

Definition and Existence of R-S Integral-Properties of the Integral-Integration and Differentiation.
(Chapter 6, Sections 6.1 to 6.22)

Unit-V Sequence and Series of functions

Discussion of Main Problem-Uniform Convergence-Uniform Convergence and Continuity-Uniform Convergence and Integration-Uniform Convergence and Differentiation-The Stone-Weierstrass theorem.
(Chapter 7, Sections 7.1 to 7.18 and 7.26 only)

BOOK FOR STUDY

1. Walter Rudin: Principals of Mathematical Analysis (THIRD Edition), McGraw-Hill International Book Company, New York.

BOOKS FOR REFERENCE

1. Apostol: Mathematical Analysis, Addison-Wesley Publishing Company, London, 1971.
2. Goldberg: Methods of Real Analysis, Oxford & IBH Publishing Company

Sem I | Hours/Week: 7
07PMA122 | Credits : 6

METHODS OF APPLIED MATHEMATICS

Objectives:

1. To provide applications of Euler's equation, integral transforms and integral equations in solving certain intrinsic problems in other fields such as Mechanics, Fluid Geometry etc.
2. To design mathematical models using integral equations etc.

Unit - I Variational Problems

Maxima and Minima - The simplest case - Illustrative examples including Geodesics - Natural boundary conditions and transition conditions - The variational notation.
(Sections 2.1 - 2.5)

Unit - II Applications

General case - Constraints and Lagrange multipliers - Variable end points - Sturm Liouville problem - Rayleigh Ritz method.
(Sections 2.6 - 2.9, 2.19)

Unit-III Hilbert Schmidt Theory

Introduction - Relation between differential and integral equations - Fredholm's equation with separable kernels - Illustrative examples - Hilbbert - Schmidt theory - Iterative methods - Neumann series.
(Sections 3.1, 3.2, 3.6 - 3.10)

Unit - IV Fredholm Theory

Fredholm theory - Singular integral equations - Special devices; Approximation of Fredholm equation by sets of algebraic equation, Approximation of the kernal.
(Sections 3.11 - 3.13, 3.15, 3.20)

Unit - V Fourier Transform

Fourier's integral theorem - Fourier transforms - Cosine transforms - Sine transforms - Transforms of derivatives - Transforms of some special functions - The Convolution integral-Parseval's theorem for Cosine and Sine transform.
(Sections 2.2 - 2.7, 2.9 - 2.10)

BOOKS FOR STUDY

1. Francis B.Hildebrand : Methods of Applied Mathematics, (Second Edition) (For Units I to IV).
2. Ian N. Sneddon, The use of Integral Transforms (For unit V)

BOOKS FOR REFERENCE

1. Irving, J. and Mullineuk, N.: Mathematics in Physics and Engineering.
2. Venkataraman, M.K.: Higher Mathematics for Engineering and Science.

Sem I | Hours/Week: 7
07PMA123 | Credit : 6

DIFFERENTIAL EQUATIONS

Objectives:

1. To give an in depth knowledge of solving differential equations that we encounter frequently in various walks of life
2. 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 - Property of Bessel functions.
(Chapter 3, Sections 3.3, 3.4(Relevant portions only), 3.5)

Unit II Existence Theorems

Existence and uniqueness theorem-Fundamental matrix - Gronwell 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 Boundary Value Problems

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

Unit IV 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
(Chapter 2, Sections 1, 2, 5, 6, 7, 8, 9, 10, 11)

Unit V 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.
(Chapter 3, Sections 1, 4, 5)

BOOK FOR STUDY

1. S.G.Deo, Lakshmikanthan, V.Raghavendra Ordinary Differential Equations- Second Edition
2. Ian.N.Snedden,Elements of Partial Differential Equations

BOOKS FOR REFERENCE

1. Birkhoff & Rora, Ordinary Differential Equations
2. John.F, Partial Differential Equations (3rd Edition) Narosa 1979.

Sem I | Hours/week: 7
07PMA141 | Credit : 5

Optional: CLASSICAL DYNAMICS

Objective:

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

Unit -I Introductory Concept

The mechanicals 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.
(ChapterIII: 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

1. Donald T. Greenwood : Classical Dynamics (Prentice Hall of India Pvt. Ltd, New Delhi)

BOOKS FOR REFERENCE

1. Herbert Goldstrein : Classical Mechanics.
2. John L.Synge & Byron A. Griffth: Principles of Mechanics.

Sem I | Hours/Week: 7
07PMA142 | Credit : 5

Optional: DIFFERENTIAL GEOMETRY

Objective:

1. To explain briefly the various intrinsic concepts and theories of Differential Geometry
2. 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 - developalde surfaces- second fundamental form - Meusrier's theorem - Euler's theorem.
(Chapter 2, sections 2.1 to 2.6)

Unit-IV

Dupin's indicatrix - some surfaces - a geometrical interpretations 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 of applications of the Gauss and the Codazzi equations - the fundamental theorem of surface theory.
(Chapter 3. Sections 3.1-3.6)

BOOK FOR STUDY

1. Dirk J.Struik : Lectures on Classical Differential Geometry (Second edition), Addison Wesley Publishing Company.

BOOK FOR REFERENCE

1. Wilmore, TJ. : Differential Geometry.

Sem II | Hours/Week: 6
07PMA224 | Credit : 6

ALGEBRA

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: sec 5.1, 5.3, 5.5)

Unit V
The elements of Galois Theory - bounded on the size of G (k, F) - Fundamental theorem of Galois theory-Finite Fields.
(Chapter5: 5.6 and Chapter 7: 7.1)

BOOK FOR STUDY
1. Herstein.I.N. Topics in Algebra 2nd edition John Wiley & Sons

BOOKS FOR REFERENCE
1. Sergi Lang - Algebra.
2. Gopala Krishnan - University Algebra.

Sem II | Hours/Week: 6
07PMA225 | Credit: 6

MEASURE AND INTEGRATION

Objective.
1. To generalize the concept of integration using measures.
2. To develop the concept of analysis in abstract situations.

Unit 1 - Lebesgue Measure
Outer measure-Definition & properties-Lebesgue measure-measurable sets-properties-non-measurable set-measurable functions-Little wood's three principle.
(Chapter 3 Sec. 1-6)

Unit 2 - 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 3 - 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 4 - General measure and Integration
Measure spaces - Measurable functions - Integration - Signed measure-Hahn decomposition theorem - Jordan decomposition theorem-Radon-Nikodym theorem-Lebesgue decomposition theorem.
(Chapter 11 Sec. 1-6)

Unit 5 - 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
1. Real Analysis -H.L.Royden - Prentice Hall of India 2001 edition

BOOKS FOR REFERENCE
1. De Barra.G. Measure and Integration-Wiley Eastern Limited 1991 edition
2. Walter Rudin-Real and Complex Analysis

Sem II Hours/Week: 6
07PMA226 Credit : 6

COMPLEX ANALYSIS

Unit I

Line Integral- Rectifiable arcs- Line integrals as functions of arcs- Cauchy's Theorem for a rectangle- Cauchy's theorem in a disk-Index of a point with respect to a closed curve- Integral formula- Higher derivative.
(Chapter 4 Sections 1.1 to 2.3)

Unit II

Removable singularities- Taylor's Theorem- Zeros and poles- The Local mappings- The maximum principle-The Residue Theorem- The Argument principle- Evaluation of Definite Integrals.

Unit III

Harmonic functions: Definition and Basic properties- The Mean value property, Poisson's formula- Schwarz Theorem- The Reflection principle.
(Chapter 4 Sections 6.1 to 6.5)

Unit IV

Weierstrass's Theorem-The Taylor series- The Laurent series- Partial fractions- Infinite products- Canonical products.
(Chapter 5 Sections 1.1 to 2.3)

Unit V

Representation by Exponentials- The Fourier Development- Functions of finite order- The period module- Unimodular Transformations- The Canonical Basis- General properties of Elliptic Functions-The weierstrass function-The Zeta and Sigma functions.
(Chapter 7 Sections 1.1 to 3.2)

BOOK FOR STUDY

1. Complex Analysis, Third Edition, Lars V. Ahlfors.

BOOKS FOR REFERENCE

1. Complex Analysis, Ponnusamy.

Sem.II Hours/week: 4
07PMA243 Credit : 4

Optional:
OBJECT ORIENTED PROGRAMMING WITH C++

Objectives:
1. To facilitate a mastery of the process of object oriented programming.
2. To teach the applications of object oriented programming.

Unit -I
Introduction to programming in C++-conditional statements and integer types-iteration and floating types.
(Chapters1, 2 and 3 of Text book (1))

Unit-II
Functions-arrays-pointers and references
(Chapters 4, 5 and 6 of Text book (1))

Unit-III
Class and objects-constructors and destructors
(Chapters 5 and 6 of Text book (2))

Unit-IV
Operator overloading and type conversions.
(Chapter 7, sections 7.1 to 7.7 of Text book (2))

Unit-V
Inheritance-extending classes-pointers, virtual functions-polymorphisms.
(Chapter 8, Sections 8.1 to 8.8 and Chapter 9, Sections 9.1 to 9.6 of Text book (2))

BOOK FOR STUDY
1. John Hubbard: Programming with C++, Schaum's Outline Series - McGraw Hill(1996)
2. Balagurusamy, E.:Object Oriented Programming with C++, Tata McGraw Hill(1995)

BOOKS FOR REFERENCE
1. Robert Lafore: Object Oriented Programming in Microsoft C++, Galgotia Publication Pvt., Ltd., New Delhi (1995).
2. Hilbert Schildt: C++: The Complete Reference, Tata McGraw Hill (1998).

Sem II Hours/Week:2
07PMA244 Credit : 1

COMPUTER PRACTICALS IN C++

Objectives

- ✧ To train the students to program the students in C++.
- ✧ To practice computing the results using C++.

LIST OF PRACTICALS

1. Calculation of GCD roots of quadratic equation, nC_r, nP_r, simple problems.
2. String manipulation and problems involving arrays.
3. Use of classes, objects, constructors and destructors.
4. Use of Array of objects.
5. Use of pointers to arrays.
6. Operator overloading.
7. Simple Inheritance.
8. Multilevel Inheritance.
9. Virtual functions.
10. Polymorphism.

Sem II Hours/Week: 4
07PMA245 Credits : 4

Optional:
INTERNET PROGRAMMING

Objectives
1. To develop programming skills in Java.
2. To learn the applications of Java.

Unit I
Variables-Objects-Operators-String Class-Concatenation-The String Buffer Class.
(Chapter 1, Sections 6-11, Chapter 2, Sections 1-7, 9)

Unit II
The IF statement-Nested Conditionals-Operators-Boolean Variables-The Switch statement-FOR, WHILE, DO…WHILE-Nested Loops.
(Chapter 3, Sections 1-11, Chapter 4, Sections 1-6)

Unit III
Methods-Local variables-Overloading-Classes-Constructors-Copy Constructors-Wrapper Classes.
(Chapter 5, Sections 1-7, Chapter 6, Sections 1-6, 10)

Unit IV
Composition-Recursive Classes-Inheritance-The Super Keyword-The Object Class- The Close () and Equals () methods.
(Chapter 7, Sections 1-10)

Unit V
Arrays-The Vector Class-Two Dimensional Arrays-Applets-The Applet Class-The Thread Class-Exceptions.
(Chapter 8, Sections 1-5.7, Chapter 9, Sections 1-4)

BOOK FOR STUDY
1. John Hubbard: Programming with JAVA Schaum's Outline Series, McGraw Hill.

BOOKS FOR REFERENCE
1. Patrick Norton: Complete reference in JAVA.

Sem II Hours/Week: 2
07PMA246 Credit : 1

COMPUTER PRACTICALS IN INTERNET PROGRAMMING

Objectives

- ✧ To train the students in Internet programming.
- ✧ To practice computing the results using Integer Programming.

LIST OF PRACTICALS

1. Simple Programs using for, while, do-while, ternary and switch.
2. Array and Vector.
3. String handling using string and string buffer.
4. Inheritance and Method Overriding.
5. Interfaces.
6. Packages.
7. Multithread Programming.
8. Text files (copy, display, counting characters, words and lines).
9. Data files (creating, processing).
10. Applet and Awt.
11. Web page designing.

Sem III Hours/Week: 6
07PMA327 Credit : 6

TOPOLOGY

Objectives:

1. To generalize the concepts the students have learnt in Real Analysis
2. To train the students to develop analytical thinking

Unit I - Topological spaces

Topological spaces-Basis for a topology-The order topology-The product topology on X x Y-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- The Quotient Topology - Connected Spaces-Connected Subspaces of the Real line-Components and local connectedness.
(Chapter II , Sections 19-22, 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 Urysohn Metrization Theorem-The Tietze extension Theorem.
(Chapter IV, Sections 33-35)

BOOK FOR STUDY

1. James R. Munkres: Topology-Second Edition (Pearson Education INC) 2001 Reprint

BOOKS FOR REFERENCE

1. James Dugunji: General Topology.
2. Hu, S.T: Elements of General Topology.

Sem I Hours/Week:6
07PMA328 Credit : 6

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.

Unit-I - Basic Concepts

Basic Results-Basic Concepts-Sub graphs-Degrees of vertices-Paths and connectedness-Operations on graphs-Directed graphs: Basic Concepts-Tournaments
(Chapter I, Sections 1.1 to 1.7, Chapter II, Sections 2.1 to 2.2)

Unit II - Connectivity

Vertex cuts and edge cuts-connectivity and edge connectivity-blocks.
Trees: Definitions, Characterization and simple properties-Counting the number of spanning trees-Cayley's formula.
(Chapter III, Sections 3.1 to 3.3,Chapter IV, Sections 4.1,4.3,4.4)

Unit III - Independent sets and matchings

Vertex independent sets and vertex coverings-edge independent sets - matchings and factors-Eulerian graphs-Hamiltonian graphs.
(Chapter V, Sections 5.1 to 5.2, Chapter VI, Sections 6.1 to 6.2)

Unit IV - Colouring

Graph Colourings-Vertex colouring-Critical graphs-Triangle free graphs edge colourings of graphs-Chromatic polynomials.
(Chapter VII, Sections 7.1 to 7.4, 7.7)

Unit V - Planarity

Planar and non planar graphs-Euler formula and its consequences-K_5 and $K_{3,3}$ nonplanar graphs-Dual of a planar graph-The four- colour theorem and the five colour
Theorem.
(Chapter VIII, Sections 8.1 to 8.5)

BOOK FOR STUDY:

1. R.Balakrishnan & K.Ranganathan, Textbook of Graph Theory by Springer.

BOOKS FOR REFERENCE:

1. Bondy.J.A. & Murty V.S.R-Graph theory with applications -the Mac Millan Press Ltd.1976
2. Arumugam. S and Ramachandran S. Invitation to Graph Theor-New Gamma Publishing house, Palayamkottai 1993

Sem III Hours/Week: 6
07PMA329 Credit : 6

DESIGN AND ANALYSIS OF ALGORITHMS

Objectives:

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

Unit I - Introduction

What is an algorithm? - Algorithm specification-Performance analysis-Randomized algorithms
(Sections 1.1, 1.2, 1.3.1 to 1.3.4, 1.4.1 to 1.4.3)

Unit II - Elementary data structures

Stacks and Queues-Trees-Dictionaries-Priority Queues-Graph representations.
(Sections 2.1 to 2.4, 2.6)

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 VI - 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-Traveling sales person algorithm.
(Sections 4.1, 4.3, 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-Modular arithmetic-Even faster evaluation and interpolation.
(Sections 9.1 to 9.5)

BOOK FOR STUDY

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran-Fundamentals of Computer algorithms-Galgotia Publications Pvt Ltd 2000.

BOOK 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).

Sem III Hours/Week:6
07PMA347 Credit : 4

Optional:
FUZZY ANALYSIS

UNIT - I
Crisp sets and fuzzy sets - basic concept of fuzzy set - fuzzy logic - operations on fuzzy sets - general discussion - fuzzy complements.

UNIT - II
Fuzzy union - fuzzy intersection - combinations operations.

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.

UNIT - IV
Fuzzy measures - general discussion - belief and plausibility measures - probability measures - possibility and necessity measures.

UNIT - V
Fuzzy decision making - individual decision making - fuzzy ranking methods - fuzzy linear programming.

TEXT BOOK:
1. Fuzzy sets, uncertainty and information - George J.Klir,Tina.A , Folger, (PHI,2003)
   UNIT I chapter 1- 1.4, 1.6 & chapter 2 -2.1 & 2.2
   UNIT II chapter 2 - 2.3, 2.4, 2.5
   UNIT IV chapter 4 -4.1, 4.2, 4.3, 4.4
2. Fuzzy sets and fuzzy logic theory and applications- George J. Klir and Bo Yuan (Prentice- Hall of India private limited , New Delhi)
   UNIT V chapter 15 -15.2, 15.6, 15.7
3. Fuzzy set theory and its applications (second, revised edition) H.J. Zimmermann (Allied publishers limited New Delhi)
   UNIT III chapter 6 - 6.1, 6.1.1, 6.1.2, 6.2, 6.3

BOOK FOR REFERENCE:
1. Fuzzy logic with engineering Applications- Timothy J. Ross, McGraw- Hill, Inc. New Delhi

Sem III Hours/Week: 6
07PMA348 Credit : 6

Optional:
AUTOMATA THEORY

Objective:
1. To make the students understand the nuances of Automata and Grammar.
2. 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 ε-moves-Regular expressions and their relationship with automaton.
(Book 1-Chapter 2, Section 2.1 to 2.5)

Unit II - Contex free grammar
Grammar-ambiguous and unambiguous grammars-derivation trees-Chomsky Normal form-Greibach normal form.
(Book 1-Chapter 4, Sections 4.1 to 4.3, 4.5 to 4.6)

Unit III
Pushdown Automaton -definition and examples-Relation with Contex free languages-Pumping lemma for CFLs.
(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 to 3.8)

Unit V - Basic parsing techniques
Parsers - Topdown - Bottomup - Shift reduce-operator predence - Recursive descent-Predivine parsing
(Book 2-Chapter 5, Section 5.1 to 5.5)

BOOKS FOR STUDY
1. Introduction to Automata theory, languages and combinatorics by John E. Hopcroft and J.D.Ullman, Narosa Publishing House-Chennai
2. Principles of compiler design by A.V.Aho and J.D.Ullman, Narosa Publishing House-Chennai.

Sem IV Hours/week: 7
07PMA430 Credit : 6

FUNCTIONAL ANALYSIS

Objectives

1. To study the three structure theorems of Functional Analysis viz., Hahn- Banach theorem, open mapping theorem and uniform boundedness principle.
2. 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,sections1-7)

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

1. Bose, S.C: Introduction to Functional Analysis, MacMillan India limited, Delhi, 1997

BOOKS FOR REFERENCE

1. Somasundaram.D : Functional Analysis, Viswanathan,S. &Co., Chennai.
2. Sinmons, G.F.: Introduction to Topology & Modern Analysis, International student Edition McGraw Hill Kogakusha Ltd., 1963.
3. Walter Rudin: Functional Analysis, Tata McGraw Hill publishing Co., New Delhi 1977.

Sem IV Hours/Week:7
07PMA431 Credit : 6

FLUID DYNAMICS

Objectives

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

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 2.1 to 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 and 3.9)

Unit III: Some Three- Dimensional Flows

Introduction-Sources, Sinks and Doublets Images in rigid infinite plane-Images in solid spheres-Axi-Symmetric flows; Stoke's Stream Function. (Chapter 4-Sections 4.1 to 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 to 5.8)

Unit V: Viscous Fluid

Stress components in a real fluid-Relation between Cartesian Components of Stree-Translational motion of fluid element-The Co-efficient 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 to 8.3, 8.8, 8.9, 8.10.1).

BOOK FOR STUDY

1. Frank Chorlton: Textbook of Fluid Dynamics, CBS Publishers & Distributors, Edition of Year 2000.

BOOKS FOR REFERENCE

1. Milne and Thomson.L.M. Theoretical Hydrodynamics.
2. Rathy.R.K.: An Introduction to Fluid Dynamics.

Sem IV Hours/Week: 7
07PMA432 Credit : 6

PROBABILITY AND STOCHASTIC PROCESS

Objectives

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

Unit I: Introduction to Probability Theory

Introduction - Sample space and events - Conditional probabilities - Independent events - Random Variables - Discrete Random variables - Continuous Random variables. (Chapter I (full), Chapter II, Section 2.1, 2.2, 2.3)

Unit II: Jointly Distributed Random variables and limit theorems

Expectation of Random variables - Jointly Distributed Random variables - Moment Generating functions - Limit theorems. (Chapter II, Section 2.4 - 2.6)

Unit III: Elements of Stochastic Processes and Markov Chains

Classification of General Stochastic Processes (definition of 'martingale' is omitted)-Transition Probabilities-Examples of Markov chain (examples A, B, C and E only)-Matrices of Markov chain-Classifications of states of a Markov chain-Recurrence (Proof of Abel's lemma is omitted)-examples of recurrent Markov chains-More on recurrence. (Chapter 1, Section 3 and Chapter 2, Sections 1, 2, 3, 4, 5, 6, 7)

Unit IV: Basic limit theorem of Markov chains and Applications

Discrete Renewal equation-Absorption probabilities-Criteria for recurrence-Random walk. (Chapter 3, Sections 1, 3, 4, 7)

Unit V: Classical examples of Continuous time Markov Chains

General pure birth Processes and Poisson processes-More about Poisson processes-Birth and death Processes-Examples of Birth and death processes-Birth and death processes with absorbing states-Finite state continuous time Markov chains.
(Chapter 4, Sections 1, 2, 4, 5, 6, 7, 8)

BOOKS FOR STUDY

1. Introduction to Probability Models, Sheldon M. Ross, 8th Edition, Academic Press, USA(2004) (For unit I &II)
2. Samuel Karlin, Howard M.Taylor: A first course in Stochastic Processes (second edition), Academic Press, New York. (For units III to V)

BOOKS FOR REFERENCE

1. Narayan Bhat, U: Elements of Applied Stochastic processes (second edition), John Wiley & Sons.
2. Prabhu, N.V: Stochatic processes, MacMillon New York.
3. Medhi, J: Stochastic Processes (second edition), New Age International Publishers, New Delhi.
4. An Introduction to Probability theory and its Applications, Feller, Volume I, 3rd Edition , John Wiley & Sons, New York.

EXTRA DEPARTMENT COURSES (EDC)
OFFERED BY THE VARIOUS DISCIPLINES DURING II AND III SEMESTERS

Sem	Code No.	Title of the Paper	Hr	Cr
Department of Biochemistry				
II	07PBI261	Applied Nutrition*	4	3
III	07PBI362	First Aid Management*	4	3
Department of Biotechnology				
II	07PBT261	Basics of Bioinformatics*	4	3
III	07PBT362	Geomics and Proteomics	4	3
Department of Botany				
II	07PBO261	General Microbiology	4	3
III	07PBO582	Remote Sensing and Geographical Information System	4	3
Department of Chemistry				
II	07PCH261	Environmental Science	4	3
III	07PCH362	Industrial Chemistry	4	3
Department of Commerce				
II	07PCO261	Fundamentals of Accounting for Managers	4	3
III	07PCO362	Management Concepts and Organizational Behaviour	4	3
Department of Computer Science (SFS)				
II	07PCS261	Internet Concepts*	4	3
III	07PCS362	Interpersonal Soft Skills*	4	3
III	07PCS363	Computer Applications for Social Sciences*	4	3
Department of Computer Science (MCA)				
II	07PCA261	Internet Concepts	4	3
II	07PCA262	Foundations of Computer Science	4	3
III	07PCA363	Computer Applications for Social Sciences	4	3
III	07PCA364	Fundamentals of Programming	4	3
Department of Economics				
II	07PEC261	Economics for Managers	4	3
III	07PEC362	Indian Economy	4	3
Department of Electronics				
II	07PEL261	Electronics in Communication*	4	3
III	07PEL362	Computer Hardware*	4	3
Department of English				
II	07PEN261	English for Specific Purposes	4	3
III	07PEN362	Interviews and Group Dynamics	4	3

Department of French

II	07PFR261	Beginners Course in French	4	3
III	07PFR362	Advanced Course in French	4	3

Department of History

II	07PHS261	Public Administration*	4	3
III	07PHS362	Applied Tourism*	4	3

Department of Human Resource Management

II	07PHR261	An Introduction to Human Psychology	4	3
III	07PHR362	Personality and Soft Skills Development	4	3

Department of Mathematics

II	07PMA261	Operations Research	4	3
III	07PMA362	Numerical Methods	4	3

Department of Physics

II	07PPH261	Physics for Rural Development**	4	3
II	07PPH262	Modern Photography**	4	3
III	07PPH362	Medical Physics**	4	3

Department of Tamil

II	07PTA261	அரசுப் பணித்தேர்வுத் தமிழ் - I*		
III	07PTA362	அரசுப் பணித்தேர்வுத் தமிழ் - **II***	4	3

Non-Departmental Courses

Journalism (Rev. Dr. Joseph Lourduraj)

II	07PJO261	Beginners Course in Journalism	4	3
III	07PJO362	Advanced Course in Journalism	4	3

Law (Mr. C. M. George)

II	07PLA261	Beginners Course in Law	4	3
III	07PLA362	Advanced Course in Law	4	3

Shorthand (Mr. Santhanasamy)

II	07PSH261	English Shorthand-I	4	3
III	07PSH362	English Shorthand-II	4	3

* Offered by Self Financing Section

** Both Day & Self Financing Section