SADAKATHULLAH APPA COLLEGE
(AUTONOMOUS)

(Reaccredited by NAAC with 'A' GRADE and ISO 9001: 2008 certified)

Rahmath Nagar, Tirunelveli – 627 011

DEPT. OF MATHEMATICS (SF)

M.Sc. (Mathematics)

UNITIZED SYLLABUS (CBCS)

FOR

(2011 - 2014)

(Applicable for students admitted in June 2011 and onwards)

(Updated as per the resolutions passed in the Academic Council Meeting held on 14-03-2013)

M.Sc. – MATHEMATICS (2011 - 2014)

COURSE STRUCTURE (CBCS)

I SEMESTER				II SEMESTER		
COURSE	**H/W**	**C**		**COURSE**	**H/W**	**C**
Core 1	6	4		Core 5	6	4
Core 2	6	4		Core 6	6	4
Core 3	6	4		Core 7	6	4
Core 4	6	4		Core Practical	6	3
Elective - 1 (Major)	6	5		Elective - 2 (Non-Major)*	6	5
TOTAL	**30**	**21**		**TOTAL**	**30**	**20**
III SEMESTER				**IV SEMESTER**		
Core 8	6	5		Core 12	6	5
Core 9	6	5		Core 13	6	5
Core 10	6	5		Core 14	6	5
Core 11	6	5		Core 15 - Project	6	4
Elective - 3 (Non Major)*	6	5		Elective - 4 (Major)	6	5
TOTAL	**30**	**25**		**TOTAL**	**30**	**24**

DISTRIBUTION OF HOURS, CREDITS, NO. OF PAPERS & MARKS

SUBJECT	HOURS	CREDITS	NO. OF PAPERS	MARKS
Core + Practical	96	70	15 + 1	1600
Elective (Major / Non Major)	24	20	2+2	400
TOTAL	**120**	**90**	**20**	**2000**

*** For other major students**

CBCS SYLLABUS FOR M. Sc. - MATHEMATICS (2011 - 2014)								
SEM	CO	TITLE OF THE PAPER	S.CODE	H/W	C	MARKS		
						I	E	T
I	C1	Groups, Rings & Fields	11PCMA11	6	4	25	75	100
	C2	Real Analysis – I	11PCMA12	6	4	25	75	100
	C3	Java Programming	11PCMA13	6	4	25	75	100
	C4	Analytic Number Theory	11PCMA14	6	4	25	75	100
	E (M)	A) Differential Equations **OR**	11PEMA1A	6	5	25	75	100
		B) Classical Mechanics	11PEMA1B					
II	C5	Linear Algebra	11PCMA21	6	4	25	75	100
	C6	Real Analysis – II	11PCMA22	6	4	25	75	100
	C7	Visual Basic	11PCMA23	6	4	25	75	100
	CP	Core Practical	11PCMAP1	6	3	40	60	100
	E(NM)1	Choose from the NME List	-	6	5	25	75	100
III	C8	Graph Theory	11PCMA31	6	5	25	75	100
	C9	Advanced Operations Research	11PCMA32	6	5	25	75	100
	C10	Complex Analysis	11PCMA33	6	5	25	75	100
	C11	Measure Theory and Integration	11PCMA34	6	5	25	75	100
	E(NM)2	Choose from the NME List	-	6	5	25	75	100
IV	C12	Functional Analysis	11PCMA41	6	5	25	75	100
	C13	Topology	11PCMA42	6	5	25	75	100
	C14	Mathematical Statistics	11PCMA43	6	5	25	75	100
	C15	Project	11PPMA44	6	4	80	20	100
	E (M)	A) Differential Geometry **OR**	11PEMA4A	6	5	25	75	100
		B) Coding Theory	11PEMA4B					
			TOTAL	**120**	**90**	**570**	**1430**	**2000**

*** For other major students**

DEPT. OF MATHEMATICS (P.G.) CBCS SYLLABUS - M.Sc. – MATHEMATICS (2011 - 2014)								
Non-major Elective subject offered by PG Department of Mathematics to other major PG students								
SEM	P	TITLE OF THE PAPER	S.CODE	H/W	C	MARKS		
						I	E	T
II	E(NM) 1	Quantitative Aptitude - I	11PEMA2N	6	5	25	75	100
III	E(NM) 2	Quantitative Aptitude - II	11PEMA3N	6	5	25	75	100
			TOTAL	**120**	**90**	**520**	**1480**	**2000**

CBCS SYLLABUS FOR M.Sc., MATHEMATICS

(2011 – 2014)

I SEMESTER			
Core 1	**GROUPS, RINGS & FIELDS**		**11PCMA11**
Hrs / Week : 6	**Hrs / Sem : 6x 15 = 90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To know the richness of the techniques of Mathematics by way of studying class equation, sylow's theorem, direct products and finite abelian Groups.
- To know that fields play a key role in algebra through a study of certain aspects of field theory which have impact on the theory of equations.

UNIT I

A Counting principle – Another counting principle – Sylow Theorems

UNIT II

Direct product – external, internal direct products - Finite Abelian groups.

UNIT III

Euclidean rings – Particular Euclidean rings-Polynomial rings-Polynomial over the Rational Field.

UNIT IV

Extension fields – Roots of Polynomial.

UNIT V

More about roots - Elements of Galoi's Theory – (Fundamental theorem of Galoi's theory – statement only)

TEXT BOOK:

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

   UNIT I: Section 2.5, 2.11, 2.12.

   UNIT II: Section 2.13, 2.14.

   UNIT III: Section 3.7 to 3.10.

   UNIT IV: Section 5.1, 5.3.

   UNIT V: Section 5.5, 5.6.

I SEMESTER			
Core 2	**REAL ANALYSIS I**		**11PCMA12**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit :18**	**Credit : 4**

OBJECTIVES:

- To provide deep understanding of the Metric concepts.
- To learn more about continuity and differentiations.

UNIT I

Basic topology: Finite, countable and uncountable sets -- metric spaces – compact sets - perfect sets – connected sets.

UNIT II

Numerical sequences and series: Convergent sequences – Subsequences – Cauchy sequences – Upper and lower limits – some special sequences.

UNIT III

Series – Series of Nonnegative terms – the number e-the root and ratio test. . Power series – summation by parts – absolute convergence addition and multiplication of series – Rearrangement.

UNIT IV

Continuity

UNIT V

Differentiation

TEXT BOOK:

Rudin – "Principles of Mathematical Analysis" – 3rd Edition, Tata and McGraw Hill

Unit I : chapter 2(full)

Unit II : chapter 3(section 3.1-3.20)

Unit III : chapter 3(section 3.21-3.55)

Unit IV : chapter 4(full)

Unit V : chapter 5(full)

I SEMESTER			
Core 3	**JAVA PROGRAMMING**		**11PCMA13**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To have a deep knowledge of JAVA Language.
- To study Classes, Objects and Methods.
- To Learn more about inheritance, Packages and Interfaces.
- To Motivate the students to implement problems in JAVA.

UNIT I

Overview of Java Language – Data types, variables, arrays – Operators, control statements, decision making, branching and looping.

UNIT II

Classes, Objects and methods

UNIT III

Inheritance – packages and interfaces

UNIT IV

Exception handling – multi threaded

UNIT V

Numerical solutions of ODE- Euler's method and R-K methods.

TEXT BOOKS:

1. **Patrick naughton**, **Herbert Schildt**-JAVA – 2, The complete reference (3rd edition), Tata McGraw Hill 1999.
2. **Herbert Schildt**-JAVA – 2, The complete reference (4th edition), Tata McGraw Hill 2001.
3. **G.F. Simmons**- Differential equations.
   Sections: 72, 74, 75.

I SEMESTER			
Core 4	**ANALYTIC NUMBER THEORY**		**11PCMA14**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To have a deep knowledge in Analytic Number theory.

UNIT I

The Fundamental Theorem of Arithmetic: Introduction – Divisibility – Greatest common divisor - Prime numbers - Fundamental theorem of arithmetic-The series of reciprocals of the primes – The Euclidean algorithm – The greatest common divisor of more than two numbers.

UNIT II

Arithmetical Functions and Dirichlet Multiplication: Introduction – The Mobius function $\mu(n)$ – The Euler totient function $\varphi(n)$ – A relation connecting φ and μ –A product formula for $\varphi(n)$ – The Dirichlet product of arithmetical functions – Dirichlet inverses and the Mobius inversion formula – The Mangoldt function $\Lambda(n)$ – Multiplicative functions – Multiplicative functions and Dirichlet multiplication – The inverse of a completely multiplicative functions – Liouville's function $\lambda(n)$ – The divisor functions $\sigma\alpha(n)$ – Generalized convolutions.

UNIT III

Averages of Arithmetical Functions: Introduction – The big oh notation. Asymptotic equality of functions – Euler's summation formula - Some Elementary asymptotic formulas – The average order of d(n) – The average order of the divisor functions $\sigma_\alpha(n)$ The average order of $\varphi(n)$ – An application to the distribution of lattice points visible from the origin – The average order of $\mu(n)$ and of $\Lambda(n)$.

UNIT IV

Some Elementary Theorems on the Distribution of Prime Numbers: Introduction - Chebyshev's functions $\psi(x)$ and $\acute{\upsilon}(x)$ – Relations connecting $\acute{\upsilon}(x)$ and $\pi(x)$ – Some equivalent forms of the prime number theorem – Inequalities for $\pi(n)$ and p_n – Shapiro's Tauberian theorem.

UNIT V

Congruences: Definition and basic properties of congruences – Residue classes and complete residue systems – Linear congruences – Reduced residue systems and the Euler-Fermat theorem – Polynomial congruences modulo p.Lagrange's theorem – Applications of Lagrange's theorem.

TEXT BOOKS:

Tom M.Apostol - Introduction to analytical number theory.
UNIT I: Chapter 1 (1.1 to 1.8).
UNIT II: Chapter 2 (2.1 to 2.14).
UNIT III: Chapter 3 (3.1 to 3.9).
UNIT IV: Chapter 4 (4.1 to 4.6).
UNIT V: Chapter 5 (5.1 to 5.6).

I SEMESTER			
E1 A(M)	**DIFFERENTIAL EQUATIONS**		**11PEMA1A**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To discuss several methods for finding series solutions to differential equations.

UNIT I

Power series solutions – a review of power series – series solutions of first order equations.

UNIT II

Second order linear equations - Ordinary points – Regular singular points.

UNIT III

Gauss Hyper Geometric equation – Point at infinity – Hermite polynomial.

UNIT IV

Legendre Polynomials - Bessel functions.

UNIT V

Properties of Bessel functions – Linear systems – homogeneous linear systems with constant coefficients.

TEXT BOOK:

G.F. Simmons - Differential equation with application and historical notes – Tata Mc Graw Hill Publication--Edition -2.

UNIT I : Chapter 5 (26, 30).

UNIT II : Chapter 5 (28, 29, 30).

UNIT III : Chapter 5 (31, 32).

UNIT IV : Chapter 5 (Appendix B) and Chapter 8 (44).

UNIT V : Chapter 8 (46, 47).

I SEMESTER			
E 1 B(M)	**CLASSICAL MECHANICS**		**11PEMA1B**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To learn more about of the mechanics of a partical, Lagranges equations, Hamiltons equations. Predicate calculus.
- To learn about Central force problems, Kepler's problem.

UNIT I

Mechanics of particle - Mechanics of a system of particles.

UNIT II

D'Alembert's principle and Lagrange's Equations - velocity dependent Potentials and the dissipation functions - simple applications of Lagrangion formulation.

UNIT III

Hamilton's Principles - some techniques of the calculus of variations - Derivation of Lagrange's equations from Hamilton's principle - Extension of Hamilton's principle to non-holomonic systems - Advantage of a variational principle formulation – conservation theorems and symmetry properties.

UNIT IV

The two body central force problem - reduction to the equivalent one body problem - The equivalent motions and first integrals - The equivalent one dimensional problem and classification equation for the orbit and integrable power law potentials.

UNIT V

Condition for closed orbits - The Kepler problem - Inverse Square law of force -The motion in time in the Kepler problem - The Laplace-Runge-Lenz vector.

TEXT BOOK:

H. Goldstein- Classical Mechanics-Second Edition.Addison Wesley

Chapters: 1, 2, and 3(Except Sections 3.10 and 3.11)

II SEMESTER			
Core 5	**LINEAR ALGEBRA**		**11PCMA 21**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 =90**	**Hrs / Unit :18**	**Credit : 4**

OBJECTIVES:

- To study the basic concepts of linear dependence, basis and Homomorphisms of vector spaces.
- To understand an extremely rich structure called algebra of linear transformations and the two canonical forms: triangular form and nilpotent transformations.
- To learn about Trace and Transpose, determinants and Real Quadratic forms.

UNIT I

Vector Space – Linear independence and bases – Dual Space.

UNIT II

Inner product spaces and modules.

UNIT III

The algebra of linear transformations – Characteristic roots – Matrices.

UNIT IV

Triangular form--Nilpotent form –Trace and Transpose.

UNIT V

Determinants – Hermitian, Unitary and Normal Transformation—Real Quadratic forms.

TEXT BOOK:

N. Herstein: Topics in Algebra (2^{nd} edition).

UNIT I : Section 4.1 to 4.3
UNIT II : Section 4.4 to 4.5
UNIT III : Section 6.1 to 6.3
UNIT IV : Section 6.4, 6.5, 6.8
UNIT V: Section 6.9, 6.10, 6.11

II SEMESTER			
Core 6	**REAL ANALYSIS II**		**11PCMA 22**
Hrs / Week : 6	**Hrs / Sem : 6x 15 =90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To learn about Riemann integration, Sequence and series of functions. Equicontinuous families of functions, Functions of several variables.
- To learn about the L^p spaces.

UNIT I

Riemann – Stieltjes Integral – Definition – Properties – Integration and differentiation – Integration of vector valued functions – Rectifiable Curves.

UNIT II

Sequences and series of functions- Discussion of main problem - Uniform convergence – Uniform convergence and continuity – Uniform convergence and Integration.

UNIT III

Uniform convergence and Differentiation - Equicontinuous Families of functions - The stone Weierstrass theorem (Generalization of stone's Weierstrass theorem statement only).

UNIT IV

Functions of Several variables: Differentiation - The contraction principle - the inverse function theorem - The implicit function theorem.

UNIT V

The L^p spaces: Holder and Minkowski's inequalities – Convergence and completeness – Bounded linear functional on the L^p spaces.

TEXT BOOKS:

1. Walter Rudin – Principles of Mathematical Analysis, (3rd Edition), Mc Graw Hill International Edition. Chapter 6, 7 and 9 (Sections 9.10 to 9.29)

2. H.L. Royden-Real Analysis (2nd Edition). The Macmillan company, Inc, Newyork collier Mac Millan Publishers, London. Chapter 6 (Full).

II SEMESTER			
Core 7	**VISUAL BASIC**		**11PCMA23**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 4**

OBJECTIVES:

- To have a deep knowledge of Visual Basic.

UNIT I

Introduction : The initial VB Screen – The single Document Interface Environment – The Help system – Toolbars – The Toolbox and custom controls and Components – using the File menu – Editing – Using the View menu – Using the Project menu – the Format menu – the Run and Debug menu – Using the Tools menu – Using the Add – Ins menu – using the Window menu

UNIT II

Customizing a Form and Writing simple Programs: Starting a New Project – the Properties Window – Common Form Properties – Making a form responsive – Printing a Visual representation of a Form – Types – Saving your work – Creating Stand – alone Windows Programs

First steps in building the User Interface: The Toolbox – the Control Name Property – Simple Event Procedures for comma Buttons – Access Keys – Image controls – Text Boxes – Labels – Navigating between controls – Message Boxes – the Grid – the Display in VB.

UNIT III

First steps in Programming: The code Window – VB'S editing tools – statements in VB – Variables – setting properties with code – Data types – more on strings – more on numbers – Constants – Input Boxes.

Displaying Information: Displaying information on a Form – the Format function – Picture boxes – Rich Text boxes – the Printer Object.

UNIT IV

Controlling Program Flow: Determine Loops – Indeterminate Loops – making decisions – Select Case – Nested If – Then's – the Goto.

Built – in Functions : String functions – the Like function and Fuzzy searching – the Rnd function – Bit – Twiddling functions – Numeric functions – Date and Time functions – Advanced Uses of Procedures and Functions – Object Browser

Organizing Information Via Code : Lists – One-Dimensional Arrays – Arrays with more than one dimension – using lists and arrays with Functions and Procedures – the New Array – based String handling functions – Sorting and Searching – Records – the with Statement – Enums.

UNIT V

Organizing Information via controls: Control Arrays – List and Combo Boxes – the Flex Grid Control.

Building larger projects : Projects with Multiple Forms – Code Modules – Global Procedures and Global variables – the Do Events Function and Sub Main – Sub Main

Finishing the Interface: Option Buttons – Common Dialog Boxes – the Microsoft Windows Common Controls 6.0 – Menus – MDI Forms.

TEXT BOOK:

1. **Gary Cornell** – Visual Basic 6 form the Ground UP –Tata McGraw and Hill Edition 2002 (11^{th} Reprint)
   Chapters: 2 -12, 14.

REFERENCE BOOKS:

1. **Steve Brown-**, Visual Basic 6 in Record time, BRB publications.
2. **Deital & Deital**-Visual Basic 6.0.
3. **N. Krishnan (Scitech)-**Visual Basic 6.0 in 30 days.

I& II SEMESTERS		
CORE PRACTICAL	**JAVA AND VISUAL BASIC**	**11PCMAP1**
Hrs/Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Credit : 3**

JAVA PROGRAMMING PRACTICAL

1. Simple JAVA program
2. Programs using 1 – D, 2 – D Rays
3. Programs using control statements
4. Programs using classes and objects
5. Programs using overloading
6. Programs using riding and inheritance
7. Programs using interface
8. Programs using package
9. Programs using threading concept
10. Programs suing exception handle
11. Programs on string manipulations.
12. Programs on Numerical methods.

VISUAL BASIC PRACTICAL

1. Arithmetic Calculator
2. Design a clock
3. Menu Creation – with simple file and edit options
4. Designing a color mixer using basic colors
5. Create a file open dialogue box to load a picture
6. Create an application to format the text inside the text box
7. Create an application to do the matrix additions, multiplication
8. Viewing records using data base controls
9. Adding records to database using database controls
10. Accessing Database files using ODBC
11. Display the information in the report form
12. Create an application to move the elements from list to list and add new items
13. Picture Animation
14. Rolling Dice Simulator
15. Objective type Questionnaire

III SEMESTER			
Core 8	**GRAPH THEORY**		**11PCMA 31**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To provide an indepth knowledge of graph theoretical concepts.
- To explore the various applications of graph theory.
- To motivate the students to do research in discrete and applied mathematics.

UNIT I

Trees: Bridges - Trees. **Connectivity:** Cut vertices - Blocks – Connectivity.

UNIT II

Traversability: Eulerian graphs–Hamiltonian graphs. **Digraphs:** Strong Digraphs.

UNIT III

Matchings and Factorizations: Matchings – Factorization.

UNIT IV

Planarity: Planar graphs –Embedding Graphs on surfaces.

Coloring: Vertex coloring

UNIT V

Edge coloring –The Heawood Map colouring theorem.

Ramsey Numbers: The Ramsey number of graphs.

Distance: The centre of a graph.

TEXT BOOK:

Gary Chartrand and Ping Zhang-Introduction to Graph Theory
Edition 2006. Tata McGraw-Hill Publishing Company Limited, New Delhi.
UNIT I: Chapter 4(4.1, 4.2), Chapter 5(5.1, 5.2, 5.3).
UNIT II: Chapter 6(6.1, 6.2), Chapter 7(7.1).
UNIT III: Chapter 8(8.1, 8.2).
UNIT IV: Chapter 9(9.1, 9.2), Chapter 10 (10.2).
UNITV: Chapter 10 (10.3,10.4), Chapter 11(11.1), Chapter 12 (12.1).

REFERENCE BOOKS:

1. **J. Bondy & U.S.R. Murty -**Introduction to Graph theory.
2. **D.West-**Introduction to Graph Theory.

III SEMESTER			
Core 9	**ADVANCED OPERATIONS RESEARCH**		**11PCMA32**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To understand the concept of Linear and Non-Linear Programming.
- To understand the concept of dynamic programming and Decision Theory
- To learn about inventory Models.

UNIT I.

Game theory- Solutions of m x 2 and 2 x n games- Algebraic method, iterative method, simplex method- fundamental theorem of game theory.

UNIT II

Non-linear programming – Formulation Graphical solution – constraint optimization with equality constraint - constraint optimization with inequality constraint.

UNIT III

Dynamic programming – recursive equation approach – solution of LPP by D.P – Optimal subdivision problem, Stage coach problem, investment problem ,employment smoothening problem.

UNIT IV

Queuing theory. Distribution of arrivals (pure –birth process) Distribution of inter arrival times. Distribution of departures (pure death process) single channel finite Q and infinite Q multi channel finite Q and infinite Q, machine repair model.

UNIT V

Decision Theory. Decision making process – Decision under uncertainty – Decision under risk. Decision tree analysis-Inventory models (deterministic only)

REFERENCE BOOK:

1. **Kanti Swarup & Others**. Operations Research.
2. **Mangaladoss**- Operation Research.
3. **Visit: www. math_materials.com**

III SEMESTER			
Core 10	**COMPLEX ANALYSIS**		**11PCMA33**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To develop the basic concepts of complex analysis.

UNIT I

Complex function: Introduction to the concept of analytic function – elementary theory of power series

UNIT II

Conformality: Arcs and closed curves – Analytic functions in regions - Conformal mapping - the Linear Group - the cross ratio - Symmetry.

UNIT III

Complex integration: fundamental theorems – Cauchy's integral formulae

UNIT IV

Local properties of Analytic function – the Calculus of Residues

UNIT V

Harmonic functions – Power series expansion

TEXT BOOKS:

'Ahlfors' Complex analysis – third edition Tata Mc Graw Hill Ltd sections

UNIT I: Chapter 2 (1.1 to 1.4, 2.1 to 2.5).

UNIT II: Chapter 3 (2.1 to 2.4, 3.1 to 3.3).

UNIT III: Chapter 4 (1.1 to 1.5, 2.1 to 2.3).

UNIT IV: Chapter 4 (3.1 to 3.3, 5.1 to 5.3).

UNIT V: Chapter 4 (6.1 to 6.4), Chapter 5 (1.1 to 1.3).

III SEMESTER			
Core 11	**MEASURE THEORY AND INTEGRATION**		**11PCMA 34**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To Introduce the Lebesgue Measure and Lebesague Integrals, Measure and Integration.

UNIT I

Lebesgue Measure: Introduction - Outer Measure - Measurable Sets and Lebesgue Measure - Non Measurable set - Measurable Functions - LittleWood's three principles.

UNIT II

The Lebesgue Integral: Riemann Integral - The Lebesgue Integral of a bounded function over a set of finite measure - The Integral of a non negative function - The general Lebesgue Integral - Convergence in Measure.

UNIT III

Differentiation and Integration: Differentiation of monotone functions - Functions of bounded variations - Differentiation of an integral - Absolute continuity.

UNIT IV

Measure and Integration: Measure Spaces - Measurable functions-Integrations -General convergence Theorems - Signed Measures - The Radon Nikodym Theorem.

UNIT V

Measure and Outer Measure: Outer Measure and Measurability - The Extension Theorem - The Lebesgue-Stieltjes integral - Product Measures - Integral Operators.

TEXT BOOKS:

H.L.Roydon-Real Analysis, Collier Macmillan International Edition-3rd Edition

Unit I: Chapter 3(1 to 6)
Unit II: Chapter 4(1 to 5)
Unit III: Chapter 5(1 to 4)
Unit IV: Chapter 11(1 to 6)
Unit V: Chapter 12(1 to 5)

IV SEMESTER		
Core 12	**FUNCTIONAL ANALYSIS**	**11PCMA 41**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90 Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To introduce the study of functions and Hahn- Banach theorem and its applications.
- To introduce Hilbert spaces, conjugate spaces, adjoint, self adjoint, normal and unitary operators.
- To introduce finite dimensional spectural theory.

UNIT I

Banach spaces: definition and examples – continuous linear transformation – Hahn – Banach theorem.

UNIT II

The natural embedding – open mapping theorem – Conjugate of an operator

UNIT III

Hilbert space – definition and properties – orthogonal complements – orthogonal sets – conjugate space

UNIT IV

Adjoint of an operator – self adjoint operator – Normal and Unitary operators – projections.

UNIT V

Spectral theory – spectrum of an operator – spectral theorem

TEXT BOOK:

G.F.Simmons – Introduction of Topology and Modern Analysis.
UNIT I: Chapter 9 (46 to 48).
UNIT II: Chapter 9 (49 to 51).
UNIT III: Chapter 10 (52 to 55).
UNIT IV: Chapter 10 (56 to 59).
UNIT V: Chapter 11(60 to 62).

IV SEMESTER			
Core 13	**TOPOLOGY**		**11PCMA 42**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To introduce basic concepts of Topology.
- To introduce product Topology and quotient Topology.
- To study the countability axioms and urysohn metrization theorem.

UNIT I

Topological spaces - Basic for a Topology - Order Topology - The product Topology on X x Y – The Subspace Topology - closed sets and limit points

UNIT II

Continuous functions – Product Topology - Quotient Topology.

UNIT III

Connected spaces, components and local connectedness - compact spaces

UNIT IV

Local compactness - Countability axioms - Separation axioms.

UNIT V

Normal Spaces – Urysohn lemma - Urysohn metrization theorem.

TEXT BOOKS:

J.R. Munkrus- Topology. **[**2nd Edition, Pearson education agency- Delhi (2002)]

UNIT I: Chapter 2 (12 to 17).

UNIT II: Chapter 2(18, 19, 22).

UNIT III: Chapter 3 (23, 25, 26).

UNIT IV: Chapter 3 (29), Chapter 4 (30, 31).

UNIT V: Chapter 4 (32, 33, 34).

IV SEMESTER			
Core 14	**MATHEMATICAL STATISTICS**		**11PCMA 43**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To learn the basic concepts of Mathematical Statistics.

UNIT I

Conditional Probability and Stochastic Independence.

UNIT II

Some Special Distributions.

UNIT III

Sampling Theory - Transformation of variables - t and f Distributions.

UNIT IV

Change of variable Technique - The MGF-Distributions of x and ns^2/σ^2 - Expectations of functions of random variables.

UNIT V

Limiting Distributions.

TEXT BOOK:

1. **Robert V.Hogg and Allen T.Craig**-Introduction to Mathematical Statistics-Pearson Education Asia, Chapters 2, 3, 4 and 5(except section 4.10)

IV SEMESTER		
Core 15	**PROJECT**	**11PCMA 44**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Credit : 4**

OBJECTIVE:

Every PG student is required to prepare the project subject related – based on the

Guidelines of his project guide.

GUIDELINES:

The following are the guidelines to be adhered to

1. The project should be an **individual one**
2. The language for the project is **English**
3. The Minimum number of page should be **60**
4. Project observations, suggestions and conclusion shall form an inevitable part of the project.
5. Marks for the project report will be 100 divided as 80% for project and 20% for viva-voce.

IV SEMESTER			
E 4 A(M)	**DIFFERENTIAL GEOMETRY**		**11PEMA 4A**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90**	**Hrs / Unit :18**	**Credit : 5**

OBJECTIVES:

- To learn about the basic concepts of Differential Geometry.

UNIT I

Space curves: definitions – arc length – tangents, normal and binormal – curvature and torsion – tangent surfaces – involutes and evolutes.

UNIT II

Intrinsic equations – fundamental existence theorem for space curves – Helices surfaces: definition of Surface – Surfaces of revolution – Helicoids – Metric.

UNIT III

Direction of coefficients – Families of curves – Isometric correspondence – intrinsic properties – geodesics.

UNIT IV

Canonical geodesic equations – normal property of geodesic – geodesic curvature – Gauss – Bonnet theorem – Gaussian Curvature.

UNIT V

The second fundamental form – principal curvature – lines of curvature – Developables associated with space curves, - minimal surface.

TEXT BOOKS:

T.J. Wilmore – An introduction of Differential Geometry (1st edition, Oxford)

Unit I : **1.1 to 1.5, 1.7**
Unit II: **1.8, 1.9, 2.1 to 2.5**
Unit III: **2.6 to 2.10**
Unit IV: **2.11, 2.12, 2.15, 2.16, 2.17**
Unit V : **3.1 to 3.5, 3.7**

IV SEMESTER		
E 4 B(M)	**CODING THEORY**	**11PEMA4B**
Hrs / Week : 6	**Hrs / Sem : 6 x 15 = 90 Hrs / Unit : 18**	**Credit : 5**

OBJECTIVES:

- To learn about the Overview in coding theory.

UNIT I

Error detection and correction - Minimum distance decoding

UNIT II

Families of codes

UNIT III

Linear codes and their duals - Weight distributions

UNIT IV

Hamming and Golay codes - Reed Muller Codes

UNIT V

Cyclic codes - More on cyclic codes

TEXT BOOK:

Steven, Springer-Coding and Information Theory – Verlag 1992.

Chapter 4 : Sections 4.1,4.2.4.3
Chapter 5 : Sections 5.1,5.2,
Chapter 6 : Sections 6.1, 6.2.
Chapter 7 : Sections 7.4 and 7.5.