**ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)**
**CUDDALORE-1**

**PG & RESEARCH DEPARTMENT OF MATHEMATICS**
**BOARD OF STUDIES (2018-2019)**
**March 2019**

## BOARD OF STUDIES REPORT
## BOARD OF STUDIES MEETING - (2018-2019)

PG and Research Department of Mathematics conducted Board of Studies Meeting on 11-03-2019 at 11.30 am to discuss about syllabi for UG, PG and M.Phil courses.

Syllabi for UG, PG and M.Phil courses were already framed by the faculty members and the same is brought to the notice of the board members, the Chairman, University Nominee.

**PG Board:**
The following members discussed syllabi for PG,

Chairman:
**Dr.J.JonArockiaraj**,M.Sc.,M.Phil.,B.Ed.,PGDCA.Ph.D.,
Head, Department of Mathematics,
St.Joseph's College of Arts &Science(Autonomous),
Cuddalore-1.

University Nominee:
**Dr. S.R. Kannan**, M.Sc., M.Phil, Ph.D.
Professor in Mathematics,
Pondicherry University, Puducherry.
Ph:9865707773
Email:srkannan.mat@pondiuni.edu.in

Subject Expert:
**Dr. G. Rajasekar**, M.Sc., M.Phil, Ph.D.
Associate Professor in Mathematics,
Jawahar Science College, Neyveli.
Ph:9443051420
Email:grsmaths@gmail.com

Alumni **:**

**Dr. S. Vijayabalaji,** M.Sc., M.Phil, Ph.D.
Asst. Professor in Mathematics,
Anna University College of Engineering ,
Panruti Campus, Panruti.
Ph:9443682630
Email:balaji1977harshini@gmail.com

Members of the Board:

1. Mr.T.Henson
2. Mrs.A.Arokiamary
3. Mr.S.JohnsonSavarimuthu
4. Mr. A.Virgin Raj
5. Mrs.L.JethruthEmelda Mary
6. Mr. J. Arockia Aruldoss

| | |
|---|---|
| I | **ALGEBRA I – No Change** |
| II | **REAL ANALYSIS I– No Change** |
| III | **ORDINARY DIFFERENTIAL EQUATIONS– No Change** |
| IV | **CLASSICAL MECHANICS– No Change** |
| V | MATHEMATICAL PROGRAMMING / APPLIED ABSTRACT ALGEBRA / NUMBER THEORY**– No Change** |
| VI | **ALGEBRA II– No Change** |
| VII | **MEASURE THEORY– No Change** |
| VIII | **NUMERICAL ANALYSIS - Updated** |
| IX | **FLUID DYNAMICS– No Change** |
| X | OPERATIONS RESEARCH/ INTEGRAL TRANSFORM / SPECIAL FUNCTIONS**– No Change** |
| XI | **COMPLEX ANALYSIS-I– No Change** |
| XII | **TOPOLOGY – No Change** |
| XIII | **DIFFERENTIAL GEOMENTRY– No Change** |
| XIV | **NUMBER THEORY AND CRYPTOGRAPHY ( Introduced instead of Stochastic Process)** |
| XV | **FUZZY SUBSETS AND ITS APPLICATION / ANALYTIC NUMBER THEORY/PROGRAMMING IN C++ – No Change** |
| XVI | **HUMAN RIGHTS– No Change** |
| XVII | **COMPLEX ANALYSIS-II– No Change** |
| XVIII | **FUNCTIONAL ANALYSIS – No Change** |

| | |
|---|---|
| XIX | **PROJECT– No Change** |
| XX | **PARTIAL DIFFERENTIAL EQUATIONS– No Change** |
| XXI | **GRAPH THEORY/FORMAL LANGUAGES AND AUTOMATA THEORY– No Change** |

- ❖ All the papers are accepted they are.

## M.Sc MATHEMATICS
## CURRICULUM DESIGN TEMPLATE

| Yr/ Sem | Subject | | Paper | Title of the paper | Hrs | Credits |
|---|---|---|---|---|---|---|
| I YEAR/ I SEM | Core | PMT701 | I | **ALGEBRA I** | 6 | 5 |
| | Core | PMT702S | II | **REAL ANALYSIS I** | 6 | 5 |
| | Core | PMT703 | III | **ORDINARY DIFFERENTIAL EQUATIONS** | 6 | 4 |
| | Core | PMT704S | IV | **CLASSICAL MECHANICS** | 6 | 4 |
| | Elective-I | EPMT705T& EPMT705A | V | MATHEMATICAL PROGRAMMING / APPLIED ABSTRACT ALGEBRA / NUMBER THEORY | 6 | 4 |
| I YEAR/ II SEM | Core | PMT806S | VI | **ALGEBRA II** | 6 | 5 |
| | Core | PMT807 | VII | **MEASURE THEORY** | 6 | 5 |
| | Core | PMT808S | VIII | **NUMERICAL ANALYSIS** | 6 | 4 |
| | Core | PMT809T | IX | **FLUID DYNAMICS** | 6 | 4 |
| | Elective-II | EPMT810T& EPMT810A | X | OPERATIONS RESEARCH/ INTEGRAL TRANSFORM / SPECIAL FUNCTIONS | 6 | 4 |
| I I YEAR/ III SEM | Core | PMT911 | XI | **COMPLEX ANALYSIS-I** | 6 | 5 |
| | Core | PMT912S | XII | **TOPOLOGY** | 6 | 5 |
| | Core | PMT913S | XIII | **DIFFERENTIAL GEOMENTRY** | 6 | 5 |
| | Core | PMT914Q | XIV | NUMBER THEORY AND CRYPTOGRAPHY | 5 | 3 |
| | Elective-III | EPMT915 & EPMT915A | XV | **FUZZY SUBSETS AND ITS APPLICATION / ANALYTIC NUMBER THEORY/PROGRAMMING IN C++** | 5 | 3 |
| | Compulsory | ECHR901S | XVI | **HUMAN RIGHTS** | 2 | 2 |
| I I YEAR/ IV SEM | Core | PMT1016 | XVII | **COMPLEX ANALYSIS-II** | 6 | 5 |
| | Core | PMT1017 | XVIII | **FUNCTIONAL ANALYSIS** | 6 | 5 |
| | Core | JPMT1018 | XIX | **PROJECT** | 6 | 5 |
| | Core | PMT1019T | XX | **PARTIAL DIFFERENTIAL** | 6 | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | **EQUATIONS** | | |
| | Elective-IV | EPM1020& EPM1020A | XXI | **GRAPH THEORY/FORMAL LANGUAGES AND AUTOMATA THEORY/LATEX AND SPSS** | 6 | 4 |

**Total Credits: 90**

| I – M.Sc (Maths) | ALGEBRA – I | PMT701 |
|---|---|---|
| SEMESTER – I | For the students admitted | HRS/WK - 6 |
| CORE – 1 | from the year 2009 | CREDIT - 5 |

**Objectives**

To introduce the concepts and to develop working knowledge on class equation, solvability of groups, finite abelian groups, linear transformations, real quadratic forms.

**Course Outcomes:**

**To help the students to learn the higher level on Algebra**

**CO1: Studying more on groups about Another Counting Principle**

**CO2: Studying about Sylow's proofs on index of subgroups**

**CO3:Learning about Direct products and Modules of groups**

**CO4:Reading the canonical forms and Jordan forms of Matrices**

| SEMESTER 1 | COURSE CODE: PMT701 | | | | | TITLE OF THE PAPER: ALGEBRA I | | | | | | | | | | HOURS: 6 | CREDITS: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | | |
| CO1 | 4 | 4 | 3 | 4 | 3 | 2 | 5 | 4 | 3 | 4 | 3 | 3 | 2 | 4 | 4 | 3.4 | |
| CO2 | 3 | 4 | 3 | 3 | 2 | 2 | 5 | 3 | 2 | 3 | 3 | 5 | 3 | 3 | 4 | 3.2 | |
| CO3 | 4 | 3 | 2 | 3 | 2 | 3 | 4 | 5 | 2 | 4 | 4 | 5 | 3 | 2 | 3 | 3.2 | |
| CO4 | 3 | 4 | 2 | 2 | 3 | 3 | 5 | 3 | 2 | 3 | 2 | 4 | 3 | 3 | 4 | 3.0 | |
| CO5 | 4 | 5 | 3 | 2 | 2 | 3 | 5 | 4 | 3 | 3 | 4 | 5 | 3 | 3 | 3 | 3.4 | |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.2 | |

**CO5: Studying on Rational canonical form of Trace and Transpose of Matrices**

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This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |

| Rating | Very poor | Poor | Moderate | High | Very High |
|---|---|---|---|---|---|

**Unit-I**

Another counting principle.

**Unit-II**

Sylow's Theorem

**Unit-III**

Direct Products, Finite Abelian groups, Modules.

**Unit-IV**

Canonical Forms: Triangular forms, Nilpotent Transformations, A Decomposition of V, Jordan form

**Unit-V**

Rational Canonical Form, Trace and Transpose,

**Text Book**

I.N. Herstein. Topics in *Algebra* [II Edition] Wiley Eastern Limited; New Delhi; 1975.

**Unit 1** - **Chapter 2: Sections 2.11 [Omit Lemma 2.1,2.5]**
**Unit 2-Chapter 2:12**
**Unit 3- Chapters: 2.13, 2.14, 4.5**
**Unit 4 -Chapters: 2.13, 2.14, 4.5**
**U**nit 5 - **Chapter: 6.7, 6.8,**

**Reference Books**

1. MArtin, *Algebra*, Prentice Hall of India, 1991.
2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, *Basic Abstract Algebra [II Edition]* Cambridge University Press, 1997. [Indian Edition]
3. I.SIuther and I.B.S.Passi, *Algebra,* Vol. 1 -Groups[1996]; Vol. II Rings, Narosa Publishing House , New Delhi, 1999
4. D.S.MaIik7 J.N. Mordeson and M.K.Sen, *Fundamental of AbstractAigebra,* McGraw Hill [International Edition], New York. 3997.
5. N.Jacobson, *Basic Algebra*, Vol. I & II W.H.Freeman; also published by Hindustan Publishing Company, New Delhi, 1980

| I – M.Sc (Maths) | REAL ANALYSIS<br>For the students admitted from the year 2011 | PMT702S |
|---|---|---|
| SEMESTER – I | | HRS/WK - 6 |
| CORE – 2 | | CREDIT - 5 |

**Objectives:**

To work comfortably with functions of bounded variation, Riemann -Stieltjes Integration, convergence of infinite series, infinite product and uniform convergence and its interplay between various limiting operations.

**Course Outcomes:**

**At the end of the Course the students should be able to exhibit**

**CO1: Learning the functions of bounded variations in real analysis**

**CO2: Getting the knowledge about basics and properties of Reimann- Steiljes Integral**

**CO3: Knowing more properties of Reimann- Steiljes Integral**

**CO4: Receiving more information about infinite series**

**CO5: Acquiring more knowledge of sequences of functions**

| SEMESTER I | COURSE CODE: PMT702S | | | | | TITLE OF THE PAPER: REAL ANALYSIS | | | | | | | | HOURS: 6 | CREDITS: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 4 | 4 | 3 | 4 | 3 | 5 | 3 | 4 | 2 | 3 | 4 | 3 | 1 | 1 | 5 | 3.1 |
| CO2 | 3 | 4 | 3 | 3 | 2 | 4 | 2 | 3 | 1 | 3 | 4 | 3 | 2 | 2 | 5 | 2.9 |
| CO3 | 4 | 3 | 2 | 3 | 2 | 4 | 4 | 4 | 3 | 3 | 4 | 2 | 2 | 3 | 4 | 3.2 |
| CO4 | 3 | 4 | 2 | 2 | 3 | 4 | 2 | 3 | 3 | 2 | 4 | 2 | 2 | 3 | 5 | 3 |
| CO5 | 4 | 5 | 3 | 2 | 2 | 4 | 1 | 4 | 2 | 2 | 4 | 3 | 3 | 3 | 5 | 3.1 |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.1 |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**Unit-I : Functions Of Bounded Variation:** Introduction - Properties of monotonic functions - Functions of bounded variation - Total variation - Additive property of total variation - Total variation on [a, x] as a function of x - Functions of bounded variation expressed as the difference of two increasing functions - Continuous functions of bounded variation.

**Unit-II : The Riemann - Stieltjes Integral:**Introduction - Notation - The definition of the Riemann - Stieltjes integral -Linear Properties - Integration by parts- Change of variable in a Riemann -Stieftjes integral - Reduction to a Riemann Integral - Euler's summation formula - Monotonically increasing integrators, Upper and lower integrals -Additive and linearity properties of upper and lower integrals - Riemann's condition - Comparison theorems.

**Unit-III: The Riemann-Stieltjes Integral:**Integrators of bounded variation-Sufficient conditions for the existence of Riemann-Stieltjes integrals-Necessary conditions for the existence of Riemann-Stieitjes integrals- Mean value theorems for Riemann - Stieltjes integrals - The integrals as a function of the interval - Second fundamental theorem of integral calculus-Change of variable in a Riemann integral-Second Mean Value Theorem for Riemann integral

**Unit -IV : Infinite Series :**Infinite Series :Absolute and conditional convergence - Dirichlet's test and Abel's test - Rearrangement of series - Riemann's theorem on conditionally convergent series.
Double sequences - Double'series - Rearrangement theorem for double series - A sufficient condition for equality of iterated series - Multiplication of series - Cesaro summability.

**Unit-V: Sequences of Functions:** Point-wise convergence of sequences of functions - Examples of sequences of real - valued functions - Definition of uniform convergence - Uniform convergence and continuity - The Cauchy condition for uniform convergence - Uniform convergence of infinite series of functions -Uniform convergence and Riemann - Stieltjes integration - Non-uniform Convergence and Term-by-term Integration - Uniform convergence and differentiation - Sufficient condition for uniform convergence of a series - Mean convergence.

**Text Book**

Tom M.Apostol *: Mathematical Analysis*, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974.

**Unit 1 - Chapter - 6: Sections 6.1 to 6.8**
**Unit 2 - Chapter - 7; Sections 7.1 to 7.14**
**Unit 3 -.Chapter - 7: 7.15 to 7.22**
**Unit 4 - Chapter - 8 Sections 8.8, 8.15, 8.17, 8.18, 8.20, 8.21 to 8.26**
**Unit 5- Chapter - 9 Sec 9.1 to 96, 9.8,99, 910,911, 9.13**

**Reference Books**

1. Bartle, R.G. *Real Analysis*, John Wiley and Sons Inc./1976.
2. Rudin,W, Principles of Mathematical Analysis, 3rd Edition. McGraw Hill Company, New York, 1976.

| I – M.Sc (Maths) | ORDINARY DIFFERENTIAL EQUATIONS | PMT703 |
|---|---|---|
| SEMESTER – I | For the students admitted | HRS/WK – 6 |
| CORE – 3 | from the year 2009 | CREDIT –4 |

**Objectives:**

To develop strong background on finding solutions to linear differential equations with constant and variable coefficients and to study existence and uniqueness of the solutions of first order differential equations.

**COURSE OUTCOME:**

CO1:knowing the basic concepts Linearly Independent and dependent functions for solving differential equations.

CO2:Knowing methods to solve the differential equations and check the linear solutions.

CO3:Knowing some new techniques to convert differential equations for matrix form to find matrix solution.

CO4:Knowing some matrix methods to solve the linear differential equations.

CO5:Knowing the application of Real Analysis for solving the differential equations with analysis of unique solutions.

| SEMESTER I | COURSE CODE: PMT703 | | PAPER TITLE:ORDINARY DIFFERENTIAL EQUATIONS | | | | | | | | | | HOURS: 6 | CREDITS: 4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 2 | 3 | 3 | 4 | 4 | 4 | 2 | 3 | 3 | 2 | 4 | 4 | 5 | 5 | 4 | 3.5 |
| CO2 | 3 | 4 | 3 | 4 | 4 | 5 | 3 | 3 | 3 | 3 | 4 | 5 | 5 | 4 | 4 | 3.8 |
| CO3 | 4 | 5 | 4 | 4 | 5 | 4 | 3 | 4 | 3 | 5 | 5 | 4 | 4 | 5 | 4 | 4.2 |
| CO4 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4.0 |
| CO5 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4.5 |
| Mean Overall Score | | | | | | | | | | | | | | | | 4.0 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 10%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**Unit-I: Linear differential equations of higher order:** Linear independence-Equations with constant coefficients-Equations with variable coefficients.

**Unit-II: Linear differential equations of higher order:** Wronskian-Method of variation of parameters- Method of Laplace Transforms.

**Unit-III**: **System of Linear Differential Equations :**System of first order equations-existence and uniqueness theorem- Fundamental matrix.

**Unit-IV: System of Linear Differential Equations:** Non-Homogeneous Linear Systems-Linear systems with constant coefficients.

**Unit-V**: **Existence and Uniqueness of solutions :**Lipschit condition and Gronwall inequality-Successive approximations-Picard's theorem-Fixed point Method.

**Text Book:**

Contents and Treatment as in "Ordinary Differential Equation" by S.G.Deo , V.Lakshmikantham and V.Raghavendra. Tata McGraw Hill , Second Edition Publishing company limited.

**Unit 1- Chapter-2 [ section -2.4,2.5,2.6]**
**Unit 2 - Chapter-2 [ section -2.7,2.8,2.10]**
**Unit 3- Chapter-4i-[section -4.2, 4.4,4.5]**
**Unit 4- Chapter-4 [section-t4.6, 4.7, ]**
**Unit 5- Chapter-5 [section-5.2, 5.3,5.4,5.9]**

**Books for Reference:**

1. Ordinary Differential Equation by D.Somasundaram, Narosa Publishing House
2. Advanced Differential Equations by M.D. Raisinghania , S.Chand & Company Ltd.
3. A course in Ordinary Differential Equations by B.Rai, D.P.Choudhury aand H.I.Freedman, Narosa Publishing House, New Dehi,2002.
4. Differential Equations with applications and Historical notes by George F.Simmons, Tata McGraw Hill, New Delhi,1974.
5. Ordinary Differential Equations by W.T.Reid , John Wiley and Sons, New York, 1971

| I – M.Sc (Maths) | CLASSICAL MECHANICS | PMT704S |
|---|---|---|
| SEMESTER - I | For the students admitted | HRS/WK – 6 |
| CORE – 4 | from the year 2011 | CREDIT –4 |

## Objectives

To study mechanical systems under generalized coordinate systems, virtual work, energy and momentum, to study mechanics developed by Newton, Langrange, Hamilton Jacobi and Theory of Relativity due to Einstein.

**COURSE OUTCOMES**

CO1:Use knowledge of mechanical system in classical mechanics.

CO2:Understand formulate physical problems as classical mechanics using Lagrange's equation.

CO3:Interpret solutions in physical context, Hamiltonian equations, variational principle.

CO4:Classify classical mechanics, apply Hamiltonian Jacobians, descriptions.

CO5:Formulate, understand analogies between canonical transformation.

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| SEMESTER I | COURSE CODE: PMT704S | | | | | TITLE OF THE PAPER: CLASSICAL MECHANICS | | | | | | | | HOURS: 6 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 4 | 4 | 3 | 4 | 3 | 2 | 5 | 4 | 3 | 4 | 3 | 4 | 2 | 2 | 4 | 3.4 |
| CO2 | 3 | 4 | 3 | 3 | 2 | 2 | 5 | 3 | 2 | 3 | 3 | 4 | 2 | 3 | 4 | 3.1 |
| CO3 | 4 | 3 | 2 | 3 | 2 | 3 | 4 | 5 | 2 | 4 | 4 | 5 | 3 | 2 | 3 | 3.3 |
| CO4 | 3 | 4 | 2 | 2 | 3 | 2 | 5 | 3 | 2 | 3 | 2 | 4 | 2 | 3 | 2 | 2.8 |
| CO5 | 4 | 5 | 3 | 2 | 2 | 3 | 5 | 3 | 3 | 3 | 4 | 5 | 2 | 3 | 3 | 3.5 |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.2 |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**Unit-I: Mechanical Systems**
The Mechanical system - Generalised coordinates - Constraints - Virtual work - Energy and Momentum

**Unit-II: Lagrange's Equations**
Derivation of Lagrange's equations- Examples - Integrals of motion.

**Unit-III; Hamilton's Equations**
Hamilton's Principle - Hamilton's Equation - Other variational principle.

**Unit-IV: Hamilton-Jacobi Theory**
Hamilton Principle function - Hamilton-Jacobi Equation – Separability

**Unit-V: Canonical Transformation**
Differential forms and generating functions - Special Transformations - Lagrange and Poisson brackets.

**Text Book**
D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985.
**Unit 1 - Chapter 1: Sections 1.1 to 1.5**
**Unit 2 - Chapter 2: Sections 21 to 23[Omit Section 24]**
**Unit 3 -** Chapter 4: Sections 4.1 to 43[Omit section 4.4]
**Unit 4 - Chapter 5: Sections 51 to 5.3**
**Unit 5 - Chapter 6: Sections 6.1, 6.2 and 63 [omit sections 6.4, 6.5 and 6.6]**

**Reference Books**
1. H.Goldstein, Classical Mechanics, [2nd Edition] Narosa Publishing House; New Delhi.
2. N.CRane and P.S.C.Joag, Classical Mechanics, Tata McGraw Hill, 1991.
3. J.L.Synge and B.A.Griffth, Principies of Mechanics [3rd Edition] McGraw Hill Book Co., New York, 1970.

| I – M.Sc (Maths) | MATHEMATICAL PROGRAMMING | EPMT705T |
|---|---|---|
| SEMESTER – I | For the students admitted | HRS/WK – 6 |
| ELECTIVE – 1 | from the year 2014 | CREDIT – 4 |

**Objectives**

This course introduces advanced topics in Linear and non-linear Programming.

**COURSE OUTCOMES:**

**CO1: Identify the significance to use ILP.**

**CO2: Know the different between LPP and DPP approaches.**

**CO3: Able to use some of the NLP technique.**

**CO4: Learn to solve general LPP in an effeential computation procedure.**

| SEMESTER: I | COURSE CODE:EPMT710T | | | | | TITLE OF THE PAPER: Mathematical programming | | | | | | | | HOURS: 6 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 | PSO 9 | PSO 10 | |
| CO1 | 4 | 5 | 3 | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 4 | 5 | 4 | 4.1 |
| CO2 | 4 | 5 | 3 | 4 | 3 | 4 | 4 | 3 | 5 | 4 | 3 | 4 | 5 | 3 | 5 | 3.9 |
| CO3 | 4 | 4 | 3 | 3 | 3 | 3 | 5 | 3 | 4 | 5 | 3 | 3 | 4 | 4 | 4 | 3.7 |
| CO4 | 4 | 5 | 3 | 4 | 3 | 5 | 4 | 3 | 4 | 4 | 3 | 3 | 5 | 3 | 4 | 3.8 |
| CO5 | 4 | 4 | 3 | 4 | 3 | 3 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 5 | 4 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.9 |

**CO5: Solving LPP using Revised simplex method**

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**Unit-I: Integer Linear Programming:** Types of Integer Linear Programming Problems - Concept of Cutting Plane -Gomory's AN Integer Cutting Plane Method - Gomory's mixed Integer Cutting Plane method - Branch and Bound Method. - Zero-One Integer Programming.

**Unit-II: Classical Optimization Methods:** Dynamic Programming: Characteristics of Dynamic Programming Problem -Developing Optimal Decision Policy - Dynamic Programming Under Certainty - DP approach to solve LPP.

**Unit-III: Non-linear Programming Methods**: Examples of NLPP - General NLPP - Graphical solution - Quadratic Programming - Wolfe's modified Simplex Methods - Beale's Method.

**Unit-IV : Theory Of Simplex Method**

Canonical and Standard form of LP - Slack and Surplus Variables -Reduction of any Feasible solution to a Basic Feasible solution - Alternative Optimal solution - Unbounded solution - Optimaiity conditions - Some complications and their resolutions - Degeneracy and its resolution.

**Unit-V: Revised Simplex Method**

Standard forms for Revised simplex Method - Computational procedure for Standard form I - comparison of simplex method and Revised simplex Method.

**Text Book:**

J.K.Sharma, Operations Research , Macmillan [India] New Delhi 2001

**Unit 1 – Chapte 7 - Sec:7.1 to 7.7**
**Unit 2 – Chapter 22- Sec: 22.1 to 22.5**
**Unit 3 - chapter 24 Sec: 24.1 to 24.4**
**Unit 4- chapter 25 Sec: 25.1 to 25.8**
**Unit 5 – chapter 26 Sec: 26.1 to 26.4**

**Reference Books:**

1. Hamdy A. Tana, *Operations Research*, [seventh edition] Prentice - Hall of India Private Limited, New Delhi, 1997.
2. F.S. Hillier &J.Lieberman I*ntroduction to Operation Research* [7th Edition] Tata- McGraw Hill company, New Delhi, 2001.
3. Beightler. C, D.Phillips, B. Wilde *foundations of Optimization* [2nd Edition] Prentice Hall Pvt Ltd., New York, 1979
4. S.S. Rao - *Optimization Theory and Applications,* Wiley Eastern Ltd. New Delhi. 1990

| I – M.Sc (Maths) | APPLIED ABSTRACT ALGEBRA | EPMT705B |
|---|---|---|
| SEMESTER – I | For the students admitted | HRS/WK – 6 |
| ELECTIVE-I (OPTIONAL) | from the year 2017 | CREDIT –4 |

**Objectives :**

The course aims to introduce the concepts of Lattices, Applications of lattices, Finite fields, Polynomials and Coding theory.

**Course Outcomes:**

**This paper will help the students to learn the Applications of Algebra**

**CO1: Applications of Algebra in regarding with Lattices and its properties**

**CO2;Studying about Applications of Lattices like switching circuits**

**CO3: Getting the Knowledge about fields and polynomials**

**CO4:Studying more about polynomials like reducible and irreducible polynomials to find roots**

**CO5: Getting the Knowledge about coding theory for Linear Codes and Cyclic codes**

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| SEMESTER I | COURSE CODE: EPMT705B | | | | | TITLE OF THE PAPER: APPLIED ABSTRACT ALGEBRA | | | | | | | | | HOURS: 6 | CREDITS: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 3 | 4 | 3 | 2 | 5 | 3.5 |
| CO2 | 3 | 4 | 3 | 3 | 2 | 3 | 5 | 2 | 3 | 3 | 3 | 4 | 3 | 4 | 4 | 3.2 |
| CO3 | 4 | 3 | 2 | 3 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 3 | 2 | 3 | 3.2 |
| CO4 | 3 | 4 | 2 | 2 | 3 | 2 | 3 | 5 | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 3.2 |
| CO5 | 4 | 5 | 3 | 2 | 2 | 4 | 5 | 4 | 3 | 3 | 4 | 5 | 3 | 3 | 3 | 3.5 |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.3 |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**Unit-I LATTICES:** Properties of lattices: Lattice definitions- distributive lattice. Boolean Algebras: Basic properties-Boolean polynomials, ideals, minimal forms of Boolean polynomials.

**Unit-II APPLICATIONS OF LATTICES**

Switching circuits, Basic definitions, applications

**Unit-III FINITE FIELDS**

Finite Fields and Polynomials - Finite Fields

**Unit-IV POLYNOMIALS:**

Irreducible polynomial over finite fields.

**Unit-V CODING THEORY**

Linear codes-Cyclic codes

**TEXT BOOK:**

Applied Abstract Algebra-by Rudolf Lidl and Guntur Pilz, Springer- Verlag New York 1998.

Unit 1 **Chapter 1: sec 1 to 6**
**Unit 2 Chapter 2: sec7 to 9**
**Unit 3 Chapter 3: sec13 Only**
**Unit 4 Chapter 3: sec 14 Only**
**Unit 5 Chapter 4: sec 17,18**

**Reference Books:**

1. Modern Applied Algebra, by- Garrett Birkhoff & Thomas C. Bartee, CBS PUBLISHERS & DISTRIBUTORS
2. I.N. Herstein. Topics in *Algebra* [II Edition] John Wiley & Sons Publications 2002.John
3. John B. Fraleigh, A first Course in Abstract Algebra, Norosa Publication Home, New Delhi, 1996.

| I – M.Sc (Maths) | ALGEBRA –II | PMT806S |
|---|---|---|
| SEMESTER - II | For the students admitted | HRS/WK – 6 |
| CORE – 5 | from the year 2011 | CREDIT – 5 |

## Objectives

To study field extension; roots of polynomials, Gaiois Theory, finite fields, division rings, solvability by radicals and to develop computational skill in abstract algebra.

**Course Outcomes:**

**CO1: Acquiring the knowledge on Extension fields**

**CO2: Learning the methods to find the roots of polynomials theoritically**

**CO3: Learning more about roots and Galoi's theory**

**CO4:Receiving the knowledge about solvability of groups**

**CO5:Getting the knowledge on Division Algebra and Four Square theorem**

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| SEMESTER II | COURSE CODE: PMT806S | | | | | TITLE OF THE PAPER: ALGEBRA II | | | | | | | | | | HOURS: 6 | CREDITS: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | | |
| CO1 | 4 | 4 | 3 | 4 | 3 | 2 | 5 | 4 | 3 | 4 | 3 | 4 | 2 | 2 | 4 | 3.4 | |
| CO2 | 3 | 4 | 3 | 3 | 2 | 2 | 5 | 3 | 2 | 3 | 3 | 4 | 2 | 3 | 4 | 3.1 | |
| CO3 | 4 | 3 | 2 | 3 | 2 | 3 | 4 | 5 | 2 | 4 | 4 | 5 | 3 | 2 | 3 | 3.3 | |
| CO4 | 3 | 4 | 2 | 2 | 3 | 2 | 5 | 3 | 3 | 3 | 2 | 4 | 3 | 3 | 2 | 3.0 | |
| CO5 | 4 | 5 | 3 | 2 | 2 | 3 | 5 | 3 | 3 | 3 | 4 | 5 | 2 | 3 | 3 | 3.5 | |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.3 | |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**Unit-I**

Extension fields (Finite extension, algebraic extension and algebraic number).

**Unit-II**

Roots of Polynomials (Reminder theorem, Factor theorem and isomorphism between F[x] and F'[t]).

**Unit-III**

More about roots-Elements of Galois theory,

**Unit-IV**

Solvability by radicals - Wedderburn's theorem on finite division rings.

**Unit-V**

Integral Quaternions and the Four - Square theorem-Division Algebra

**Text Book**

**I.N. Herstein. Topics in Aigebra [II Edition] Wiley Eastern Limited, New Delhi, 1975.**

**Unit 1 - Chapter 5: Section 5.1 Unit 2 - Chapter 5: Sections 5.3**

**Unit 3 - Chapter 5: Section 5.5 and 5.6.[Omit theorem5.6.3]**

**Unit 4- Chapter 5-Section 5.7 [omit Lemma 5.7.1, Lemma 5.7.2 and Theorem 5.7.1], Chapter 7: Sections 7.2 [Only Theorem 7.2.1]**

**Unit 5 - Chapter 7: Section 7.3 (omit theorem 7.3.1)[Lemma 7.4.1, 7.4.2&7.4.5 only].**

**Reference Books.**

1. MArtin, Aigebra, Prentice Hall of India, 1991.
2. B.Bhattacharya, S.KJain, and S.R.Nagpaul, Basic Abstract Aigebra [11 Edition] CambridgeUniversity Press, 1997. [Indian Edition]
3. I.S.Luther and LB.S.Passi, Aigebra, Vol. 1 - Groups [1996]; Vol. II Rings, Narosa Publishing House , New Delhi, 1999
4. D.S.Malik, J.N. Mordeson and M.K.Sen, Fundamental of Abstract Aigebrar McGraw Hill [International Edition], New York. 1997.
5. N.Jacobson, Basic Algebra, Vol. 1 SE II Hindustan Publishing Company,New Delhi.

| I – M.Sc (Maths) | MEASURE THEORY | PMT807 |
|---|---|---|
| SEMESTER - II | For the students admitted | HRS/WK – 6 |
| CORE – 6 | from the year 2008 | CREDIT – 5 |

**Objective.**

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

**Course Outcomes:**

**At the end of the Course the students should be able to exhibit**

**CO1: Learning the basics of Lebesgue Measure**

**CO2: Getting the more knowledge about Lebesgue Measure**

**CO3: Knowing more properties of Measureable set**

**CO4: Receiving the information about General measure**

**CO5: Acquiring more knowledge of Measure and outer measure**

| SEMESTER V | COURSE CODE: PMT807 | | | | | TITLE OF THE PAPER: MEASURE THEORY | | | | | | | | | | HOURS: 6 | CREDITS: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | | |
| CO1 | 4 | 4 | 3 | 4 | 3 | 5 | 4 | 1 | 5 | 4 | 4 | 3 | 5 | 4 | 2 | 3.7 | |
| CO2 | 3 | 4 | 3 | 3 | 2 | 5 | 5 | 2 | 3 | 3 | 3 | 2 | 5 | 4 | 2 | 3.4 | |
| CO3 | 4 | 3 | 2 | 3 | 2 | 5 | 2 | 3 | 2 | 2 | 3 | 5 | 5 | 3 | 1 | 3.1 | |
| CO4 | 3 | 4 | 2 | 2 | 3 | 2 | 4 | 4 | 4 | 5 | 2 | 1 | 4 | 3 | 1 | 3 | |
| CO5 | 4 | 5 | 3 | 2 | 2 | 5 | 1 | 5 | 4 | 5 | 1 | 2 | 4 | 4 | 1 | 3.2 | |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.3 | |

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**Unit 1-Lebesgue Measure**

Outermeasure–Definition&properties–Lebesguemeasure-measurable sets-properties-non-measurable-set-measurable functions-Little wood's three principle.

**Unit 2-Lebesgue Integral**

Lebesgue Integral of simple function bounded measurable function –of a non negative function-Fatou's lemma-monotone convergence therorem-General Lebesgue integral –Lebesgue convergence in measure.

**Unit 3-Differentiation and Integration**

Differetiation of monotone functions Vitali's lemma-Integral of derivative-Functions of bounded variation Differentiation of an integral –absolute continuity –convex functions-Jensen's inequality.

**Unit 4-General measure and Integration**

Measure spaces –Measurable functions –Integration-Signed measure –Hahn decomposition theorem.

**Unit 5-Measure and outer measure**

Outer measure Measurability –extension theorem-product measures Fubini's theorem-Tonnelli's theorem.

**Text Book**

Real Analysis –H.L.Royden –Prentice Hall of India 2001 edition.
Unit 1- **chapter 3 sec.1 to 6**
Unit 2 – **chapter 4 sec 1 to 5**
**Unit 3 -chapter 5 sec 1 to 5**
Unit 4 **-chapter 11 sec 1, 2, 3, & 5.**
Unit 5 **-chapter 12 sec 1,2 and 4**

**Reference Books**

1. De Barra.G.Measure and Integration –Wiley Eastern Limited 1991 edition
2. Walter Rudin-Real and Complex analysis.

| I – M.Sc (Maths) | NUMERICAL ANALYSIS | PMT808S |
|---|---|---|
| SEMESTER – II | For the students admitted | HRS/WK – 6 |
| CORE – 7 | from the year 2018 | CREDIT – 4 |

**Objectives**

This courses introduces a numerical methods for hands-on experience on computers.

**COURSE OUTCOME:**

**CO1**:Knowing the methods to find roots of non-linear equation.

CO2:Knowing the Numerical value of Integration by comparing the Analytical solution.

CO3:Knowing the intermediate values using cubic spline.

CO4:Knowing the methods of cubic spline to solve the differential equations.

CO5:Knowing the numerical solution of partial differential equations.

| SEMESTER I | COURSE CODE: PMT808S | | | PAPER TITLE: NUMERICAL ANALYSIS | | | | | | | | | | HOURS: 6 | CREDITS: 4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 3 | 4 | 4 | 4 | 2 | 4 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 3.5 |
| CO2 | 4 | 4 | 3 | 3 | 4 | 5 | 4 | 3 | 3 | 3 | 4 | 5 | 5 | 4 | 4 | 3.9 |
| CO3 | 5 | 5 | 3 | 4 | 3 | 3 | 4 | 3 | 4 | 5 | 4 | 4 | 4 | 2 | 4 | 3.8 |
| CO4 | 3 | 4 | 4 | 3 | 4 | 3 | 5 | 4 | 2 | 4 | 4 | 3 | 4 | 4 | 4 | 3.7 |
| CO5 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 5 | 4 | 3 | 3 | 3 | 3.6 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.7 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**Unit –I**

**Nonlinear equation:** Fixed –point iteration method and its convergence- Bisection method- regular – Falsi method – secant method – convergence of secant/Regular-Falsi method – Newton- Raphson method and its convergence-convergence when roots are repeated.

**Unit-II**

Numerical intgratiom: Newton – Cotes Formulae, Eulers- Maclaurin forrmula –Romberg integration- Gaussian quadratue

**Unit-III:**

**Splines and their applications:** A piece – wise polynomial – spline approximation – uniqueness of cubic spline – construction of cubic spline.

**Unit-IV :**

Minimal property of splines –Application to differential equation – Cubic spline parametric form – Chebyshev approximation by principles of least squares .

**Unit-V :**

Partial differential equation:

Some standard forms – Boundary conditions – Finite difference approximations for derivatives – Methods for solving parabolic equation – Explicit method – fully implicit scheme – Crank – Nicolson's (C-N) scheme – derivative boundary.

**TEXT BOOKS:**

Elements of Numerical Analysis by Radhey S. Gupta Macmillan India Ltd.

**REFERENCE BOOK:**

1. Elementary Numerical Analysis by Samuel D. Conte and Carl de Boor, McGraw Hill.1981
2. Introductory Methods of Numerical Methods by S. S. Sastry, Prentice – Hall India , 1994.

| II – M.Sc (Maths) | FLUID DYNAMICS | PMT809T |
|---|---|---|
| SEMESTER – II | For the students admitted | HRS/WK – 6 |
| CORE – VIII | from the year 2012 | CREDIT –4 |

**OBJECTIVES:**

This course aims to discuss kinematics of fluids in motion, Equations of motion of a fluid, three dimensional flows, two dimensional flows and viscous flows.

**COURSE OUTCOME:**

CO1: To Understand the Concepts of flow in Fluid

CO2: Measure Fluid Pressure and related to flow velocity, understanding various equation Bernouli's

CO3: To understand the concept of some Three Dimensional Flow, Like source, sink.

CO4: To understand and analysis the Concepts of Two Dimensional in Complex Fluid

CO5:To understand concepts of Stress in flow of Fluid , Navier Stokes Equation.

| Sem:II | Sub Code:PMT807T | | | | | Sub: FLUID DYNAMICS | | | | | | | | | | Hours: 6 | Credit: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcome | Programme Outcome (PO) | | | | | Programme Specific Outcome(PSO) | | | | | | | | | | | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO1 | PSO2 | PSO2 | PSO4 | PSO5 | PSo6 | PSO 7 | PSO8 | PSO9 | PSO 10 | Mean Score of CO's | |
| CO1 | 5 | 5 | 4 | 5 | 3 | 3 | 5 | 5 | 3 | 5 | 3 | 5 | 2 | 5 | 4 | 4.1 | |
| CO2 | 5 | 4 | 3 | 5 | 2 | 3 | 5 | 5 | 3 | 5 | 2 | 5 | 2 | 5 | 3 | 3.8 | |
| CO3 | 5 | 4 | 5 | 5 | 3 | 3 | 4 | 5 | 3 | 5 | 2 | 4 | 2 | 5 | 5 | 4.0 | |
| CO4 | 5 | 4 | 4 | 3 | 2 | 2 | 3 | 5 | 2 | 5 | 2 | 5 | 2 | 5 | 4 | 3.5 | |
| CO5 | 5 | 3 | 4 | 5 | 2 | 3 | 5 | 5 | 3 | 5 | 3 | 4 | 2 | 5 | 3 | 3.8 | |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.84 | |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |

| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
|---|---|---|---|---|---|
| Rating | Very poor | Poor | Moderate | High | Very High |

**UNIT –I KINEMATICS OF FLUIDS IN MOTION:**Real fluids and Ideal fluids- Velocity of a fluid at a point, Stream lines, path lines, steady and unsteady flows- The Velocity potential – The vorticity vector – Local and particle rates of changes – Equations of continuity- Worked examples- Acceleration of a fluid – Conditions at a rigid boundary.

**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 – Conditions at a boundary of two inviscid immiscible fluids – Euler's equation of motion – Bernoulli's equation- worked examples- Discussion of the case of steady motion under conservative body forces.

**UNIT –III SOME THREE DIMENSIONAL FLOWS:**Introduction – Sources, Sinks, and doublets – Image in a rigid infinite plane – Axis symmetric flows.

**UNIT – IV: SOME TWO DIMENSIONAL FLOWS:**Meaning of two dimensional flow – Use of Cyclindrical polar coordinate – The stream function – The complex potential for two dimensional, irrotational incompressible flow- Complex velocity potentials for standard two dimensional flows- Some worked examples- Two dimensional Image systems- The Milne Thompson circle Theorem.

**UNIT – V : VISCOUS FLOWS:**Stress components in a real fluid – Relations between Cartesian components of stress – Translational motion of fluid elements- The rate of strain quadric and principal stresses- some further properties of the rate of strain quadric – Stress analysis in fluid motion- Relation between stress and rate of strain – The coefficient of viscosity and Laminar flow – The Navier – Stokes equations of motion of a Viscous fluid.

**Text Book:**

F. Chorlton, Text Book of Fluid dynamics, CBS publications. Delhi, 1985.
Unit 1 - Chapter 2. Sections 2.1 to 2.10 ,Unit 2 - Chapter 3 Sections 3.1 to 3.7
Unit 3- Chapter 4 Sections 4.1, 4.2, 4.3, Unit 4 - Chapter 5 Sections 5.1 to 5.8
Unit 5 - Chapter 8 Sections 8.1 to 8.9

**Reference Books**


- R.W.Fox and A.T.McDonald. Introduction to Fluid Mechanics, Wiley, 1985.
- E.Krause, Fluid Mechanics with problems and solutions, Springer, 2005.
- B.S.Massey, J.W.Smith and A.J.W.Smith, Mechanics of Fluids, Taylor and Francis, New York, 2005.
- P.Orlandi, Fluid Flow Phenomena, Kluwer, New York, 2002
- T. Petrila, Basics of Fluid Mechanics and Introduction to Computational Fluid Dynamics, Springer

| I – M.Sc (Maths) | OPERATIONS RESEARCH | EPMT810T |
|---|---|---|
| SEMESTER – II | For the students admitted | HRS/WK – 6 |
| ELECTIVE-II | from the year 2014 | CREDIT –4 |

## Objectives:

The course aims to introduce PERT, CPM, deterministic and probabilistic inventory systems, queues, replacement, maintenance problems and simulation problems.

**COURSE OUTCOMES:**

**CO1: Acquires the knowledge of PERT – CPM calculation**

**CO2: develops the skill of analyzing the stock managements**

**CO3: exposed to identify and solve different queuing models**

**CO4: to optimize the outcome in production using Replacement models**

**CO5: gets knowledge on stocks, demand and supply for smooth business progress.**

| SEMESTER II | COURSE CODE: EPMT810T | | | | | TITLE OF THE PAPER: OPERATIONS RESEARCH | | | | | | | | HOURS: 6 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO1 | PO 2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 3.9 |
| CO2 | 3 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 3.6 |
| CO3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 3.8 |
| CO4 | 4 | 4 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3.7 |
| CO5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 3.9 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.8 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

## UNIT-I: PROJECT MANAGEMENT : PERT AND CPM

Basic Difference between PERT and CPM – Steps in PERT/CPM Techniques- PERT/CPM Network Components and Precedence Relationships – Critical Path

Analysis – Probability in PERT Analysis – Project time-cost Trade Off – Updating the Project – Resource Allocation.

**UNIT - II : DETERMINISTIC INVENTORY CONTROL MODELS**

Meaning of inventory Control – Functional Classification – Advantage of Carrying Inventory – Features of Inventory System – Inventory Model building – Deterministic Inventory Model with no Shortage – Deterministic Inventory with Shortages.

**UNIT-III: QUEUES THEORY**

Essential Features of Queueing System – Operating Characteristic of Queueing System – Probabilistic Distribution in Queueing Systems – Classification of Queueing Models – Solution of Queuing Models – Probability Distribution of Arrivals and Departures

**UNIT-IV: REPLACEMENT AND MAINTANANCE MODELS**

Failure Mechanism of Items – Replacement of Items Deteriorates with Time – Replacement of Items that fail completely – other Replacement Problems.

**UNIT- V: SIMULATION**

Introduction – Steps of Simulation Process – Advantages and Disadvantages of Simulation – Monte Carlo Simulation – Random Number Generation – Simulation Inventory Problems – Queuing Problems – PERT Problems.

**TEXT BOOK:**

JK. Sharma, Operations Research, MacMillan India, New Delhi, 2001.
Unit 1- Chapter 13 : Sec. 13.1 to 13.9 ,Unit 2 - Chapter 14: Sec. 14.1 to 14.8 ,
Unit 3 -.Chapter 16: Sec. 16.1 to 16.7 Unit 4 - Chapter 17: Sec. 17.1 to 17.5
Unit 5 - Chapter 19: 19.1to 19.11, 19.13

**REFERENCE BOOKS**


- Kanti Swarup, P.K. Gupta, Man Mohan - *Operations Research*, Sultan Chand & Sons, New Delhi.
- F.S. Hillier and J.Lieberman - *Introduction to Operations Research* [8th Edition], Tata McGraw Hill Publishing Company, New Delhi,2006.
- Beightler.C, D.Phillips, B. Wilde, *Foundations of Optimization* [2nd Edition] Prentice Hall Pvt Ltd., New York, 1979.

| I – MSC | SPECIAL FUNCTIONS | EPMT810A |
|---|---|---|
| SEMESTER – II | For the students admitted | HRS/WK – 6 |
| ELECTIVE –II (OPTIONAL) | from the year 2017 | CREDIT – 4 |

**SPECIAL FUNCITONS**

Objectives To develop computational skill in certain special functions which are frequently occurring in higher mathematics and mathematical physics.

**COURSE OUTCOME:**

CO1: Students able to solve simultaneous linear differential equations.

CO2: Students able to determine the Numerical solution using Taylor series.

CO3: Students able to analyse problems in linear second order differential equations.

CO4: Students able to pertain Bessel functions and Legendre functions.

CO5: Students able to know Fourier series and Fourier integrals.

| SEMESTER II | COURSE CODE: EPMT810A | | | | | TITLE OF THE PAPER: SPECIAL FUNCTIONS | | | | | | | | HOURS: 6 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 3 | 4 | 4 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 2 | 3 | 4 | 3.6 |
| CO2 | 3 | 4 | 3 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 2 | 2 | 4 | 3.46 |
| CO3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 5 | 2 | 4 | 3 | 5 | 2 | 2 | 4 | 3.46 |
| CO4 | 3 | 4 | 4 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 3 | 2 | 4 | 3.6 |
| CO5 | 3 | 4 | 3 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 2 | 2 | 4 | 3.46 |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.5 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**UNIT-I:**

Properties of Linear Operators - Simultaneous Linear Differential Equations - Special Solvable Types of Nonlinear Equations.

**UNIT-II:**

Numerical Solutions Using Taylor Series - Adams and Modified Adams Method - Extrapolation with Differences

**UNIT-III:**

Properties of Power Series - Examples - Singular Points of Linear Second Order Differential Equations - Method of Frobenius.

**UNIT-IV:**

Bessel Functions - Properties - Legendre Functions.

**UNIT-V:**

Term by Term Differentiation of Fourier Series, Legendre Series - Fourier Integral.

**Recommended Text Book:**

F.B.Hildebrand. (1977) Advanced Calculus for Applications. Prentice Hall. New Jersey. B.Sc. Mathematics : Syllabus (CBCS)

**Reference Books**

1. J.N.Sharma and R.K.Gupta (1998) Special Functions, Krishna Prakashan Mandir, Meerut.
2. Satya Prakash. (2004)Mathematical Physics.Sultan & Sons. New Delhi.
3. B.D.Gupta (1978) Mathematical Physics, Vikas Publishing House.

| I-MSC (CS) | MATHEMATICAL FOUNDATIONS | PCS701S |
|---|---|---|
| SEMESTER – I | FOR COMPUTER SCIENCE | HRS/WK - 6 |
| CORE – 1 | For the students admitted from the year 2011 | CREDIT - 5 |

**OBJECTIVES**

The course aim is to introduce the concepts of operations on set and applications, logical operators, finite automata, equivalence of finite automata and pushdown automata.

## COURSE OUTCOMES:

**CO1: Know the basic concepts of operations on sets, relations and functions.**

**CO2: Learns to solve the logical operators and know the tautology concepts.**

**CO3: Know the concepts of finite automata and language accepted by a finite automata.**

**CO4: Know the concepts of equivalence of finite automata and nondeterministic finite automata.**

| SEMESTER: I | COURSE CODE: PCS701S | TITLE OF THE PAPER: MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE | HOURS: 4 | CREDITS: 5 |
|---|---|---|---|---|

**CO5: Enables to understand the pushdown automata, acceptance by pushdown automata and important properties of move relation.**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 | PSO 9 | PSO 10 | |
| CO1 | 3 | 5 | 2 | 2 | 4 | 3 | 5 | 5 | 2 | 4 | 3 | 3 | 3 | 3 | 4 | 3.4 |
| CO2 | 4 | 5 | 3 | 4 | 3 | 4 | 4 | 3 | 5 | 4 | 3 | 4 | 5 | 3 | 5 | 3.9 |
| CO3 | 4 | 4 | 4 | 3 | 3 | 5 | 5 | 3 | 4 | 5 | 2 | 3 | 5 | 4 | 4 | 3.8 |
| CO4 | 3 | 5 | 3 | 3 | 4 | 5 | 5 | 3 | 4 | 4 | 3 | 4 | 5 | 3 | 5 | 3.9 |
| CO5 | 4 | 3 | 3 | 4 | 4 | 3 | 5 | 4 | 4 | 5 | 3 | 4 | 4 | 3 | 4 | 3.8 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.7 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT-I**

**Set Theory :** Introduction-Sets-Notations and Descriptions of Sets-Subsets-Operations on Sets-Properties of Set Operations-Verification of the Basic Laws of Algebra-Cartesian product of two sets-Relations-Representation of a Relation-Operations on Relations-Equivalence Relations-Partition and Equivalence Classes-Functions-One-to-one and Onto Functions-Special types of Functions-Invertible Functions-Composition of Functions.

**UNIT-II**

Logic: Introduction-TF Statements- Connectives-Compound Statements-Truth Table of a Formula-Tautology-Tautology Implications and Equivalence of Formulae-Normal Forms-Principles of Normal Forms-Theory of Inference, simple problems .

**UNIT-III :**Finite Automata-Definition of an Automaton- Representation of Finite Automaton-Acceptability of a string by a Finite Automaton-Languages accepted by a Finite automaton – Nondeterministic Finite automata - Acceptability of a string by Nondeterministic Finite Automata.

**UNIT-IV:** Equivalence of FA and NFA- Procedure for finding an FA equivalent to a given NFA –Phase-structure Grammars .

**UNIT-V:**Pushdown Automata-Definition of a Pushdown Automaton – Instantaneous Descriptions of a PDA- Important properties of move relation - Acceptance by PDA – Equivalence of two types of a AcceptancebyPDA

**Text Book:**

Discrete Mathematics-Venkatraman M.K, ,Sridharan.N, Chandrasekaran.N , The National Publishing Company, Chennai, 2000.

Unit 1-Chapter 1:sec-1 to 4,6 to 8, Chapter 2:sec-1 to 5,7, Chapter 3:sec -1 to 5, Unit 2 - Chapter 9:sec 1 to 4, 6 to 8, 11 to 13 , Unit 3- Chapter 12: sec -1 to 8 , Unit 4 Chapter 12 sec -:9,10,16. Unit 5 - Chapter 12: sec -23 to 28

**Reference Books:**

1. Theory of Computer Science- K.L.P Mishra and N. Chandrasekaran, Prentice Hall of India, Pvt Ltd
2. Discrete Mathematical Structures applications toComputerScience, Trembly &Manohar, Tata McGraw.
3. Introduction to Automata Theory, Languages and Computions, Hopcraft and Ullman, 2nd Edition, Pearson Education.
4. Discrete Mathematical Structures with Applications to Combinatorics, RamaswamyV, UnivPress, 2006.
5. Veerarajan T, "Discrete Mathematics with graph theory and combinatorics", TMG, 2007.

| II – M.Sc (Maths) | COMPLEX ANALYSIS-I | PMT911 |
|---|---|---|
| SEMESTER – III | For the students admitted | HRS/WK – 6 |
| CORE – X | from the year 2008 | CREDIT – 5 |

**Objectives:**

The course aims to introduce the concepts of Analytic Functions Linear Transformations , Conformal Mappings , Complex Integration, Cauchy's Integral Formula, Calculus of Residues and Evaluation of Definite Integrals. Harmonic Functions.

**Course Outcome:**

At the end of the course students will be able to

CO1: Explain fundamental concepts of complex analysis and the role in modern mathematics.

CO2: Apply calculus in complex domain..

CO3: Apply cauchy's theorem in evaluating integral in different domains.

CO4:Apply cauchy's intergral formula In evaluating complex integrals.

CO5: Apply cauchy's residue theorem in evaluating harder integral

| SEMESTER III | COURSE CODE: PMT911 | | | | | TITLE OF THE PAPER: COMPLEX ANALYSIS I | | | | | | | | | | HOURS: 6 | CREDITS: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | | |
| CO1 | 3 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 4 | 3 | 4 | 3 | 4 | 5 | 3.1 | |
| CO2 | 3 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 5 | 4 | 5 | 4 | 5 | 5 | 3.5 | |
| CO3 | 3 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 5 | 4 | 5 | 4 | 5 | 5 | 3.6 | |
| CO4 | 3 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 4 | 4 | 3 | 5 | 3 | 2 | 5 | 3.2 | |
| CO5 | 3 | 4 | 3 | 3 | 3 | 3 | 4 | 5 | 2 | 4 | 3 | 4 | 2 | 2 | 4 | 3.3 | |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.34 | |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT-I**

**Conformality:** Arcs and closed curves, Analytic Functions in Regions, Conformal Mapping, Length and Area. Linear Transformations: The Linear Group,The Cross Ratio, Symmetry, Oriented Circles, Families of Circles.

**UNIT-II**

**Elementary Conformal Mappings:**The Use of Level Curves,A Survey of Elementary Mappings, Elementary Riemann Surfaces. Complex Integration: Fundemental Theorems:Line Integrals, Rectifiable Arcs, Line Integrals as Functions of Arcs, Cauchy's Theorem for a Rectangle, Cauchy's theorem in a Disk.

**UNIT-III**

**Cauchy's Integral Formula:**The Index of a Point with Respect to a Closed Curve,The Integral Formula, Higher Derivatives, Local Properties of Analytical Functions:Removable Singularities, Taylor's Theorem, Zeros And Poles,The Local Mapping, The Maximum Principle.

**UNIT-IV**

**The General Form of Cauchy's Theorem and The Calculus of Residues:**

Chains and Cycles, Simple Connectivity, Homology, The General Statement of Cauchy's Theorem, Proof of Cauchy's Theorem, Locally Exact Differentials, Multiply Connected Regions. The Residue Theorem, The Argument Principle.

**UNIT-V Definite integral and hormonic function**

Evaluation of Definite Integrals. Harmonic Functions:Definition and Basic Properties, The Mean-value Property,Poisson's Formula,Schwarz's Theorem, The Reflection Principle.

**Text Book** :

COMPLEX ANALYSIS by Lars V.Ahlfors (Third Edition)
CHAPTER 3: 2.1 to 4.3
CHAPTER 4: 1.1 to 6.5

**Reference books:**

1. H.A Presly, "Introduction to Complex Analysis", Clarendon Press,

Oxford,1990.
2. J.B.Conway, " Functions of one complex variables, Springer- Verlag, International student edition, Naroser Publishing Co. 1978.
3. E.Hille, Analytic function theory, Gonm & Co., 1959.
4. M.Heins, " Comples function Theory, Academic Press, New York, 1968.

| II – M.Sc (Maths) | TOPOLOGY | PMT912S |
|---|---|---|
| SEMESTER – III | For the students admitted | HRS/WK – 6 |
| CORE – XI | from the year 2014-15 | CREDIT – 5 |

## Objectives:

The course aims to introduce the concepts of Metric spaces, Topological spaces, Separation axioms, Compact spaces and Connected spaces.

**COURSE OUTCOME:**

CO1:To understand Concept such as open set,closed set, interior, clourse related to Topology

CO2: create new topological by using sub spaces

CO3:To understand Concepts of Compactness and ability to analysis the related theorem

CO4:construct the completely requlars spaces and normal spaces in topology.

CO5: Demonstrate a Weierstrass approximation theorem in locally connected spaces

| Sem:III | Sub Code: PMT912S | | | | | Sub: TOPOLOY | | | | | | | | | | Hours:6 | Credit: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcome | Programme Outcome (PO) | | | | | Programme Specific Outcome(PSO) | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO2 | PSO4 | PSO5 | PSo6 | PSO7 | PSO8 | PSO9 | PSO10 | Mean Score of CO's | |
| CO1 | 4 | 5 | 4 | 3 | 2 | 3 | 5 | 4 | 5 | 5 | 2 | 5 | 2 | 4 | 5 | 3.9 | |
| CO2 | 3 | 4 | 5 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 2 | 5 | 2 | 4 | 5 | 3.7 | |
| CO3 | 4 | 5 | 4 | 2 | 2 | 3 | 5 | 4 | 5 | 5 | 2 | 5 | 2 | 3 | 5 | 3.7 | |
| CO4 | 3 | 5 | 4 | 3 | 2 | 2 | 3 | 4 | 5 | 5 | 2 | 5 | 2 | 4 | 5 | 3.6 | |
| CO5 | 3 | 5 | 5 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 2 | 5 | 2 | 4 | 5 | 3.7 | |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.72 | |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**UNIT-1**

**METRIC SPACES**: The definition and some examples-Open sets-Closed sets-Convergence, completeness, and Baire' s theorem-Continuous mappings-Spaces of continuous functions-Euclidean and unitary spaces

**UNIT-2**

**TOPOLOGICAL SPACES:** The definition and some examples-Elementary concepts-Open bases and open subbases-Weak topologies-The function algebras $\ell(X,R)$ and $\ell(X,C)$

**UNIT-3**

**COMPACTNESS:** Compact spaces-Products of spaces-Tychonoff's theorem and locally compact spaces-Compactness for metric spaces-Ascoli's theorem

**UNIT-4**

**SEPARATION**: $T_1$-spaces and Hausdorff spaces-Completely regular spaces and normal spaces-Urysohn's lemma and the Tietze extension theorem-The Urysohn imbedding theorem- The Stone-Cech compactification-

**UNIT-5**

**CONNECTEDNESS:** Connected spaces-The components of a space-Totally disconnected spaces-Locally connected spaces-The Weierstrass approximation theorem

**Text Book**

GEORGE F. SIMMONS, Introduction to Topology & Modern Analysis Mc Graw Hill Internatinal Edition , New York-1963

Unit 1 chapt 2; sec 9 to 15, Unit 2 chapt3; sec 16 to 20 , Unit 3 chapt 4 ; sec 21 to 25, Unit 4 chapt 5; sec 26 to 30 ,Unit 5 chapt 6; sec 31 to 34, chapt 7; sec 35

**REFERENCE BOOKS**:

1. James R. Munkers- "TOPOLOGY A FIRST COURSE" Second edition, Prentice Hall of India Ltd, New Delhi.
2. Seymour Lipschitz- " GENERAL TOPOLOGY", Schaum's outline series McGraw Hill Book company.
3. M.L.Khanna- "TOPOLOGY", Jayaprakashnath & co, Meerut, India.
4. B.C.Chattargee, S.Ganguly, M.R.Athikari- " A TEXT BOOK OF TOPOLOGY", Asian Books Private limited, New Delhi.

| II – M.Sc (Maths) | DIFFERENTIAL GEOMETRY | PMT913S |
|---|---|---|
| SEMESTER – IV | For the students admitted | HRS/WK – 6 |
| CORE – VI | form the year 2015 | CREDIT – 5 |

**OBJECTIVES:**

This course introduces space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surface and the differential geometry of surfaces are explored.

## Course Outcome:

CO1: To understand the concept of Space Curve and learn to classify the standard examples. In particular contact between curves and surfaces, Involutes, Evolutes ,SerentFerent Formula.

CO2: To Learn Properly in Space Curves, Fundamental Existence in Space Curves

CO3: Understanding of Intrinsic Properties and its related to other discipline.

CO4: Calculate the Gaussian Curvature, Mean curvature, the geodesics of the surfaces

CO5: Capability to analysis Non Intrinsic Properties of surfaces

| Sem:III | Sub Code:PMT913S | | | | | Sub: Differential Geometry | | | | | | | | | | Hours: 6 | Credit:5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcome | Programme Outcome (PO) | | | | | Programme Specific Outcome(PSO) | | | | | | | | | | Mean Score of CO's | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSo6 | PSO7 | PSO8 | PSO9 | PSO10 | | |
| CO1 | 4 | 5 | 3 | 3 | 2 | 4 | 5 | 3 | 3 | 5 | 3 | 4 | 2 | 4 | 4 | 3.6 | |
| CO2 | 5 | 4 | 3 | 2 | 2 | 5 | 5 | 3 | 2 | 5 | 3 | 4 | 2 | 5 | 4 | 3.6 | |
| CO3 | 4 | 4 | 3 | 2 | 2 | 5 | 4 | 5 | 3 | 4 | 4 | 5 | 2 | 4 | 5 | 3.7 | |
| CO4 | 5 | 5 | 5 | 4 | 2 | 5 | 4 | 5 | 3 | 4 | 3 | 5 | 2 | 5 | 5 | 4.1 | |
| CO5 | 5 | 5 | 5 | 3 | 2 | 4 | 5 | 3 | 3 | 4 | 4 | 5 | 2 | 5 | 5 | 4.0 | |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.8 | |

This course is having **HIGH** association with Programme outcomes and Programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**UNIT – I: SPACE CURVES:**
Definition of space curve - Arc length – Tangent, normal and binormal – Curvature and torsion – Contact between curves and surfaces – Tangent surfaces -Involutes and evolutes.

**UNIT- II: SPACE CURVES [Contd]**
Intrinsic equations – Fundamental existence theorem for space curves – Helices.
**INTRINSIC PROPERTIES OF A SURFACE:** Definition of a surface – curves on a surface - Surface of revolution

**UNIT - III: INTRINSIC PROPERTIES OF A SURFACE[Contd]:**
Helicoids – Metric – Direction coefficients – Family of curves – Isometric correspondence – Intrinsic properties.

**UNIT - IV: GEODESICS:** Geodesics – Canonical geodesic equations – Normal property of geodesics – Existence theorems- Geodesic parallels – Geodesics curvature – Gauss Bonnet theorem

**UNIT – V: NON - INTRINSIC PROPERTIES OF A SURFACE:**
The second fundamental form – Principal curvature – Lines of curvature – Developable – Developable associated with space curves

**Text Book:**
T.J. Wilmore, An Introduction of Differential Geometry, Oxford University Press,($17^{th}$ Impression) New Delhi 2002. (Indian Print)
Unit 1 Chapter I: Sections 1 to 7. , Unit 2 Chapter I: Section 8 &9 Chapter II: Sections 1 to 3
Unit 3 Chapter II: Sections 4 to 9, Unit 4 Chapter II: Sections10 to 16 ,
Unit 5 Chapter III: Sections 1 to 5.

**Reference Books:**

- Wilhelm Klingender, A course in Differential Geometry, Graduate Texts in Mathematics, Springer-verlag 1978.
- J.A. Thorpe, Elementary topics in Differential Geometry, under – graduate Texts in Mathematics, Springer-verlag 1978.
- M. L. Khanna, Differential Geometry, Jai Prakash Nath & Co., MeerutCity
- Mittal, Agarwal, Differential Geometry, Krishna Prakashan Media (P) Ltd.

Meerut City

- Nirmala Prakash, Differential Geometry, Tata McGraw – Hill Publishing company Ltd, New Delhi.

| II – M.Sc (Maths) | NUMBER THEORY AND CRYPTOGRAPHY | EPMT914Q |
|---|---|---|
| SEMESTER – IV | For the students admitted | HRS/WK – 5 |
| CORE – VI | form the year 2015 | CREDIT – 4 |

**OBJECTIVES:**

The course aim is to introduce the concept divisibility and Euclidean algorithm, quadratics residues and reciprocity, encryption and decryption, primality test.

**COURSE OUTCOME:**

CO1: Students able to understand the divisibility and Euclidean algorithm.

CO2: Students able to understand quadratics residues and reciprocity.

CO3: Students able to analyse encryption and decryption.

CO4: Students able to do the primality test.

CO5: Students able to the determine the elliptic curve primality test.

| SEMESTER IV | COURSE CODE: PMT914Q | | | | | TITLE OF THE PAPER: NUMBER THEORY AND CRYPTOGRAPHY | | | | | | | | | | HOURS: 5 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | | |
| CO1 | 3 | 4 | 4 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 2 | 3 | 4 | 3.6 | |
| CO2 | 3 | 4 | 3 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 2 | 2 | 4 | 3.46 | |
| CO3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 5 | 2 | 4 | 3 | 5 | 2 | 2 | 4 | 3.46 | |
| CO4 | 3 | 4 | 4 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 3 | 2 | 4 | 3.6 | |
| CO5 | 3 | 4 | 3 | 3 | 3 | 4 | 5 | 5 | 2 | 4 | 3 | 5 | 2 | 2 | 4 | 3.46 | |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.5 | |

This course is having **HIGH** association with Programme outcomes and Programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**UNIT-1: INTRODUCTION TO NUMBER THEORY**

The estimates for doing arithmetic-Divisibility and the Euclidean algorithm-Congruences-Model exponentiation-Some applications to factoring.

**UNIT-2: QUARATICS RESIDUES AND RECIPROCITY**

Finite Fields-Multiplication generators-Uniqueness of fields with prime power elements-Quadratic residues and reciprocity.

**UNIT-III : CRYPTOSYSTEMS**

Some simple crypto systems- Digraph transformation-Enciphering Matrices-Affine enchipering transformation RSA- Discrete log- Diffie-Hellman Key exchange-The massey-Omura cryptosystem-Digital signature standard-Computation of discrete log.

**UNIT-IV : PRIMALITY AND FACTORING-I**

Pseudoprimes- Strong pseudo primes- Solovay- Strassen primality test- Miller-Rabin test- Rho method-Fermat factoring and factor bases- Quadratic sieve method.

**UNIT-V: PRIMALITY AND FACTORING-II**

Elliptic curves-Elliptic curve primality test – Elliptic curve factoring –pollard's p-1 method – Elliptic curve reduction modulo n – Lenstras method.

**TEXT BOOK :**

Neal Koblitz, "A course in number theory and cryptography",2nd Edition, Springer-Verlag,1994.

**REFERENCE:**

MenezesA, " Van Oorschot and Vanstone S.A,Hand book of applied cryptography",CRC press, 1996.

| II – M.Sc (Maths) | FUZZY SUBSETS AND ITS APPLICATION | EPMT915 |
|---|---|---|
| SEMESTER – III | For the students admitted | HRS/WK – 5 |
| Elective – III | from the year 2008 | CREDIT –3 |

**OBJECTIVES:**

This course aims to offer fuzzy graphs ,fuzzy relation ,fuzzy logic and fuzzy composition.

**COURSE OUTCOMES:**

**CO1: Acquire knowledge on the basic definitions and fundamentals of Fuzzy set theory.**

**CO2: Able to get ideas on Fuzzy graphs and its properties**

**CO3: Improve their ability in the concept of Fuzzy relations**

**CO4: Attain knowledge of the Fuzzy Logic in different forms**

**CO5: Understand the applications of Fuzzy logic**

| SEMESTER III | COURSE CODE: EPMT915 | | | | | TITLE OF THE PAPER: FUZZY SUBSETS AND ITS APPLICATION | | | | | | | | | HOURS: 5 | CREDITS: 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S |
| | PO1 | PO 2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 4 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 3.5 |
| CO2 | 3 | 4 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 3.5 |
| CO3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 3.6 |
| CO4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3.4 |
| CO5 | 4 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 3.5 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.5 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT –I: FUNDAMENTAL NOTION**

Introduction –Review of the notion of membership-Concept of fuzzy subsets-Dominance relation-Simple operation- Set of fuzzy subsets for E and M finite-Properties of fuzzy subsets –Product and algebraic sum of two fuzzy subsets-problems.

**UNIT –II: FUZZY GRAPHS**

Introduction – Fuzzy graphs –Fuzzy relation -Composition of Fuzzy relation – Fuzzy subsets induced induced by the mapping –Conditioned fuzzy subsets-Properties of fuzzy binary relation-Transitive closure – Paths in finite Fuzzy graphs-Problems .

**UNIT-III: FUZZY RELATION**

Fuzzy Preorder relation –Similitude- Similitude sub relation –Anti symmetry – Fuzzy order relation – Anti-symmetry relations without loops-Ordinal relations-Ordinal functions- Dissimilitude –Resemblance –Properties of Similitude and Resemblance –Properties of Fuzzy perfect order relation –Problems.

**UNIT-IV: FUZZY LOGIC**

Introduction –Characteristic functions of a fuzzy subsets-Fuzzy variables – Polynomial forms –Analysis of function of Fuzzy variables –Method of marinos –Logical structure.

**UNIT-V: APPLICATIONS.**

Introduction – Engineering – Medical– Economics – Soft Computers

**Text Books:**

1. A. Kaufman, Introduction to the theory of Fuzzy subsets, Vol I,( 1975) Acadamic Press, New York,. (For unit – I to unit IV)
2. George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic Theory and Applications,( 2001) Prentice Hall India, New Delhi,. (Unit – V Only)
   Unit 1 Chapters1:sec 1 to 9 , Unit 2 Chapters2: sec10 to 18
   Unit 3 Chapters2:sec 19 to 29
   Unit 4 Chapters3:sec 31 to35(Omit 33)
   Unit 5 Chapters5:[ "Fuzzy sets and Fuzzy Logic Theory and Applications"] – George . J.Klir

**Reference book:**

- H. J. Zimmermann, Fuzzy set Theory and its Applications,( 1996.) Allied Publications, Chennai,

| II – M.Sc (Maths) | INTEGRAL TRANSFORMS | EPMT915A |
|---|---|---|
| SEMESTER – IV | For the students admitted | HRS/WK – 6 |
| ELECTIVE-III (OPTIONAL) | from the year 2017 | CREDIT –3 |

**Objectives:**

To understand integral equations, to focus on easily applicable techniques and to emphasize linear integral equations of the second kind.

**COURSE OUTCOMES:**

**CO1: Enables to classify, convert and solve linear equations, IVP and BVP**

**CO2: Attains knowledge on Fredholm Intergral Equation**

**Able to get ideas on Fuzzy graphs and its properties**

**CO3: Improves their understanding ability on Volterra Integral Equations**

**CO4: Attains knowledge on Integra-Differential Equations**

**CO5: understands the idea on Singular Integral Equations**

| SEMESTER IV | COURSE CODE: EPMT915A | | | | | TITLE OF THE PAPER: INTEGRAL TRANSFORMS | | | | | | | | | | HOURS: 6 | CREDITS: 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO 10 | | |
| CO1 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 3.5 | |
| CO2 | 3 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 3.5 | |
| CO3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 2 | 3 | 4 | 3.5 | |
| CO4 | 5 | 4 | 3 | 3 | 3 | 4 | 2 | 4 | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 3.5 | |
| CO5 | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 3.6 | |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.5 | |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT I Introductory Concepts**

Definitions - Classification of Linear Integral Equations - Solution of an Integral Equation - Converting Volterra Equation to ODE - Converting IVP to Volterra Equation - Converting BVP to Fredholm Equation

**UNIT II Fredholm Integral Equations**

Introduction - The Decomposition Method - The Direct Computation Method - The Successive Approximations Method - The Method of Successive Substitutions - Comparison between Alternative Methods - Homogeneous Fredholm Equations

**UNIT III Volterra Integral Equations**

Introduction -The Adomian Decomposition Method - The Series Solution Method -Converting Volterra Equation to IVP - Successive Approximations Method - The Method of Successive Substitutions - Comparison between Alternative Methods - Volterra Equations of the First Kind

**UNIT IV Integra-Differential Equations**

Introduction - Fredholm Integro-Differential Equations - Volterra Integro-Differential Equations

**UNIT V Singular Integral Equations**

Definitions - Abel's Problem - The Weakly-Singular Volterra Equations .

**Text Book:**

A First course in integral equations –A.M. Wazwaz (1997) (world Scientific)

**Reference Book:**

Introduction to Integral Equation with Applications –A.J. Jerri (1999)Second edition Wiley Interscience.

| II – M.Sc (Maths) | COMPLEX ANALYSIS-II | PMT1016 |
|---|---|---|
| SEMESTER – IV | For the students admitted | HRS/WK – 6 |
| CORE – XIII | from the year 2008 | CREDIT – 5 |

## OBJECTIVES

The course aims to introduce the concepts of Power Series Expansions, Jensen's Formula, The Riemann Zeta Function, Arzela's Theorem, The Riemann Mapping Theorem, Conformal Mapping of Polygons, Simply Periodic Functions, Doubly Periodic Functions and The Weierstrass Theory

**Course Outcome:**

At the end of the course students will be able to

C01: Compute the Taylor's and Laurent expansion of simple functions, determine the singularity .

C02: manipulate and explicit analytic expression for exponential and trigonometric functions.

C03: understand the Riemann zeta functions and its role in application of complex analysis to number theory.

C04: Apply Normality, Equi- continuity, compactness properties of family of family of analytic function.

C05: Apply Riemann mapping theorem in mapping of multiply connected region, Apply reflection principle in simple connected region.

| SEMESTER IV | COURSE CODE: PMT1016 | | | | | TITLE OF THE PAPER: COMPLEX ANALYSIS II | | | | | | | | HOURS: 6 | CREDITS: 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 3 | 3 | 4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 2 | 4 | 3.1 |
| CO2 | 3 | 4 | 4 | 3 | 3 | 2 | 2 | 3 | 3 | 4 | 3 | 5 | 2 | 3 | 5 | 3.3 |
| CO3 | 3 | 4 | 4 | 3 | 3 | 2 | 3 | 4 | 2 | 4 | 5 | 4 | 3 | 2 | 5 | 3.0 |
| CO4 | 3 | 4 | 5 | 3 | 3 | 2 | 3 | 4 | 2 | 4 | 3 | 4 | 2 | 3 | 5 | 3.1 |
| CO5 | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 2 | 4 | 3 | 4 | 2 | 2 | 5 | 3.3 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.16 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |

| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
|---|---|---|---|---|---|
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT-I**

**Power Series Expansions:**Weierstrass's Theorem,The Taylor Series,The Laurent Series.Partial Fractions and Factorization:Partial Fractions,Infinite Products,Canonical Products,The Gamma Function

**UNIT-II**

**Entire Functions:** Jensen's Formula, Hadamard's Theorem. The Riemann Zeta Function:The Product Development, Extension of (s) to the Whole Plane,The Functional Equation,The Zeros of the Zeta Function.

**UNIT-III**

**Normal Families:**Equicontinuity,Normalitiy and Compactness,Arzela's Theorem,Families of Analytic Functions,The Classical Definition.The Riemann Mapping Theorem, Boundary Behavier, Use of the Reflection Principle.

**UNIT-IV**

**Conformal Mapping of Polygons:**The Behavior at an Angle, The Schwarz-Christoffel formula, Mapping on a Rectangle.A Closer Look at Harmonic Functions:Functions with the Mean-Value Property, Harnack's Principle.Simply Periodic Functions:Representation by Exponentials, The Fourier Development, Functions of Finite Order.

**UNIT-V**

**Doubly Periodic Functions:**The Period Module, Unimodular Transformations,The Canonical Basis,General Properties of Elliptic Functions.The Weierstrass Theory:The Weierstass -function,The Functions (z) and (z),The Differential Equation.

**Text Book:**

COMPLEX ANALYSIS by Lars V.Ahlfors (Third Edition)
CHAPTER 5:1.1 to 5.5(omit2.5)
CHAPTER 6: 1.1 to 3.2(omit1.4&2.4)
CHAPTER 7: 1.1 to 3.3

**Reference books:**


- H.A Presfly, "Introduction to Complex Analysis", Clarendon Press, Oxford, 1990.
- J.B.Conway, "Functions of one complex variables, Springer- Verlag, International student edition, Naroser Publishing Co. 1978.
- E.Hille, Analytic function theory, Gonm & Co., 1959.
- M.Heins, "Complex function Theory, Academic Press, New York, 1968.

| II – M.Sc (Maths) | FUNCTIONAL ANALYSIS | PMT1017 |
|---|---|---|
| SEMESTER – IV | For the students admitted | HRS/WK – 6 |
| CORE – XIII | from the year 2008 | CREDIT – 5 |

## OBJECTIVES

The course aims to introduce the concepts of Banach spaces, Hilbert spaces, normal and unitary operators, Finite dimensional spectral theory and General preliminaries on Banach algebras.

**COURSE OUTCOME:**

CO1:To understand the concept of Banach Space and learn to classify some standard examples

CO2: To understand the concept of Hilbert Space and learn to classify some standard examples

CO3:To Learn to Properly the specific Techniques for bounded operator over normed and Hilbert Space

CO4:To understand How to use the main Properties of Compact Operator

CO5: To understand the concept of Banach Algebra

| Sem:IV | Sub Code:PMT1017 | | | | | Sub: Functional Analysis | | | | | | | | | | Hours:6 | Credit:5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Outcome | Programme Outcome (PO) | | | | | Programme Specific Outcome(PSO) | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO2 | PSO4 | PSO5 | PSo6 | PSO7 | PSO8 | PSO 9 | PSO1 0 | Mean Score of CO's | |
| CO1 | 4 | 5 | 4 | 3 | 2 | 2 | 4 | 4 | 4 | 5 | 2 | 5 | 2 | 5 | 4 | 3.7 | |
| CO2 | 5 | 5 | 5 | 4 | 2 | 2 | 5 | 3 | 5 | 4 | 2 | 4 | 2 | 5 | 4 | 3.8 | |
| CO3 | 3 | 4 | 4 | 3 | 2 | 2 | 4 | 4 | 5 | 5 | 2 | 4 | 2 | 3 | 3 | 3.3 | |
| CO4 | 4 | 5 | 3 | 4 | 2 | 2 | 5 | 3 | 5 | 4 | 2 | 4 | 2 | 4 | 5 | 3.6 | |
| CO5 | 3 | 5 | 5 | 3 | 2 | 2 | 5 | 5 | 5 | 4 | 2 | 5 | 2 | 5 | 5 | 3.9 | |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.66 | |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |

| Rating | Very poor | Poor | Moderate | High | Very High |
|---|---|---|---|---|---|

**UNIT I**

**BANACH SPACES:** Definition - examples-continuous linear transformations-The Hahn-Banach theorem-the natural embedding of $N^*$ in to $N^{**}$ - open mapping theorem-conjugate of an operator.

**UNIT II**

**HILBERT SPACES:** Definition– examples-simple properties-orthogonal complements-orthonormal sets

**UNIT III**

**HILBERTSPACES (CONTD):** conjugate space $H^*$ -adjoint of an operator-self adjoint operators-normal and unitary operators- Projections.

**UNIT IV**

**FINITE DIMENSIONAL SPECTRAL THEORY:** Matrices-Determinants and the spectrum of an operator- The spectral theorem-A survey of the situation.

**UNIT V**

**GENERAL PRELIMINARIES ON BANACH ALGEBRAS:** Definition – examples-regular and singular elements- Topological divisors of zero- The spectrum- The formula for spectral radius- The radical and semi-simplicity.

**Text Book:**

G.F. SIMMONS,"Introduction to TOPOLOGY AND MODERN ANALYSIS", Mc Graw Hill International Edition, New York 1963.

Unit-1 Chapter 9:sec 46 to 51,Unit-2 Chapter 10:sec 52,53,54,Unit-3 Chapter 10:sec 55 to 59,Unit-4 Chapter 11:sec 12, 64 to 69,Unit-5 Chapter 12:sec 64 to 69

**REFERENCE BOOKS:**


- Walter Rudin , “Functional analysis”, Tata Mc Graw Hill Publishing company, New Delhi1973
- M.L.Khanna- “Functional analysis”, Jayaprakashnath & co, Meerut, India1988.
- G.Bachman & L.Narici, “Functional analysis” Academic Press, New York1966.
- S. Ponnusamy, ”Foundations of Functional Analysis”, Narosa Publishing House, New Delh.

| II – M.Sc (Maths) | PARTIAL DIFFERENTIAL EQUATIONS | PMT1019T |
|---|---|---|
| SEMESTER - IV | For the students admitted | HRS/WK – 6 |
| CORE – XX | from the year 2017 | CREDIT –4 |

**OBJECTIVES**

The course aim is to introduce the concept of equations of the first order and higher degree, elliptic differential equation, parabolic differential equation, hyperbolic differential equations.

**COURSE OUTCOME**

CO1: Use knowledge of partial differential equation(PDE), partial differential equation of first order.

CO2: Formulate fundamental concepts,second order PDE.

CO3: Understand analogies between elliptic differentialequations.

CO4: Classify PDE and apply parabolic differential equation for a circle.

CO5: Solve practical PDE problems with hyperbolic differential equations.

| SEMESTER IV | COURSE CODE: PMT1019T | | | | | TITLE OF THE PAPER: PARTIAL DIFFERENTIAL EQUATIONS | | | | | | | | | | HOURS: 6 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | | |
| CO1 | 4 | 4 | 3 | 3 | 4 | 3 | 4 | 5 | 2 | 4 | 2 | 3 | 3 | 4 | 5 | 3.5 | |
| CO2 | 3 | 2 | 4 | 2 | 4 | 2 | 3 | 5 | 3 | 4 | 2 | 3 | 2 | 4 | 5 | 3.2 | |
| CO3 | 4 | 3 | 4 | 4 | 2 | 3 | 4 | 5 | 2 | 4 | 2 | 3 | 3 | 4 | 5 | 3.5 | |
| CO4 | 3 | 2 | 3 | 4 | 3 | 2 | 3 | 5 | 3 | 3 | 2 | 3 | 2 | 3 | 5 | 3.1 | |
| CO5 | 4 | 3 | 2 | 3 | 3 | 2 | 3 | 5 | 2 | 3 | 2 | 3 | 2 | 3 | 5 | 3.0 | |
| | | | | | | Mean Overall Score | | | | | | | | | | 3.3 | |

This course is having **HIGH** association with programme outcomes and programme specific outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very poor | Poor | Moderate | High | Very High |

**Unit – 1: Partial Differential Equations of First order**

Formation of Partial differential Equation - Solution of Partial Differential Equations of First order - Integral Surfaces passing through a given curve - The Cauchy Problem for First Order Equations - Compatible System of First Order Equation - Charpit's Method

**Unit-2: Fundamental Concepts**

Introduction - Classification of Second Order PDE - Canonical Forms - Adjoint Operators - Riemann's Method

**Unit – 3: Elliptic Differential Equations**

Occurrence of the Laplace and Poisson Equation – Boundary Value Problem (BVPs) – Separation of Variables – Dirichlet Problem for a rectangle – Interior Dirichlet Problem for a circle – Exterior Dirichlet Problem for a circle – Miscellaneous Examples

**Unit – 4: Parabolic Differential Equations**

Occurrence of Diffusion Equation – Boundary Condition – Elementary solution for the Diffusion Equation – Dirac Delta Function – Separation of Variable method - Miscellaneous Examples

**Unit – 5: Hyperbolic Differential Equations**

Occurrence of Wave Equations – Derivation of One dimensional Wave Equation – Solution of One dimensional Wave Equation by Canonical Reduction – The Initial value Problem; D' Alembert's Solution – Vibrating String – Variable Separable Solution – Forced Vibrations – Solution of Non-homogeneous Equation – Boundary and Initial Value Problem for Two-dimensional Wave-Periodic Solution of One-dimensional Wave Equation in Cylindrical Coordinates – Miscellaneous Examples

**Text Book:**

K. Sankara Rao, Introduction to Partial Differential Equations, Prentice Hall of India, New Delhi, 2007.

**References:**


- J. N. Sharma and Kehar Singh, Partial Differential Equations for Engineers and Scientists – Narosa Publishing House, New Delhi, 2000.
- M. D. Raisinghania Advanced Differential Equations, S. Chand & Company Ltd, New Delhi, 2001.
- Robert C. McOwen, Partial Differential Equations, Pearson Education, 2004.

| II – M.Sc (Maths) | FORMAL LANGUAGES AND AUTOMATA THEORY For the students admitted from the year 2008 | EPM1020A |
|---|---|---|
| SEMESTER - IV | | HRS/WK – 6 |
| ELECTIVE | | CREDIT –4 |

**OBJECTIVES**

The course aims to introduce the concepts of **Finite Automata,** Regular expression, and regular sets, Context-Free Grammars, Pushdown Automata and Properties of Context-Free Languages

**COURSE OUTCOMES:**

CO1: Know the concepts of finite automata, nondeterministic finite automata and finite automata moves.

CO2: Learns the concepts of regular expression and pumping lemma for regular sets.

CO3: Know the concepts of free grammars and simplification of context.

CO4: Enables to understand the pushdown automata and free languages.

CO5: Able to understand the properties of context-free languages.

| SEMESTER: V | COURSE CODE: EPM1020A | | | | | TITLE OF THE PAPER: FORMAL LANGUAGES AND AUTOMATA THEORY | | | | | | | | | | HOURS: 6 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 | PSO 9 | PSO 10 | | |
| CO1 | 4 | 5 | 3 | 4 | 3 | 4 | 4 | 3 | 5 | 4 | 3 | 4 | 5 | 3 | 5 | 3.9 | |
| CO2 | 4 | 4 | 4 | 3 | 3 | 5 | 5 | 3 | 4 | 5 | 2 | 3 | 5 | 4 | 4 | 3.8 | |
| CO3 | 4 | 4 | 4 | 3 | 3 | 5 | 5 | 3 | 4 | 5 | 2 | 3 | 5 | 4 | 4 | 3.8 | |
| CO4 | 3 | 4 | 3 | 4 | 4 | 3 | 5 | 4 | 4 | 5 | 3 | 4 | 4 | 3 | 4 | 3.8 | |
| CO5 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 3.6 | |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.7 | |

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This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes**.**

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**Unit-1 Finite Automata:**

Finite state systems- Basic definitions-Nondeterministic finite automata- Finite Automata with moves

**Unit-II Regular expression and regular sets:**

Regular expressions- The Pumping lemma for regular sets. [18 HRS]

**Unit-III**

Context-Free Grammars:Context-Free grammars- Derivation trees (Definition and examples only).Simplification of context-free Grammars - Chomsky normal form- Greibach normal form

**Unit-IV Pushdown Automata:**

Definitions-Pushdown Automata and context-free languages.

**Unit-V Properties of Context-Free Languages:**

The Pumping lemma for CFL's- Closure properties for CFL.

Sections:2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.2, 5.3, 6.1, 6.2

Omit 3.2, 3.3, 3.4, and 6.3

**Text Book**

Introduction to Automata Theory, Languages and Computation "by John E. Hop craft and Jeffrey D.Ullman. Narosa Publishing House, New Delhi, 1987.

**Reference Books**

1. Introduction to Languages and theory of Computations by John C. Martin (2nd Edition) Tata- McGraw HillCompany Ltd, New Delhi, 1999
2. A.Salomaa, Formal Languages, Academic Press, New York, 1973.

| II – M.Sc (Maths) | GRAPH THEORY | EPM1020 |
|---|---|---|
| SEMESTER - IV | For the student admitted | HRS/WK – 6 |
| Elective - IV | from the year 2012 | CREDIT –4 |

This course introduces the application of graph theory in various field..

## COURSE OUTCOMES:

CO1: Develops the skill of calculating minimum shortest path in a weighted graph.

CO2: Learns to get an minimum weighted complete graph using krushal algorithm.

CO3: Knows to determine the good solution for travelling sales man problem.

CO4: Collectively solve the time tabling problem using edge colourings.

CO5: Enables to understand the characterization of planar graph and dual, vertex colouring and its application.

| SEMESTER IV | COURSE CODE: EPM1020 | | | | | TITLE OF THE PAPER: GRAPH THEORY | | | | | | | | HOURS: 6 | CREDITS: 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | MEAN SCORE OF CO'S |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 | PSO 6 | PSO 7 | PSO 8 | PSO 9 | PSO 10 | |
| CO1 | 3 | 5 | 4 | 4 | 3 | 3 | 5 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 3.8 |
| CO2 | 4 | 5 | 3 | 4 | 3 | 4 | 4 | 3 | 5 | 4 | 3 | 4 | 5 | 3 | 5 | 3.9 |
| CO3 | 4 | 4 | 4 | 3 | 3 | 5 | 5 | 3 | 4 | 5 | 2 | 3 | 5 | 4 | 4 | 3.8 |
| CO4 | 3 | 5 | 3 | 4 | 3 | 5 | 5 | 3 | 4 | 4 | 3 | 4 | 5 | 3 | 5 | 3.9 |
| CO5 | 3 | 4 | 3 | 4 | 4 | 3 | 5 | 4 | 4 | 5 | 3 | 4 | 4 | 3 | 4 | 3.8 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.8 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT-I GRAPHS & SUBGRAPHS**
Paths&Connection-cycles.
Application: The Shortest Path Problem-Sperner's lemma.

**UNIT-II TREES & CONNECTIVITY**
Trees-cut edges and bonds-cut vertices-Cayles's formula.
Application: The connector Problem
Connectivity: Connectivity-Blocks
Applications: Constructions of Reliable communication networks.

**UNIT-III EULER TOURS & HAMILTONIAN CYCLES**
Euler Tours & Hamilton Cycles
Application: The Chinese postmanProblem –The travelling sales man problem.

**UNIT-IV DGE COLOURINGS&INDEPENDENT SETS**
Edge chromatic number-vizings theorem, Independent sets-Ramsey's theorem.
Application: The time tabling Problem.

**UNIT-V VERTEX COLOURINGS**
Chromatic number-Brooke's theorem-Hajose' Conjecture-Chromatic polynomials.
Applications: A Storage problem,
Plane & Planar graphs-Dual graphs-Kuratowski's theorem.

**TEXT BOOK:**
Bondy J.A& Murthy U.S.R, Graph theory and its applications.
**Unit 1 chapt 1** Sections 1.6, 1.7, 1.8,1.9
**Unit 2 chapt 2** Sections – 2.1, 2.2, 2.3, 2.4, 2.5, chapt 3;3.1, 3.2, 3.3
**Unit 3 chapt 4;** Sections –4.1, 4.2,4.3,4.4
**Unit 4 chapt 6; Sections –6.1, 6.2, 6.3, 7.1, 7.2,**
**Unit 5;chapt 8;** Sections – 8.1, 8.2, 8.3, 8.4, 8.6, 9.1, 9.2, 9.5

**REFERENCE BOOKS:**
1. Balakrishanan&K.Ranganathan, AText book of graph theory,Springer 2000.
2. Harary, Graph theory-Addison Wesley, 1969.

**QUESTION PATTERN**

**Time: 3Hrs**
**Max. Marks:75**

**Section – A**
**5x2=10, Answer ALL Questions**
**(Each Unit have One Questions)**

**Section – B**
**3x5=15 ,Answer any THREE Questions (Out of five)**
**(Each Unit have One Questions)**

**Section – C**
**5x10=50,Answer ALL Questions (Either or Type)**
**(Each Unit have two Questions)**

## BOARD OF STUDIES MEETING - (2018-2019)

PG and Research Department of Mathematics conducted Board of Studies Meeting on 11-03-2019 at 11.30 am to discuss about syllabi for UG , PG and M.Phil courses.

Syllabi for UG , PG and M.Phil courses were already framed by the faculty members and the same is brought to the notice of the board members, the Chairman ,Subject Experts.

**M.Phil Board:**
The following members discussed syllabi for M.Phil :

Chairman:
**Dr.J.JonArockiaraj**, M.Sc., M.Phil, Ph.D.
Head, Department of Mathematics,
St.Joseph's College of Arts &Science(Autonomous),
Cuddalore-1.

University Nominee:
**Dr. S.R. Kannan**, M.Sc., M.Phil, Ph.D.
Professor in Mathematics,
Pondicherry University, Puducherry.
Ph:9865707773
Email:srkannan.mat@pondiuni.edu.in

Subject Expert:
**Dr. G. Rajasekar**, M.Sc., M.Phil, Ph.D.
Associate Professor in Mathematics,
Jawahar Science College, Neyveli.
Ph:9443051420
Email:grsmaths@gmail.com

Alumni **:**
**Dr. S. Vijayabalaji,** M.Sc., M.Phil, Ph.D.
Asst. Professor in Mathematics,
Anna University College of Engineering ,
Panruti Campus, Panruti.
Ph:9443682630
Email:balaji1977harshini@gmail.com

Members of the Board:

1. Mr.T.Henson
2. Mrs.A.Arockia Mary
3. Mr.S.JohnsonSavarimuthu
4. Mr.A.Virgin Raj

❖ All the Papers are Accepted they are.

## M.Phil MATHEMATICS

## CURRICULUM DESIGN TEMPLATE

| Yr/ Sem | Subject | SUB CODE | Paper | Title of the paper | Hrs | Credits |
|---|---|---|---|---|---|---|
| I YEAR/ I SEM | Core | MMT101S | I | **ALGEBRA AND ANALYSIS** | 9 | 5 |
| | Core | MMT102S | II | **TOPOLOGY AND DIFFERENTIAL EQUATIONS** | 9 | 5 |
| II SEM | Core | | III | **ELECTIVE PAPER** | 9 | 5 |
| | core | | | **DISSERTATION AND VIVA VOCE** | | 21 |

## Illustration: M.Phil CURRICULUM GRADE STATEMENT

| Semester &Course | Course number/ Code | Credits earned | Marks secured (Max:100) |
|---|---|---|---|
| **First Semester** | | | |
| Core | | 5 | 70 |
| Core | | 5 | 60 |
| Elective | | 5 | 75 |
| Grade point total<br>Weight average total | | 15 | 68.33 |
| **Second Semester** | | | |
| Dissertation & Viva voce | | 21 | 64 |
| Grade point total<br>Weight average total | | 21 | 64 |
| Cumulative grade point average<br>36<br>Overall weighted percentage marks | | | 65.81 |

| YEAR – I | ALGEBRA AND ANALYSIS<br>FOR THE STUDENT ADMITTED FROM 2016 | MMT101S |
|---|---|---|
| SEMESTER –I | | Hrs / Week: 9 |
| CORE – I | | Credit: 5 |

**COURSE OUTCOME:**

CO1:Knowing the advance concepts of rings, ideals and modules.

CO2:Getting the knowledge of rings modules of Fractions and primary decomposition.

CO3:Knowing the advanced concepts of measure theory and HPspaces.

CO4:Knowing the Fourier transforms and some new types.

CO5:Getting the basic knowledge of research methodology

| SEMESTER I | COURSE CODE: MMT101S | | | PAPER TITLE: ALGEBRA AND ANALYSIS | | | | | | | | | | HOURS: 7 | CREDITS: 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 5 | 4 | 5 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 3.6 |
| CO2 | 4 | 4 | 3 | 3 | 4 | 5 | 4 | 3 | 4 | 3 | 3 | 4 | 4 | 3 | 3 | 3.6 |
| CO3 | 5 | 4 | 3 | 5 | 4 | 3 | 5 | 4 | 4 | 4 | 5 | 4 | 5 | 2 | 4 | 4.0 |
| CO4 | 3 | 4 | 3 | 5 | 4 | 4 | 5 | 4 | 3 | 5 | 4 | 3 | 4 | 3 | 4 | 3.9 |
| CO5 | 3 | 4 | 2 | 4 | 4 | 3 | 5 | 4 | 4 | 5 | 3 | 4 | 2 | 4 | 3 | 3.6 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.7 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT I: Rings, Ideals and Modules**

Rings and ring homomorphism-Ideals, Quotient rings-Zero-divisors, Nil potent elements ,units-Prime ideals and maximum ideals-Nil radical and Jacobson radical-operations on ideals-extension and contraction-exercises-Modules and module homomorphism-sub modules and quotient modules-operation on sub modules-Direct sum and product-Finitely generated modules. -Exercises.

**UNIT-II: Rings, Modules of Fractions and Primary Decomposition**

Extract sequences-Tensor product of modules-Restriction and extension of scalars-Exactness properties of the tensor product-Algebra-Tensor product of algebras-Local properties- Extended and contracted ideals in rings of fractions Exercises- Primary decomposition – Exercise.

**UNIT-III: Abstract Integration and $L^p$ – spaces**

**$L^p$**– Spaces

Convex Function and Inequalities – The **$L^p$**– Spaces – Approximation by Continuous Functions – The Inversion Theorem.

**$H^p$ Spaces**

The concept of $H^p$spaces-the role played by the **$H^p$**spaces-simple functions – inequalities-Exercises.

**UNIT-IV: Fourier Transforms and Holomorphic Fourier Transforms**

Formal properties – The Invention Theorem – thePlancheral Theorem – The Banach algebra Li- Introduction – Two Theorems of Paley and Wiener – Quasi – analytic classes – The Denjoy- Carleman theorem.

**UNIT-V: Research Methodology**

Research – Research methods and methodology –Types of Research – Mode of approach– Art of writing a Research paper and thesis

**TEXT BOOKS:**

1. M.F. Atiyah, I.G. Macdonald, Introduction to Commutative Algebra, Addison – Wesley Publishing Company, 1969.
   Unit-I Chapter – 1 (pg 1-10), Chapter – 2 (pg 17 – 31)
   Unit-II Chapter - 3 ( pg 36 – 43), Chapter – 4 (pg 50 – 55)
2. Walter Rudin, Real and Complex Analysis II Edition, McGraw Hill International, 1986.
   Unit – III Chapter - 3 (pg61 – 70), Chapter – 17 (pg335 – 355),
   Unit-IV Chapter – 9 (pg 178 – 193), Chapter – 19(pg 371 – 383) .
3. Unit-V Research Methodologyby S Rajasekar, P Philominathan and V Chinnathambi, e-material at http://arxiv.org/pdf/physics/0601009.pdf.

| YEAR – I | TOPOLOGY AND DIFFERENTIAL EQUATIONS FOR THE STUDENT ADMITTED FROM 2016 | MMT102S |
|---|---|---|
| SEMESTER –I | | Hrs / Week: 9 |
| CORE-2 | | Credit: 5 |

CO1: Get Knowing the fundamental group and covering spaces

CO2: Knowing the simplicial complexes.

CO3: Knowing the linear systems

CO4: getting the knowledge of non linear systems:local theory

CO5: Knowing the techniques and dynamic of teaching.

| SEMESTER I | COURSE CODE: MMT101S | | | PAPER TITLE: ALGEBRA AND ANALYSIS | | | | | | | | | | HOURS: 7 | CREDITS: 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE OUTCOMES | PROGRAMME OUTCOMES(PO) | | | PROGRAMME SPECIFIC OUTCOMES(PSO) | | | | | | | | | | MEAN SCORE OF CO'S | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 | |
| CO1 | 5 | 4 | 5 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 3.6 |
| CO2 | 4 | 4 | 3 | 3 | 4 | 5 | 4 | 3 | 4 | 3 | 3 | 4 | 4 | 3 | 3 | 3.6 |
| CO3 | 5 | 4 | 3 | 5 | 4 | 3 | 5 | 4 | 4 | 4 | 5 | 4 | 5 | 2 | 4 | 4.0 |
| CO4 | 3 | 4 | 3 | 5 | 4 | 4 | 5 | 4 | 3 | 5 | 4 | 3 | 4 | 3 | 4 | 3.9 |
| CO5 | 3 | 4 | 2 | 4 | 4 | 3 | 5 | 4 | 4 | 5 | 3 | 4 | 2 | 4 | 3 | 3.6 |
| Mean Overall Score | | | | | | | | | | | | | | | | 3.7 |

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

| Association | 1%-20% | 21%-40% | 41%-60% | 61%-80% | 81%-100% |
|---|---|---|---|---|---|
| Scale | 1 | 2 | 3 | 4 | 5 |
| Interval | 0<=rating<=1 | 1.1<=rating<=2 | 2.1<=rating<=3 | 3.1<=rating<=4 | 4.1<=rating<=5 |
| Rating | Very Poor | Poor | Moderate | High | Very High |

**UNIT –I: Fundamental Group and Covering Spaces**
Homotopy – Fundamental group – Covering spaces.

**UNIT – II: Simplicial Complexes**
Geometry of Simplicial Complexes - Bary Centric subdivisions – Simplicial approximation Theorem – Fundamental Group of a simplicial Complex.

**UNIT-III: Linear Systems**
Uncoupled Linear System – Diagonalization – Exponentionals operators – The Fundamental Theorem for linear system – Linear System in R2 – Complex Eigen Values – Multiple Eigen Values – Non Homogeneous Linear System.

**UNIT-IV: Non Linear Systems: Local Theory**
Some preliminary concepts & definitions – The Fundamental Existence – Uniqueness Theorem – Dependence on Initial Conditions and Parameters – The Maximum Interval of Existence- The Flow Defined by a Differential Equation.

**UINT-V: Techniques and Dynamics of Teaching- Learning**
a. Emerging trends in Educational Psychology– Meaning, Scope and Methods
b. Learning–Different Theories of learning, Approaches to learning(Classical Conditioning- Ivan Pavlov; Operant conditioning-B.F.Skinner); kinds of learning, factors affecting learning
**c.** Motivation: Intrinsic and extrinsic motivation, Development of memory and intelligence.

**TEXT BOOKS:**

1. I.M.Singer, J.A.Thorpe, Lecture notes on Elementary Topology and Geometry, Spring- Verlag, Newyork,1967.
   Unit-I -Chapter -3 ,pg(49-77)Unit-II-Chapter -4 ,pg (78-108)
2. L.Pergo,Differential Equation and Dynamical System, thirdedition, Springer –Verlag, Newyork,2006
   Unit-III Chapter -1,sections (1.1 to 1.7and 1.10) –pg(1-39 , 60-63)
   Unit-IV Chapter -2,sections (2.1 to 2.5)-pg(65-101)
3. Unit-V
   Covey, Stephen. (2004),**7 Habits of Highly effective people***,* Free Press.
   Driscoll, M. P. (2005),**Psychology of Learning for Instruction**, Pearson HigherEd. Gardner, Howard (1983; 1993) **Frames of Mind: The theory of multiple intelligences**, New York: Basic Books

| YEAR – I | TOPOLOGY ANALYSIS | |
|---|---|---|
| SEMESTER –II | | Hrs / Week:9 |
| CORE | | Credit: 5 |

**UNIT-I**

Compact sets- Diameters and distances – superior and inferior limits-convergence-connected sets. Well chained sets.
Ch. 1.5-1.8

**UNIT II**

Limit theorem. Applications- Continua- irreducible continua- Reduction theorem-Locally connected sets – Property S.Uniformly locally connected sets.
Ch. 1.9-1.13

**UNIT III: Mappings**

Continuity-Complete spaces.Extension of transformations-Mapping theorems-Arc wise connectedness. Accessibility-Simple closed curves.
Ch. 2.1 – 2.5

**UNIT IV: Open Mappings**

General theorems. Property S and Local Connectedness- Extension of Openness- the Scattered inverse property.
Ch. 7.1-7.3

**UNIT V**

Open mappings on simple cells and manifolds-Local topological analysis – the derivative function.
Ch.7.4 – 7.6

**Text Book:**

Topological Analysis, Gordon Thomas Why bum, Princeton University Press. 1958.

**Reference Books:**

1. Dugundji,J. Topology, Allyn and Bacon, Boston,1966
2. Hocking, J, and Young, G, Topology, Addison-Wesley, Massachusetts, 1961
3. Kelly, J.L., general Topology, Van Nostrand Reinhold Co., New York, 1955
4. Wilansky A., Topology for analysis, R.E. Krieger, Florida, 1988.
5. Willards S., General Topology, Addison – Wesley, Massachusetts, 10970

| YEAR – I | GRAPH THEORY AND ITS APPLICATIONS | |
|---|---|---|
| SEMESTER –II | | Hrs / Week: 9 |
| CORE | | Credit: 5 |

**UNIT I**

Graphs and simple graphs-Graph Isomorphism- The incidence and Adjacency Matrices- Sub graphs- Vertex degrees-Paths and Connection-cycles.

**UNIT II**

Trees-Cut Edges-Bonds-Cut Vertices-Cayley's Formula-Connectivity-Blocks

**UNIT III**

Matching – Matching and coverings in Bipartite Graphs- Berge's Theorem-Hall's Theorem – covering numbers-Konig's Theorem-Perfect matching – Gallai's theorem.

**UNIT IV**

Vertex colorings and chromatic number of graphs – critical graphs and their properties – Brook's Theorem – Hajo's conjuncture and Dirac's Theorem.

**UNIT V**

Directed Graph – Definition and examples – Directed path (Roy – Gaalli theorem)-Directed Hamilton Path.

**Text Books:**

Bondy J.A and U.S.R. Murty, Graph theory with Applications Elsevier, 1976

UNIT I - Chapter 1 – 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 and 1.7

UNIT II - Chapter 2 – 2.1, 2.2, 2.3 and 2.4
Chapter 3 – 3.1 and 3.2

UNIT III - Chapter 5 – 5.1, 5.2 and 5.3

UNIT IV - Chapter 8 – 8.1, 8.2, and 8.3

UNIT V - Chapter 10 – 10.1, 10.2, and 10.3

| YEAR – I | FUZZY SUBSETS AND ITS APPLICATIONS | |
|---|---|---|
| SEMESTER –II | | Hrs / Week:9 |
| CORE | | Credit: 5 |

**UNIT I: Fundamental Lotions**

Review of lotion of membership – concept of fuzzy subset – Dominance relation – simple operation on fuzzy subsets – set of fuzzy subsets for E and M finite- properties of set of fuzzy subset – Product and algebraic – sum of two fuzzy subsets.

**UNIT II: Fuzzy graphs and fuzzy relation:**

Fuzzy graphs definition and explanation with example- fuzzy relation definition and explanation with example - composition of fuzzy relations – fuzzy subsets induced by a mapping – conditioned fuzzy subsets – properties of fuzzy binary relation – paths in finite fuzzy graphs.

**UNIT III: Fuzzy Pre-order relation**

Similitude relation – Similitude sub relation in a fuzzy pre- order- anti symmetry – fuzzy order relation – Dis-similitude – resemblance relation – various properties of similitude and resemblance – various properties of fuzzy perfect order relation – ordinary membership function

**UNIT IV: Fuzzy Logic**

Characteristic function of a fuzzy subset – fuzzy variable- polynomial forms – Analysis of the function of fuzzy variable – Method of Marino's - logical structure of a function of fuzzy variables – composition of interval fuzzy preposition and their functional representation – Theory of fuzzy subsets and theory of Probles.

**UNIT V: Application of Fuzzy subsets - Fuzzy pattern recognition:**

Introduction – Fuzzy clustering – Fuzzy C-means clustering method – clustering method based upon fuzzy equivalence relation – Fuzzy pattern – recognition

**Fuzzy decision making:**

Individual decision making –multi person decision making – multi criteria decision making –multi stage decision making – Fuzzy ranking method – Fuzzy linear programming

**Recommended Text Books**

Kaufman Unit I (Kauffmann)

Fuzzy sets & fuzzy logic theory

| YEAR – I | ORDINARY DIFFERENTIAL EQUATIONS | |
|---|---|---|
| SEMESTER –II | | Hrs / Week: 9 |
| CORE | | Credit: 5 |

**Unit I: Linear Differential equations of higher order**

Linear independence- Equations with constant coefficients – Equations with variable coefficients- Wronskian – Variations of parameters – Methods of Laplace Transforms.

**UNIT II: Systems of Linear Differential Equations**

Systems of first order equations – existence and uniqueness theorem – Non-Homogeneous linear systems – Linear systems with constant coefficients – Successive approximations – Picard's Theorem – Fixed point method – Gronwal inequality.

**UNIT III: Linear systems**

Uncoupled linear system – Diagonalization – Exponential operators – The fundamental theorem for linear systems – Linear system in $R_2$ – Complex Eigen values multiple Eigen values – Non-Homogeneous linear system

**UNIT IV: Non-Linear system: Local theory**

Some preliminary concepts and definitions – the fundamental existence – Uniqueness theorem Dependence of initial conditions and parameters- the maximum interval of existence – The flow defined by a differential equation.

**UNIT V**

Linearization – The stable manifold theorem

**Recommended Text:**

1. Contents and treatment as in Ordinary Differential equation by S.G. Deo, V. lakshmikanthan and V. Raghavendra.Second Edition, Tata Mcgraw Hill, Publishing Company limited.
2. Differential Equations and Dynamical Systems by Lawrence Perko, Springer international Edition, Third Edition.

| YEAR – I | MATHEMATICAL MODELLING | |
|---|---|---|
| SEMESTER –II | | Hrs / Week: 9 |
| CORE | | Credit: 5 |

**UNIT 1**

Mathematical modeling: Needs, techniques, classifications & simple illustrations

1.1Simple situations requiring mathematical modeling
1.2The technique of mathematical modeling
1.3Classifications of mathematical models
1.4Some characteristics of mathematical models
1.5Mathematical modeling through geometry
1.6Mathematical modeling through algebra

**UNIT 2**

Mathematical modeling through ordinary differential equations of first order

2.1 Mathematical modeling through differential equations
2.2 Linear growth and decay models
2.3 Non-Linear growth and decay models
2.4 Compartment models
2.5 Mathematical modeling in dynamics through ordinary differential equations of first order

**UNIT 3**

Mathematical modeling through systems of ordinary differential equations of the first order

3.1 Mathematical modeling in population dynamics
3.2 Mathematical modeling of epidermis through systems of ordinary differential equations of the first order

**UNIT 4**

Mathematical modeling through ordinary differential equation of second order

4.1 Mathematical modeling of planetary motions
4.2 Mathematical modeling of circular motion and motion of satellites
4.3 Mathematical modeling through linear differential equations of second order

**UNIT 5**

Mathematical modeling through partial differential equations

5.1 Situations giving rise to partial differential equation models

5.2 Mass-Balance equations: first method of getting PDE models

5.3 Momentum-Balance equations: The second method of obtaining partial differential equations models

**Text book;**

Mathematical Modeling, J.N. Kapur, Publishers: New Age International (P) Ltd. New Delhi

| YEAR – I | FLUID DYNAMICS | |
|---|---|---|
| SEMESTER –II | | Hrs / Week: 9 |
| CORE | | Credit: 5 |

**Unit 1: KINEMATICS OF FLUIDS IN MOTION**

Real fluids and Ideal fluids, velocity of a fluid at a point, streamlines and path lines, steady and unsteady flows, velocity potential, vorticity vector, local & particle rate of change, the equation of continuity.

**Unit 2: EQUATIONS OF MOTIONS OF A FLUID**

Pressure at a point in a fluid at rest, pressure at a point in a moving fluid conditions at a Boundary of two In viscid Immiscible fluids, Euler's Equations of motion, Bernoulli's equations , worked example.

**Unit 3: SOME TWO-DIMENSIONAL FLOWS**

Meaning of two-dimensional flow, use of cylindrical polar coordinates, the stream function, and the complex potential for two-dimensional, irrational incompressible flow, complex velocity potentials for standard two-dimensional flows, some worked examples.

**Unit 4: VISCOUS FLOW**

Stress components in a real fluid, relations between Cartesian components of stress, translational motion of fluid element, the rate of strain quadratic & principal stress, the coefficient of viscosity & laminar flow, the navier-strokes equations of motion of a viscous fluid.

**Unit 5: MAGNETOHYDRODYNAMICS**

Nature of magneto hydrodynamics, simplification of the electromagnetic field equations, the magnetic Reynolds number, Alfven's theorem, the magnetic body force.

**Text Book:**

Text Book of fluid dynamics by F.chorlton

## QUESTION PATTERN

**Time: 3Hrs**
**Max. Marks:75**

**Section – A**
**5x6=30**
**Answer ALL Questions (Either or Type)**

**Section – B**
**3x15=45**
**Answer any THREE Questions (Out of five)**

**VALUE ADDED COURSE SYLLABUS**

| DEPARTMENT | COURSE TITLE | COURSE CODE |
|---|---|---|
| Mathematics | Introduction to LaTeX | VAMT01 |

**OBJECTIVES:**

1. To create understanding of the LaTeX
2. To understand the fundamentals of LaTeX and utilization
3. Development of typesetting skills.

**UNIT 1:**

Introduction to LaTeX – Basic LaTeX notation – Installation of the software LaTeX

**UNIT 2:**

Understanding LaTeX compilation basic syntax, Writing equations, Matrix, Tables

**UNIT 3:**

Page layout – Titles, Abstract chapters, Sections, references, equation references, citation. List making environments Table of contents, Generating new commands, Figure handling numbering, list of figures, List of tables, Generating index

**UNIT 4:**

Packages: Geometry, algorithms, Algorithmic graphic, color, title listing. Classes: article, book, report, slides

**UNIT 5:**

Applications to: Writing Resume, Writing question paper, Writing articles/research papers, Presentation using beamer. Theory, Practical and exercises based on the above concepts

**REFERENCES:**

1. Chris A Mack, Fundamental Principles of Optical Lithography. The science of Microfabrication. Wiley, 2007.

2. Michel Gossens, Frank Mittelbach, and Alexander Samarin. The LaTeX Companion. Addison- Wesley, Reading, Massachusetts, 1993.

**CERTIFICATE COURSE SYLLABUS**

| DEPARTMENT | COURSE TITLE | COURSE CODE |
|---|---|---|
| Mathematics | MATLAB | CAMT01 |

**Objectives:**

1. To create understanding of the MatLab
2. To understand the fundamentals of MatLab and Development of Program skills

**UNIT – I STARTING WITH MATLAB, CREATING ARRAYS**

Starting with MATLAB, MATLAB Windows – Working in the Command windows – Arithmetic Operations with Scalars – Display formats – Elementary Math Bult in functions – Defining Scalar Variable – Creating one dimensional arrays and Creating two dimensional arrays.

**Chapter 1:** 1.1 – 1.6 **Chapter 2:** 2.1 – 2.2

**UNIT – II MATHEMATICAL OPERATIONS WITH ARRAYS**

Addition and Subtraction – Array Multiplication – Array Division – Element by Element Operation – Using Arrays in MATLAB – Bult in Math Function – Bult in Functions for Analyzing Arrays.

**Chapter 3**: 3.1 – 3.6

**UNIT – III PROGRAMMING IN MATLAB**

Relational operator and Logical operator – Conditional Statement – The Switch Statement – Loops – Nested Loop and Nested Conditional Statement – The Break and Continue Commands.

**Chapter 7** : 7.1 – 7.6

**UNIT – IV POLYNOMIALS, CURVE FITTING AND INTERPOLATION**

Polynomials – Curve fitting – Interpolation – The Basic fitting Interface.

**Chapter 8**: 8.1 – 8.4

**UNIT – V APPLICATION IN NUMERICAL ANALYSIS**

Solving an Equation with one variable – Finding a Maximum or a Minimum of a function – Numerical Integration – Ordinary Differential Equation.

**Chapter 10**: 10.1 – 10.4

**Text Book : MATLAB An Introduction with Applications** by AMOS GILAT – John wiley& sons, INC