GOVERNMENT COLLEGE FOR WONMEN(A), KUMBAKONAM
PG & RESEARCH DEPARTMENT OF MATHEMATICS
M.Sc., MATHEMATICS – REVISED COURSE STRUCTURE UNDER CBCS
(For the Candidates admitted from the Academic year – 2021 – 2022 onwards)

SEMESTER – I

Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						CIA	ESE	Total
CCI	P21MC101	LINEAR ALGEBRA	6	5	3	25	75	100
CCII	P21MC102	REAL ANALYSIS – I	6	5	3	25	75	100
CC III	P21MC103	GRAPH THEORY	6	4	3	25	75	100
CC IV	P21MC104	ORDENARY DIFFERENTIAL EQUATIONS	5	4	3	25	75	100
MBEC - I	P21M1MBE1:1	PROBABILITY THEORY	5	4	3	25	75	100
	P21M1MBE1:2	APPLIED CRYPTOGRAPHY						
	P21M1MBE1:3	MATHEMATICAL STATISTICS						
SEC – I (Practical))	P21M1SE1P	INTRODUCTION TO LATEX (for Scientific Documentation)	2	2	2	40	60	100
Total			**30**	**24**				**600**

SEMESTER – II

Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						CIA	ESE	Total
CC V	P21MC205	ALGEBRA	6	5	3	25	75	100
CC VI	P21MC206	REAL ANALYSIS – II	5	5	3	25	75	100
CC VII	P21MC207	COMPLEX ANALYSIS	5	5	3	25	75	100
CC VIII	P21MC208	THEORY OF NUMBERS	5	4	3	25	75	100
MBEC – 1I	P21M2MBE2:1	STOCHASTIC PROCESSES	5	3	3	25	75	100
	P21M2MBE2:2	CODING THEORY						
	P21M2MBE2:3	ALGEBRIC NUMBER THEORY						
EDC	P21M2EDC	1.GENERAL INTELLIGENCE	2	2	3	25	75	100
		2.RESOURSE MANAGEMENT						

SEC – 1I	P21M2SE2P	INTRODUCTION TO SCIENTIFIC COMPUTING (MATLAB)	2	1	2	40	60	100
Total			**30**	**25**				**700**
Self Study Course -I	P212SS1	General Studies for Research Fellowship and Lectureship.		2	2	-	100	100
NCGPA (Internship)	INT	Internship		2		-	-	-

SEMESTER – III

Course Type	**Course Code**	**Title of the Course**	**Hrs/ Week**	**Credits**	**Exam Hrs**	**Marks**		
						CIA	**ESE**	**Total**
CC– IX	P21MC309	PARTIAL DIFFERENTIAL EQUATIONS	6	5	3	25	75	100
CC– X	P21MC310	MEASURE THEORY AND INTEGRATION	6	5	3	25	75	100
CC – XI	P21MC311	TOPOLOGY	6	5	3	25	75	100
CC– XII	P21MC312	CLASSICAL DYNAMICS	6	4	3	25	75	100
MBEC– III	P21M3MBE3:1	FUZZY MATHEMATICS	6	3	3	25	75	100
	P21M3MBE3:2	OPERATOR THEORY						
	P21M3MBE3:3	RESEARACH METHODOLOGY						
Total			**30**	**22**				**500**
SSC- II	P21SSC2	MATHEMATICAL SCIENCES		2	2	-	100	100

SEMESTER – IV

Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
						CIA	ESE	Total
CC – XIII	P21MC413	FUNCTIONAL ANALYSIS	6	5	3	25	75	100
CC– XIV	P21MC414	DIFFERENTIAL GEOMETRY	6	4	3	25	75	100
CC – XV (Project)	P21MPW415	PROJECT	12	6	-	-	100	100
Major Based Elective – IV	P21M4MBE4:1	AUTOMATA THEORY AND COMPILER CONSTRUCTION	6	4	3	25	75	100
	P21M4MBE4:2	OPTIMIZATION TECHNIQUES						
	P21M4MBE4:3	3. INTEGRAL TRANSFORMS						
Total			**30**	**19**				**400**

Course Structure Abstract for

M.Sc., Programme 2021-2022 onwards

Part	**Course**	**Total No Papers**	**Hours**	**Credit**	**Mark**
III	Core Course(CC)	14	80	65	1400
III	Core Project	1	12	6	100
III	Major Based Elective Course – IV(MBEC)	4	22	14	400
III	Extra Disciplinary Course (EDC)	1	2	2	100
III	Skill Enhancement (SEC)	2	4	3	100
Total		**22**	**120**	**90**	**2200**
Extra Credit Courses					
Self Study Course (SSC)		2	-	4	200
NCGPA Course (Internship)		**---**	-	2	**---**
Value Added Course		1	-	2	100
Total		**3**		**98**	**2500**

CC - I LINEAR ALGEBRA

Theory Hours : 6	**Course Code : P21MC101**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

1. To study Linear Transformations and its properties
2. To study the Algebra of Polynomials and Annihilating Polynomials
3. To study Invariant space and its properties

UNIT I :

Systems of linear Equations – Matrices and Elementary Row operations – Row - Reduced Echelon matrices – Matrix multiplication – Invertible matrices – Vector spaces – Subspaces –Bases and Dimension – Co- ordinates.

UNIT II :

The algebra of linear transformations – Isomorphism of vector spaces – Representations of Linear Transformations by Matrices – Linear functional – The Double Dual – The Transpose of Linear Transformation.

UNIT III :

The algebra of polynomials – Lagrange Interpolation – Polynomial Ideals – The prime factorization of a polynomial, Commutative rings – Determinant functions – permutations and the uniqueness of determinants – Additional properties of Determinants.

UNIT IV :

Characteristic values – Annihilating polynomials, Invariant subspaces –simultaneous triangulation and simultaneous Diagonalization – Direct- sum – Decompositions.

UNIT V :

Invariant Direct sums – The primary Decomposition Theorem – Cyclic subspaces – Cyclic Decompositions and the Rational Form.

TEXT BOOK :

[1] Kenneth Hoffman and Ray kunze, Linear Algebra second Edition, prentice –Hall of India private limited, New Delhi, 2005.

UNIT I : Chapter 1 and chapter 2 (sections 2.1 to 2.4)
UNIT II : Chapter 3
UNIT III : Chapter 4 and Chapter 5 (sections 5.1 to 5.4)
UNIT IV : Chapter 6 (sections 6.1 to 6.6)
UNIT V : Chapter 6 (sections 6.7, 6.8) and chapter 7 (sections 7.1, 7.2)

REFERNCES:

[1] I.N. Herstein, Topics in Algebra, Wiley Eastern Limited, New Delhi, 1975.
[2] I.S. Luther and I.B.S. Passi, Algebra, volume II – Rings, Narosa publishing House, 1999.
[3] N. Jacobson. Basic Algebra, vols. I and II Freeman, 1980 (also published by Hindustan Publishing Company).

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Discuss in detail the basic concept of linear system of equations, Vector spaces, Bases and Dimension.

CO2: Learn linear Transformations and double dual structure.

CO3: Understand the algebra of polynomials and various properties of determinant.

CO4: Evaluate Characteristic values and Direct-sum decompositions.

CO5: Capture the idea of cyclic decompositions and the rational form.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC - II REAL ANALYSIS – I

Theory Hours : 6	**Course Code : P21MC102**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

1. To provide the knowledge about the various aspects of Real Line and Metric spaces.
2. To introduce a complete Topological approach in all aspects of Analysis.

UNIT I :

The Real and Complex Number System: Introduction – Ordered Sets – Fields – The Real Field – The Extended Real Number System – The Complex Field – Euclidean Spaces.

Basic Topology: Finite Countable and Uncountable sets – Metric spaces.

UNIT II:

Connectedness and Compactness: Compact sets – Perfect sets – Connected sets

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UNIT III :

Sequences and Series: Convergent Sequences - Subsequences – Cauchy Sequences – Upper and Lower Limits – Some special Sequences – Series – Series of Nonnegative Terms – The Number e – The Root and Ratio Test – Power Series – Summation by Parts – Absolute Convergence – Addition and Multiplication of Series – Rearrangements.

UNIT IV :

Continuity: Limits of Functions – Continuous Functions – Continuity and Compactness – Continuity and Connectedness – Discontinuities – Monotonic Functions – Infinite Limits and Limits at Infinity.

UNIT V :

Differentiation: The Derivative of a Real Functions – Mean Value Theorems – The Continuity of Derivatives – L'Hospital's Rule – Derivatives of Higher Order – Taylor's Theorem – Differentiation of Vector-Valued Functions.

TEXT BOOK:

[1] Walter Rudin, Principles of Mathematical Analysis, Third Edition, McGraw Hill, 1976.

UNIT I : Chapter 1, Chapter 2 (sections 2.1, 2.2)
UNIT II : Chapter 2 (sections 2.3, 2.4, 2.5)
UNIT III : Chapter 3
UNIT IV : Chapter 4
UNIT V : Chapter 5

REFERENCES:

[1] Tom. M. Apostol, Mathematical Analysis, Narosa publishing House, New Delhi-1.
[2] R.G. Bartle and D.R. Sherbert, Introduction to Real Analysis, 3rd Edition, John Wiley & Sons, 2000.

[3] S. Kumaresan, Topology of Metric Spaces, Narosa Publishing House, New Delhi, 2005.
[4] Kenneth A. Ross, Elementary Analysis: The Theory of Calculus, Springer Velag, 2004.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Gain knowledge of basic topology, metric spaces.
CO2: Analyze continuity, derivability of given real valued function.
CO3: Realize the key idea convergence of sequences and the quantitative inequality estimates. Here numerous examples would have demonstrated the role of inequalities.
CO4: Learn the crucial concept of limit of function and continuity and compactness, connectedness.
CO5: Study thoroughly the Derivative of a Real Functions and discuss the ideas derivatives of higher order.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)
SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))
SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – III GRAPH THEORY

Theory Hours : 6	**Course Code : P21MC103**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1. To train the students to get expertise in the mathematical concepts involved in the field of graph theory which has applications in diverse areas including computer science.
2. To give applications of Graph Theory.
3. In this course, the rudiments of graph theory viz., paths, tress and connectedness of graphs, Matching, Planarity, Independent sets and Colorings are introduced.

UNIT I :

Graphs, Sub graphs and Trees; Graphs and simple graphs – Graph Isomorphism – The Incidence and Adjacency Matrices – Sub graphs – Vertex Degrees – Paths and Connection – Cycles – Trees – Cut Edges and Bonds – Cut Vertices.

UNIT II :

Connectivity, Euler Tours and Hamilton Cycle: Connectivity – Blocks – Euler Tours – Hamilton Cycles.

UNIT III:

Matching, Edge Colorings: Matching – Matching and Coverings in Bipartite Graphs – Edge Chromatic Number – Vizing's Theorem.

UNIT IV :

Independent sets and Cliques, Vertex Colorings: Independent sets – Ramsey's Theorem – Chromatic Number – Brook's Theorem – Chromatic Polynomials.

UNIT V :

Planar graphs : Plane and Planar Graphs – Dual graphs-Euler's Formula – The Five – Color theorem and the four – Color Conjecture.

TEXT BOOK:

[1] J.A., Bondy and U.S.R Murthy, Graph Theory with Applications, Macmillan Press Ltd., Singapore and Tokyo, 1978.

UNIT I : Chapter 1(sections 1.1 to 1.7), Chapter 2 (sections 2.1 to 2.3)
UNIT II : Chapter 3 (sections 3.1, 3.2), Chapter 4 (sections 4.1, 4.2)
UNIT III : Chapter 5 (sections 5.1, 5.2), Chapter 6 (sections 6.1, 6.2)
UNIT IV : Chapter 7 (sections 7.1, 7.2), Chapter 8 (sections 8.1, 8.2, 8.4)
UNIT V : Chapter 9 (sections 9.1 to 9.3, 9.6)

REFERENCES :

[1] J. Clark and D.A. Holten, A First look at Graph theory, Allied Publishers, New Delhi,1995.
[2] R. Balakrishnan and K. Ranganathan, A Textbook of Graph Theory, Second Edition, Springer, New York, 2012.
[3] Douglas B. West, Introduction to Graph Theory, Second Edition, PHI Learning Private Ltd, New Delhi-2011.
[4] G. Chartrand, Linda Lesniak and Ping Zhang, Graphs and Digraphs, Fifth Edition, CRC Press, 2011.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Know some important classes of graph theoretic problem.
CO2: Be able to formulate and prove connectivity, Euler Tours, Hamilton cycles.
CO3: Good knowledge on graph theory of matching's, colorings and coverings.
CO4: Workout in detail the independent sets and cliques of a given graph with help of Ramsey's theorem and Brook's theorem.
CO5: Comprehend and work on me concept of planarity and discuss the dual of a plane graph.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – IV ORDINARY DIFFERENTIAL EQUATIONS

Theory Hours : 5	**Course Code : P21MC104**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1. To study in detail about the second order differential equations and their Power series solutions.
2. To analyze the stability of non-linear differential equations.

UNIT I:

The general solution of the homogeneous equation – The use of known Solution to find another – The method of variation of parameters – Power series Solutions: A Review of Power series – Series solutions of First Order Equations-Second order linear equations, Ordinary points.

UNIT II:

Regular Singular Points – Gauss's hyper geometric equation – The Point at infinity – Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions.

UNIT III:

Linear Systems of First Order Equations – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of solutions of Initial Value Problem for First Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard's Theorem.

UNIT IV:

Qualitative Properties of Solutions: Oscillations and the Sturm Separation theorem – The Sturm Comparison Theorem

UNIT V:

Nonlinear equations: Autonomous Systems: the phase plane and its phenomena – Types of critical points; Stability – Critical points and stability for linear systems – Stability by Liapunov's direct method – Simple critical points of nonlinear systems.

TEXT BOOK:

[1] George. F. Simmons, Differential Equations with Applications and Historical Notes, TMH, New Delhi, 2003.

UNIT I : Chapter 3 (Sections 15, 16, 19) and Chapter 5 (Sections 26 to 28)
UNIT II : Chapter 5 (Sections 29 to 32) and Chapter 8 (Sections 44 to 47)
UNIT III : Chapter 10 (Sections 55, 56) and Chapter 13 (Sections 68, 69)
UNIT IV : Chapter 4 (Sections 24, 25)
UNIT V : Chapter 11 (Sections 58 to 62)

REFERENCES:

[1] W.T. Reid, Ordinary Differential Equations, John Wiley and Sons, New York.
[2] E.A. Coddington and N. Levinson, Theory of Ordinary Differential Equations, Tata McGraw Hill Publishing Company Limited, New Delhi, 1972.
[3] M. Braun, Differential Equations and their Applications, Springer, 1992.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Find the general solution of the first order linear homogenous equations and solving various Second order Ordinary Differential Equations.

CO2: Get introduced to the Hyper geometric functions which arise in connection with solution of the Second Order Ordinary Differential Equations with regular singular points.

CO3: Understand the importance of studying well- posed problems namely existence, Uniqueness and continuous dependence of the first order Differential Equations through Picard's theorem and strum Liouviles problem.

CO4: Solve the problem arise in mathematical physics using properties of special functions.

CO5 :Discuss the Critical points and stability for linear systems.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

MBEC – I PROBABILITY THEORY

Theory Hours : 5	**Course Code : P21M1MBE1:1**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1. To make the students gain in-depth knowledge in probability which plays a main role in solving real life problems.
2. The give a detailed study of binominal and Poisson distribution and characteristic function.

UNIT I :

Probability – Mathematical Probability – Axiomatic approach to probability – Addition and multiplication theorem (two events only) – Boole's Inequality, Baye's theorem – Simple problems.

UNIT II :

Random variables – Concepts – One dimensional random variable – Discrete and continuous random variable – Probability mass function – Probability density function – Distribution function – Simple problems. Two dimensional random variables – Discrete – Continuous random variables – Marginal, conditional probability functions – Simple problems.

UNIT III:

Mathematical expectation – Definition – Properties of Expectation. Variance – Properties of variance, covariance (concept only) – Simple problems – Conditional Expectations and Conditional Variance (concept only) – Simple problems.

UNIT IV :

Moment generating function (M.G.F) – Definition – Properties of M.G.F –Cumulant generating function – Properties of cumulants – Characteristic function – Definition – Properties of characteristic function.

UNIT V :

Binomial and Poisson distribution – Definition – Applications – m.g.f.– Properties – Recurrence relation for the moments – Characteristic function – Additive property – Simple problems only.

TEXT BOOK :

[1] S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical statistics – Sultan chand and Sons, Educational publishers, Reprint – 2005.

UNIT I : Chapter 3 (sections 3.4, 3.8, 3.8.5, 3.9, 3.9.1 to 3.9.3, 3.11)
Chapter 4 (section 4.2)
UNIT II : Chapter 5 (sections 5.1 to 5.4, 5.4.1, 5.4.3, 5.5, 5.5.1)
UNIT III : Chapter 6 (sections 6.2, 6.4, 6.5, 6.9)
UNIT IV : Chapter 7 (sections 7.1, 7.1.2, 7.1.3, 7.2, 7.3, 7.3.1)
UNIT V : Chapter 8 (sections 8.4, 8.4.2, 8.4.6 to 8.4.8, 8.5, 8.5.4 to 8.5.6)

REFERENCES:

[1] R.B. Ash, Real Analysis and Probability, Academic Press, New York, 1972.
[2] K.L. Chung, A course in probability, Academic Press, New York, 1974.

[3] B.R. Bhat, Modern Probability Theory (3rd Edition), New Age International (P) Ltd, New Delhi, 1999.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Develop problem – solving techniques needed to accurately calculate probabilities.
CO2: Understand probability axioms and find conditional probabilities for lot of cases to calculate probabilities for various examples.
CO3: Evaluate the Mathematical Expectation .
CO4: Determine the distribution function using characteristic function.
CO5: Gain mastery in the important probability distributions, viz., Binomial, Poisson and normal.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

MBEC – I APPLIED CRYPTOGRAPHY

Theory Hours : 5	**Course Code : P21M1MBE1:2**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1.Communications professionals can use cryptography.
2.To shows how they can be used to solve security problems.

UNIT I :

Data encryption standard as Block Cipher Algorithm: Data encryption standard (DES) - key schedule – Enciperment – Deciperment – S-Box Analysis and Design – Inter symbol dependencies.

UNIT II :

Stream cipher System – Synchronous stream ciphers – Self Synchronization ciphers – Error propagation – Non linear combination of LFSR sequences.

UNIT III :

Public key cryptosystem – Merkle Hellman knapsack cryptosystem – RSA Cryptosystem – RSA authentication scheme – Melliece's Algebraic codes cryptosystem. Bipliographical and Historical Review.

UNIT IV:

Bose – Chanudhuri – Hocquenghem codes – Expression of Cyclic codes – BCH code Structure and encoding – Syndrome computation – BCH decoding – Direct solution Method by Peterson, Gorenstein and ziereer – Direct coding by chien's method – BCH Decoding by Berlekamp Algorithm by symmetrical syndrome matrix – straight forward approach for BCH decoding .

UNIT V:

Galois field adder – Combinational logic multipliers – Sequential logic multipliers – Cellular Array multiplier – Circuits for squares and square roots – Division circuits Over GF (2^m) arithmetic based on exponent representation – GF(2^m) – Arithmetic based on Normal basis.

TEXT BOOK:

[1] Man Young Rhee – Cryptography and secure communication– McGraw Hill , Book Co. Singapore (1994).

UNIT I : Chapter 3
UNIT II : Chapter 4
UNIT III : Chapter 5
UNIT IV : Chapter 7
UNIT V : Chapter 6

REFERENCES:

[1]. Biham, E and A. Shamir Differential Cryptanalysis of DES – Like Cryptosystems., proc. Crypto 90. Page 17, Sanda Barbara, CA, August. 1990

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[2] Beker .H and F. Piper Cipher systems, The protection of Communications, wiley, New York, 1982.

[3] Brickell , E.F and A.M Odlyzko, Cryptanalysis : A Survey of Recent results, Proc. IEEE, VOL.76, No.5, 1988.
[4] Berlekamp, E.R, Algebraic Coding Theory, McGraw – Hill, New York, 1968.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Have been introduced to the concept of secure communication and fundamentals of cryptography.
CO2: Know classical Ciphers such as Vigenere Ciphers and Hill Ciphers.
CO3 : Know of RSA, attach on RSA, Diffie-Hellman Key exchange and Eigamal public key cryptosystem.

CO4 : Discuss the BCH coding and BCH decoding.

CO5 : Analysis the combinational logic, sequential logic and cellular array multiplier.

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)
SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))
SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

MBEC – I MATHEMATICAL STATISTICS

Theory Hours : 5	**Course Code : P21M1MB1:3**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1. To study sample moments of distribution functions, concept of statistical test, and methods of finding estimates.
2. To gain a working knowledge on analysis of variance and performing sequential analysis.

UNIT I :

Sample Moments And Their Functions: Notion of a sample and a statistic – The χ^2 distribution – Student's t-distribution – Fisher's Z-distribution – Distribution of $\bar{X}$ for some mean non-normal populations.

UNIT II :

Significance Test: Concept of a statistical test – Parametric tests for small samples and large samples – The χ^2 test - Tests of Kolmogorov and Smirnov type – The Wald-Wolfovitz and Wilcoxon-Mann-Whitney tests – Independence Tests by contingency tables.

UNIT III :

Estimation: Preliminary notions – Consistent estimates – Unbiased estimates – Sufficiency – Efficiency – Asymptotically most efficient estimates – Methods of finding estimates – confidence Intervals.

UNIT IV:

Analysis of Variance: One way classification and Multiple classification, Hypotheses Testing - The Power function and the OC function – Most Powerful test – Uniformly most powerful test – unbiased test.

UNIT V:

Sequential Analysis: The Sequential Probability Ratio Test (SPRT) – Auxiliary Theorems – The fundamental identity – OC function of SPRT – E(n) and Determination of A and B – Testing a hypothesis concerning p of 0-1 distribution and m of a Normal Population.

TEXT BOOK:

[1]To Olge and Aleksander, Probability Theory and Mathematical Statistics, John Wiley and sons, New York, 1962.

UNIT I : Chapter 9 (Sections 9.1,9.2,9.4, 9.6 to 9.8**)**
UNIT II : Chapter 12: (Sections 12.1 to 12.7)
UNIT III : Chapter 13: (Sections 13.1 to 13.8)
UNIT IV : Chapter 15: (Sections 15.2to 15.2**)**
:Chapter 16: (Sections 16.1 to 16.5)
UNIT V : Chapter 17: (Sections 17.1 to 17.9)

REFERENCES:

[1]. E.J.Dudewicz and S.N.Mishra, Modern Mathematical Statistics, Jobn Wiley and Sons, New York, 1988.

[2]. V.K. Rohatgi An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi, 1988(3rd Print).

[3] . G.G.Roussas, A First Course in Mathematical Statics, Addison Wesley Publishing Company, 1973.

[4]. B.L.Vander Waerden, Mathematical Statistics, G. Allen & Unwin Ltd., London, 1968.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Understand the notion of a sample and a statistic distribution functions of χ^2 distribution, Student t-distribution

CO2: Analyze the Significance Test.

CO3 : Do the Consistent estimates ,Unbiased estimates, Asymptotically most efficient estimates and confidence Intervals.

CO4 : Discuss the analysis of variance.

CO5 : Understand the The Sequential Probability Ratio Test

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

SEC – I Introduction to Latex
(for Scientific Documentation)

Theory Hours : 2	**Course Code : P21M1SE1P**
Exam Hours : 2	**Credits : 2**
	Internal : 40
	External : 60

Objectives:

1. To make the students learn the art of typing mathematics text on their own.
2. To inculcate professional training required to become a scholar in mathematics.

UNIT I :

Basic Structure of Latax 2e – Input file structure – Layout – Editors – Forward search – Inverse Search – Compling – Conversion to various formats.

UNIT II :

Typesetting simple documents – sectioning – Titles – page layout – listing – enumerating – quote letter formats.

UNIT III :

Using package amsmath typing equations labeling and refreing.

UNIT IV:

Figure inclusion – Table inclusion.

UNIT V:

Bibliography – Intex typing – Beamer presentation Styles.

TEXT BOOK:

[1] Leslie Lamport, LATEX: A Document preparation System, Addison – Wesley, Reading,Massachusetts, second edition, 1994.

REFERENCES:

[1] Tobias Oetiker, Hubert Partl, Irence hyna and Elisabeth Schlegl., The (Not So) Short Introduction to LATEX2e, Samurai Media Limited (or available online at http:// mirrors,ctan.org/info/lshort/English/lshort.pdf)

[2] LATEX Tutorials – A Primer, Indian Tex Users Group, available online at https://www.tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf)

[3]H.J.Greenberg. A Simplified introduction to LATEX, available online at http://www.ctan.org/tex-archive/info/simplified-latex/

[4]Using Kile – KDE Documentation, https://docs.kde.org/trunk4/en/extragear-office/klie/quick_using.html

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Students can type their own mathematical article/notes/books/journal paper/project work.

CO2: Will motivate them to meticulously prepare their own mathematical notes.

CO3: Able to understand basic structure of Latex 2e and conversions of them to various formats.

CO4: Able to typeset and compile documents with titles, sectioning and enumeration etc.

CO5: Understand how to align math equations, matrices etc.

Question Paper Pattern

ANSWER ALL THE QUESTIONS:

1×15 = 15 Marks

2× 20 = 40 Marks

Record = 5 Marks

Total = 60 Marks

CC - V ALGEBRA

Theory Hours : 6	**Course Code : P21MC205**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

1. To introduce the various algebraic structures.
2. To study the properties of these structures.

UNIT I:

Another counting principle – Sylow's theorem – Direct Products – Finite Abelian Groups.

UNIT II:

More Ideals and Quotient rings – Polynomial rings – Polynomial over the rational field – Polynomial rings over Commutative rings.

UNIT III :

Dual spaces – Inner Product spaces – Modules – Orthogonal Complement – Orthogonal Basis – left module over a Ring – Submodule – Quotient module – Cyclic module – Structure Theorem for Finitely Generated Modules over Euclidean Rings.

UNIT IV :

Fields : Extension Fields – Roots of Polynomials – More about roots.

UNIT V :

The Elements of Galois Theory – Solvability by Radicals – Finite Fields.

TEXT BOOK :

[1] I.N Herstein, Topics in Algebra, Second Edition John Wiley and Sons, 1975.

UNIT I : Chapter 2 (sections 2.11, 2.12, 2.13 and 2.14)
UNIT II : Chapter 3 (sections 3.5, 3.9, 3.10 and 3.11)
UNIT III : Chapter 4 (sections 4.3, 4.4 and 4.5)
UNIT IV : Chapter 5 (sections 5.1, 5.3 and 5.5)
UNIT V : Chapter 5 (sections 5.6, 5.7) and Chapter 7 (Section 7.1)

REFERENCES :

[1] Surjeet Singh, Qazi Zammeruddin, Modern Algebra, Vikas Publishing House private Limited, 1972.
[2] John B.Fraleigh, A first course in Abstract Algebra, Pearson Education privat Limited, 2003.
[3] Vijay K.Khanna and S.K Bhambri, A course in Abstract Algebra, Vikas Publishing House private limited, 1993.
[4] John B. Fraleigh, A First Course in Abstract Algebra, Seventh Edition, Instructor's Solution Manual, University of Rhode Island, July 2002.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Analyze structure and properties of relation, conjugacy classes, counting principle and direct products.

CO2: Understand the concepts of the integers serve as a motivation for the algebraic concepts for Rings.

CO3: Identify the various algebraic structures and understand the concept of structures for finitely generated modules.

CO4: Learn the fundamental concept in field theory of field extensions and would see the idea of generating new fields.

CO5: Have a clear cut idea in the notion of Galois groups and solvability of radicals. Also will be able to prove the impossibility of certain geometric constructions.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC - VI REAL ANALYSIS – II

Theory Hours : 5	**Course Code : P21MC206**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

1. To study the concept of convergence of sequences and series of functions and to introduce the theory multivariable calculus.
2. To introduce a complete Topological approach in all aspects of Analysis.

UNIT I :

The Riemann – Stieltjes Integral: Definition and Existences of the Integral – Properties of Integral – Integration and Differentiation – Integration of Vector-Valued Functions – Rectifiable Curves.

UNIT II:

Sequences and Series of Functions: Discussions of Main Problems – Uniform convergence – Uniform Convergence and Continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation – Equi-continuous Families of Functions – The Stone - Weierstrass' Theorem.

UNIT III :

Some Special Functions: Power Series – The Exponential and Logarithmic Functions – The Trigonometric Functions – The Algebraic Completeness of the Complex Field – Fourier Series – The Gamma Functions.

UNIT IV :

Functions of Severable Variables: Linear Transformations – Differentiations – The Contraction Principle – The Inverse Function Theorem – The Implicit Function Theorem.

UNIT V :

Functions of Severable Variables: The Rank Theorem. **Integration of Differential Forms:** Integration – Primitive Mappings – Partitions of Unity – Change of Variables – Differential Forms.

TEXT BOOK:

[1] Walter Rudin, Principles of Mathematical Analysis, Third Edition, McGraw Hill, 1976

UNIT I : Chapter 6
UNIT II : Chapter 7
UNIT III : Chapter 8
UNIT IV : Chapter 9 (sections 9.1 to 9.5)
UNIT V : Chapter 9 (section 9.6) Chapter 10 (sections 10.1 to 10.5)

REFERENCES:

[1] Edward D. Gaughan, Introduction to Analysis, AMS, Indian Edition 2010.
[2] R.P. Boas, A Primer of Real Functions, Mathematical Association of America,1966.
[3] C.L. Carothers, Real Analysis, Cambridge University Press, South Asian Edition,2000.

[4] Tom.M.Apostol,Mathematical Analysis, Narosa publishing House, New Delhi-1.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Analyze integrals of given real valued function through limits and gain the knowledge of Riemann integration of real valued functions.

CO2: Solve the problems of convergence and divergence of sequences and series.

CO3: Explain the applications and the usefulness of these special functions.

CO4: Understand purpose and functions of the Inverse Function and Implicit Function.

CO5: Evaluate the special functions of using in the Integration of Differential Forms**.**

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – VII COMPLE X ANALYSIS

Theory Hours : 5	**Course Code : P21MC207**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

1. The concepts of derivation of analytic functions.
2. Express the Cauchy's derivative formulas.

UNIT I :

Conformality: Arcs and Closed Curve – Analytic Functions in Regions – Conformal Mapping – Length and Area. Linear Transformations: The Linear Group – The Cross Ratio – Symmetry.

UNIT II :

Fundamental Theorems in complex Integration: Line Integrals – Rectifiable Arcs – Line Integrals as Functions of Arcs – Cauchy's Theorem for a Rectangle – Cauchy's Theorem in a Disk. Cauchy's Integral Formula: The Index of a point with respect to a closed curve – The Integral Formula – Higher Derivatives.

UNIT III :

Local Properties of Analytic Functions: Removable singularities – Taylor's Theorem – Zeros and poles – The Local mapping – The maximum principle .

UNIT IV :

The General Form of Cauchy's Theorem : Chains and Cycles – Simple connectivity – Multiply Connected Regions. The Calculus of Residues: The Residue Theorem – The Argument Principle – Evaluation of Definite Integrals.

UNIT V :

Harmonic Functions: Definition and Basic Properties – The mean value Property – Poisson's Formula – Schwarz's Theorem – Power Series Expansions: Weierstrass's Theorem – The Taylor Series – The Laurent Series.

TEXT BOOK:

[1] Lars.V.Ahlfors, Complex Analysis, Third Edition McGraw-Hill book Company,Tokyo, 1979.

UNIT I : Chapter 3 (sections 2.1 to 2.4 , 3.1 to 3.3)
UNIT II : Chapter 4 (sections 1.1 to 1.5, 2.1 to 2.3)
UNIT III : Chapter 4 (sections 3.1 to 3.4)
UNIT IV : Chapter 4 (sections 4.1, 4.2, 4.7, 5.1 to 5.3)
UNIT V : Chapter 4 (sections 6.1 to 6.4) Chapter 5: (sections 1.1 to 1.3)

REFERENCES :

[1] S Ponnusamy , Foundation of complex Analysis, Narosa Publishing House .1995
[2] V Karunakaran, complex analysis, Narosa publishing House, 2005.
[3] J.B. Conway, Functions of one Complex Variable, Narosa, 2nd edition, 1991.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Determine whether a given function is differentiable and if so find its derivative.
CO2: Analyze line integrals and Fundamental Theorems in Complex Integration.
CO3: Determine Singularities , Zeros and Poles.
CO4: Evaluation of Definite Integrals and Residues.
CO5: Construct basic properties of Harmonic functions and Poisson's formula.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – VIII THEORY OF NUMBERS

Theory Hours : 5	**Course Code : P21MC208**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives

1. To expose the students to the fascination, facts and touch in the world of numbers.
2. To highlight some of the Applications of the Theory of Numbers.

UNIT I :

Fundamentals of Congruence's: Basic properties of Congruence's – Residue Systems – Solving Congruence's: Linear Congruence's – The Theorems of Fermat and Wilson Revisited

UNIT II :

The Chinese Remainder Theorem – Polynomial Congruence's. Arithmetic functions: Combinatorial study of Φ (n) – Formulae for d (n) and σ (n) – Multiplicative Arithmetic functions – The mobius Inversion formula

UNIT III :

Quadratic Residues: Euler's criterion – The Legendre symbol – The Quadratic reciprocity law – Applications of the Quadratic reciprocity law

UNIT IV :

Sums of Squares: sums of two squares – Sums of Four Squares – Elementary Partition theory: Graphical representation – Euler's partition theorem – Searching for partition identities .

UNIT V:

Partition Generating Function: Infinite products as Generating functions –Identities between infinite series and Products . Partitions Identities : History and Introduction – Euler's Pentagonal number theorem.

TEXT BOOK :

[1] George E. Andrews, Number theory, Dover Publication, INC, New York, Reprint 2013.

UNIT I : Chapter 4 (sections 4.1, 4.2) and Chapte5 (sections 5.1, 5.2)
UNIT II : Chapter 5 (sections 5.3,5.4) and Chapter 6(sections 6.1 to 6.4)
UNIT III : Chapter 9 (sections 9.1 to 9.4)
UNIT IV : Chapters 11 and 12
UNIT V : Chapter 13 and Chapter 14 (sections14.1, 14.2)

REFERENCES:

[1] Dr. Sudhir Pundir and Dr. Rimple Pundir, Theory of Numbers, First Edition, Pragasiprakashan Publications, 2006.
[2] Gareth A. Jones and J. Mary Jones, Elementary Number Theory, Springer Verlag,

Indian Reprint, 2005.
[3] David M. Burton, Elementary Number theory,6th edition, McGraw Hill, 2007.
[4] J. William, Fundamentals of Number Theory, Leveque, Addison-Wesley Publishing Company, Phillipines, 1977.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Understand and work numerous problems on concepts of divisibility and primes.
CO2: Gain expertise in Euler's, Fermat's and Wilson theorems and work on applications illustrating them.
CO3: Solve congruence's as application of Chinese remainder theorem.
CO4: Discuss quadratic reduce and Jacobi symbol and work on sum of two square problems.
CO5: Attained mastery in the Elementary partition theorem, Graphical representation and searching for partition identities.

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)

SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))

SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

CC – XIII PURE GEOMETRY

Theory Hours : 5	**Course Code : P21MC208**
Exam Hours : 3	**Credits : 4**
	Marks : 75

Objective:

1. Generalizing theorems or mathematical structures can lead to deeper understanding of the original theorems or structures.
2. To study of mathematical concepts independently of any application outside mathematics.

UNIT I:

Harmonic Ranges and Pencils – Theorem 1 to 5 and Examples

Page No: 1 – 8

UNIT II:

Harmonic Ranges and Pencils – Theorems 6 to 10 and Examples

Page No: 8 –15.

UNIT III:

Properties of Circles – Theorems 1 to 5 and Examples.

Page No: 18 – 24

UNIT IV:

Properties of Circles – Theorems 6 to 11 and Examples.

Page No: 24 – 35

UNIT V:

Properties of Circles – Coaxial Circles

Page No: 35 – 44

TEXT BOOK :

[1] S. Narayanan, R. Anumantha Rao, K.Seetharaman and K.S. Ramachandran Classical And Modern Geometry ; S. Chand and Company Ltd.; Ram Nagar New Delhi (1979).

REFERENCE:

[1] Do Carmo M, Differential Geometry of curves and surfaces,Englewood Cliffs, Prentice Hall, 1976.

[2] R. Millman & G. Parker, Elements of differential Geometry, Englewood Cliffs, Prentice Hall, 1977.

COURSE OUT COMES:

After studying this course the student will be able to

CO1: Understand and generalize the concept of Harmonic Ranges and Pencils.

CO2: The concept of a Harmonic Ranges and Pencils in outside mathematics.

CO3: Determine the concept of properties of circles in geometrical concepts.

CO4: Identify and characterize the properties of circles in mathematical structure.

CO5: The concept of coaxial circles in outside oriented mathematics.

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)

SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))

SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

MBEC – II STOCHASTIC PROCESSES

Theory Hours : 5	**Course Code : P21M2MBE2:1**
Exam Hours : 3	**Credits : 3**
	Internal : 25
	External : 75

Objectives:

1. To study the basic concept from the theory of Markov chain and their properties.
2. To study the states in Markov chain in discrete state and continuous state space.
3. To study the renewal process and related results and their applications.
4.To learn more about several queuing models with time series and their performance Measures.

UNIT I :

Stochastic Processes: Some Notions – Specification of Stochastic Processes – Stationary Processes – Markov Chains : Definitions and Examples – Higher Transition Probabilities.

UNIT II :

Generalization of Independent Bernoulli Trails – Sequence of Chains – Dependent Trials.

Markov Chains: Classification of states and chains – Determination of Higher Transition probabilities – Stability of a Markov system.

UNIT III:

Markov processes with Discrete state space: Poisson processes and its Extensions – Poisson processes and related distributions – Birth and Death process .

UNIT IV :

Renewal Processes and Theory: Renewal Process – Renewal Processes in continuous time – Renewal equations – Stopping time – Wald's equation.

UNIT V :

Stationary Processes and Time Series: Models of Time Series – Time and Frequency domain: Power Spectrum – Statistical Analysis of Time Series.

TEXT BOOK:

[1] J.Medhi, Stochastic Processes, Second Edition, New Age International Private Limited, New Delhi, 1994.

UNIT I : Chapter 2 (Sections 2.1to2.3,) and Chapter 3 (Sections 3.1 , 3.2)
UNIT II : Chapter 3 (Sections 3.3 to 3.6)
UNIT III : Chapter 4 (Sections 4.1, 4.2, 4.4)
UNIT IV : Chapter 6 (Sections 6.1 to 6.4)
UNIT V : Chapter 8 (Sections 8.2 to 8.4)

REFERENCES :

[1] Samuel Korlin, Howard M.Taylor,A First course in Stochastic Processes,Second

Edition.
[2] Narayan Bhat, Elements of Applied Stochastic Processes.
[3] S.K. Srinivasan and K. Mehata, Stochastic Processes, Tata McGrew Hill 1976.
[4] Oliver Knill, Probability Theory and Stochastic Process with Applications, Overseas Press (India), Pvt. Ltd, Edition 2009.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Understand the deviations involving conditional probability distributions and conditional expectations.

CO2: Classify the classes of states in Markov chain and characterize the class.

CO3:To solve the derivation of the differential equations for time continuous Markov processes with discrete state space.

CO4: Understand the renewal process with results.

CO5: Using the queuing theory models of time series in Statistics.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

MBEC – II CODING THEORY

Theory Hours : 5	**Course Code : P21M2MBE2:2**
Exam Hours : 3	**Credits : 3**
	Internal : 25
	External : 75

Objectives:

1. To learn how codes in mathematics are used for error correction and data transmission.
2. To comprehend the algebraic structure of linear codes viewed as a vector space over a finite field.

UNIT I :

Linear code: Introduction – Linear Codes, Encoding, Decoding – Check Matrices and Dual Code.

UNIT II :

Linear Code continued: Classification by Isometry – Semilinear Isometry Classes of Linear Codes – The Weight Enumerator.

UNIT III:

Bounds and Modifications: Combinatorial Bounds for the parameters – New Codes from Old and Minimum distance – Further Modifications and Constructions.

UNIT IV :

Reed Muller Codes – MDS Codes.

UNIT V :

Cyclic Codes: Cyclic Codes as Group Algebra Codes – Polynomila Representation of Cyclic Codes – BCH Codes and Reed-Solomon Codes.

TEXT BOOK:

[1]Anton Betten, Michael Braun, Harald Fripertinger, Adalbert Kerber, Axel Kohnert and Alfred Wassermann, Error-Correcting Linear Codes, Classification by Isometry and Applications, Springer-Verlag berlin Heidelberg 2006.

UNIT I : Chapter 1 (Sections 1.1to 1.3,)
UNIT II : Chapter 1 (Sections 1.4 to 1.6)
UNIT III : Chapter 2 (Sections 2.1 to 2.3)
UNIT IV : Chapter 2 (Sections 2.4 and 2.5)
UNIT V : Chapter 4 (Sections 4.1 – 4.3)

REFERENCES :

[1] F.J. Mac Williams and N.J.A. Sloane, The Theory of Error-Correcting Codes, North Holland Publishing Company 1977.
[2] D.G. Hoffman et al, Coding Theory: The Essential, Marcel Dekker, Inc, 1991.
[3] S. Ling and C. Xing, Coding Theory: A first Course, Cambridge University Press, 2004.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Students get thorough idea about channel, noise, encoding, decoding etc and also error detection and error correction which are involved in a data communication..

CO2 : Discuss the Classification of Isometry and the weight Enumerator.

CO3: Analyze the Bounds and Modifications.

CO4: Explain the Reed Muller codes and MDS codes.

CO5:To get expertise in some important cyclic Codes , Polynomial representation of Cyclic Codes and BCH Codes.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

MBEC – II ALGEBRAIC NUMBER THEORY

Theory Hours : 5	**Course Code : P21M2MBE2:3**
Exam Hours : 3	**Credits : 3**
	Internal : 25
	External : 75

Objectives:

1.To acquire knowledge about recent development in algebra have its impact on number theory and number theory too its own contribution to the development.
2.To understand and appreciate the role played by algebra in number theory.

UNIT I :

Congruences: Techniques of Numerical Calculation- Public – Key Cryptography- prime power moduli- prime modulus.

UNIT II :

Primitive roots and power residues- Congruences of degree two, prime modulus – Number Theory from an algebraic view point-Groups, Rings and Fields.

UNIT III :

Some functions of Number Theory: Greatest Integer function – Arithmetic functions – The Mobius Inversion Formula-Recurrence Functions..

UNIT IV:

Some Diophantine equations: The Equation ax+by=c – Simultaenous linear equations – Pythagorean Triangles.

UNIT V:

Simple Continued Fractions: Infinite continued fractions- Irrational numbers- approximations to irrational numbers – periodic continued fractions – pell's equation

TEXT BOOK:

[1] . Invan Nivan – An Introduction to the Theory of Numbers.

Unit I : Chapter 2 (Sec 2.4, 2.5, 2.6, 2.7)

Unit II : Chapter 2(Sec 2.8, 2.9, 2.10, 2.11)

Unit III : Chapter 4 (Sec 4.1, 4.2, 4.3, 4.4)

Unit IV : Chapter 5 (Sec 5.1, 5.2, 5.3)

Unit V : Chapter 7 (Sec 7.3, 7.4, 7.5, 7.7, 7.8)

REFERENCES:

[1] George E. Andrews, Number theory, Dover Publication, INC, New York, Reprint 2013.

[2] Dr. Sudhir Pundir and Dr. Rimple Pundir, Theory of Numbers, First Edition, Pragasiprakashan Publications, 2006.
[3] Gareth A. Jones and J. Mary Jones, Elementary Number Theory, Springer Verlag, Indian Reprint, 2005.
[4] David M. Burton, Elementary Number theory,6th edition, McGraw Hill, 2007.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Analyze the Key Cryptography , prime power moduli and prime modulus.

CO2: Discuss in detail the basic concept of Primitive roots and power residues.

CO3 : Know of Some functions of Number Theory

CO4 : Discuss the Simultaenous linear equations and Pythagorean Triangles.

CO5 : Analyze the Simple Continued Fractions, periodic continued fractions and pell's equation

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)

SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))

SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

EDC - GENERAL INTELLIGENCE

Theory Hours : 2	**Course Code : P21M2ED**
Exam Hours : 3	**Credits : 2**
	Internal : 25
	External : 75

Objectives:

1. To gain quantitative aptitude required in the present scenario.
2. To emphasize the right perceptive needed to crack such problems and understand the recurring pattern in those problems.

UNIT I

Problems on Numbers – Average – Problems on Ages.
Chapter - 1, 6, 16.

UNIT II

Percentage – Profit & Loss – Simple Interest – Compound Interest.
Chapter – 5, 9, 17, 18.

UNIT III

Ratio & Proportion – Partnership – Clock and Calender.
Chapter – 7, 8, 24.

UNIT IV

Time and work – Pipes & Cistern.
Chapter – 10, 11.

UNIT V

Time & Distance – Problems on Trains – Boats and Streams.
Chapter – 12, 13.

TEXT BOOK:

[1] Dinesh Khattar, The Pearson Guide To Quantitative Aptitude For Competitive Examinations, Pearson Education, 3 edition, 2015.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: To face competitive examinations with confidence and to solve a lot of problems on numbers, averages and problems on ages.

CO2: Get a lot of training on percentage, profit and loss.

CO3: Work on a plenty of problems on time and work and get working knowledge on ratios and proportions.

CO4: To evaluate time, distance, speed given the other two and solve lot of problems.

CO5: Acquire problem solving ideas on trains, boats and streams.

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)

SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))

SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

SEC – II INTRODUCTION TO SCIENTIFIC COMPUTING (MATLAB)
(Practical only)

Theory Hours : 2	**Course Code : P21M2SE2P**
Exam Hours : 2	**Credits : 1**
	Internal : 40
	External : 60

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Objectives:

1. To introduce the Mathematical software MATLAB for high-performance numerical computations and visualization.
2. To learn MATLAB built-in functions provided to solve all type of scientific problems.
3.

UNIT I : Introduction to MATLAB

Introduction – MATLAB Environment – Command Window – Command History Window – Types of files – Platform – Search path –Some Useful Matlab commands. **Constants, Variables and Expressions-** Character set – Data types – Constants and Variables – Operators- Hierarchy of Operations – Built in fuctions – Assignment statement.

UNIT II: **Vectors and Matrices.**

Introduction – Scalars and Vectors – Assigning data to elements – Vector product – Vector Transpose – evenly spaced row vectors – matrices – line continuation – subscripts/ indices – multi-dimensional matrices / arrays – matrix manipulation – Commands- Matrix and Array operations- Functions with array inputs

UNIT III: Polynomials

Introduction – entering a polynomial – evaluation – roots of polynomial– addition, subtraction, multiplication and division of a polynomial- polynomial matrix – polynomial differentiation, integration and curve fitting – Evaluation of Polynomials with Matrix arguments

UNIT IV: Graphics.

Introduction – 2D plots – Printing labels - Grid and Axes box –Entering Text in a Plot - Axis control – Axis Aspect ratio – Multiple plots (plot, hold, line commands) – style options – legend Command – subplots -Specialised 2D plots (Logarithmic plot) – functions (polar, area, bar, barh, hist, rose, pie, stairs, stem compass) – 3D plots (plot3, bar3, bar3h, pie3, stem3,meshgrid, mesh, surf, contour and contour3)

UNIT V: Control Structures and Programs and Functions.

Introduction – Loops (for, nested for and while loop) – Branches Control Structures (if, switch, break, continue, error, try-catch) – statements.

TEXT BOOK:

[1] Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma MATLAB and its Applications in Engineering.

UNIT I : Chapter 1 and 2
UNIT II : Chapter 3
UNIT III : Chapter 4
UNIT IV : Chapter 6
UNIT V : Chapter 7

LAB LIST

1. Plotting a function.

2. Polar plot.

3. Arithmetic operations on matrices.

4. Finding the determinant of a matrix.

5. Finding the rank of a matrix

6. Finding transpose of a Matrix

7. Finding Eigen values and Eigen vectors of a matrix.

8. Polynomial curve fitting.

9. 2D plots, 3D plots.

10. Sum of all integers.

11. Finding squares of integers.

12. Programme using Switch structure, break statement and error statement.

(Five questions have to be answered out of six questions. At least one question from each unit must be asked. Each question carries ten marks).

(Internal Marks – 40 ; External Marks – 60)

REFERENCE BOOKS:

1. RUDRA PRATAP, Getting Started with MATLAB-A Quick Introduction for Scientists and Engineers, Oxford University Press, 2003.
2. William John Palm, Introduction to Matlab 7 for Engineers, McGraw-Hill Professional, 2005.
3. Dolores M. Etter, David C. Kuncicky, Introduction to MATLAB 7, Prentice Hall, 2004
4. Website: **www.ann.jussieu.fr/free.htm**
5. MATLAB – The language of technical computing, The MATH WORKS Inc, Version 5 1996 (http: \\www.mathworks.com)

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Find importance of this software for lab experimentation.
CO2: Articulate importance of software's in research by simulations work.
CO3: Have in depth knowledge of providing virtual instruments on lab view environment.
CO4: Write basic mathematical problems in MATLAB.
CO5 : Use of this software for real time applications.

Question Paper Pattern

ANSWER ALL THE QUESTIONS:
1×15 = 15 Marks
2× 20 = 40 Marks
Record = 5 Marks

Total = 60 Marks

EXTRA CREDIT COURSE

INTERNSHIP

SUBJECT CODE: INT Credit: 2 credits (Extra credits)

The curriculum includes the internship for students for 30 hours during the summer vacation after the second semester of all PG programs.

OBJECTIVES

The following are the intended objectives of internship training:

- To Enhance the employability skills of the students.
- To expose students to the industrial/Societal environment, which cannot be simulated in the classroom hence creating competent professionals for the industry and other organizations.
- To Provide possible opportunities to learn, understand, and sharpen the real-time technical/managerial skills required at the job.

Duration: 30 hours at the minimum

Period: During the summer vacation which could be completed within the third semester.

Assessment:

1. The assessment of the internship will be based on the feedback given by the internship provider and the report submitted by the student by the mentor.
2. After completion of the internship, the mentor has to make arrangements to get a proper training certificate from the industry/institution.
3. An abstract for details of the internship in the prescribed format has to be submitted by the departments to the COE on time.
4. Two credits are provided for the Internship as extra credits included under the Non-CGPA course for all PG programs.

LETTER FORMAT

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS), KUMBAKONAM

REQUEST LETTER FROM THE COLLEGE TO INTERNSHIP PROVIDER

To

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Subject: REQUEST FOR INSTITUTIONAL/INDUSTRIAL TRAINING of M.A./M.Com/M.Sc Degree Programme,

Dear Sir/Madam,

You must be aware that our College has made internship mandatory for all M.A./M.Com/M.Sc students.

In view of the above, I request your good self to allow following students of our college for practical training in your esteemed organization. Kindly accord your permission and give at least 30 hours of training for the students to complete the internship.

S.NO	**NAME OF THE STUDENT**	**REG.NO**	**DISCIPLINE**

If vacancies exist, kindly plan for Campus/Off Campus Interviews for_____ batch passing out students in above branches.

A line of confirmation will be highly appreciated.

With warm regards,

Yours sincerely,

Head of the Department.

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS), KUMBAKONAM

REQUEST LETTER FROM THE COLLEGE TO INTERNSHIP PROVIDER

To

……

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.....

Subject: REQUEST FOR INSTITUTIONAL/INDUSTRIAL TRAINING of M.A./M.Com/M.Sc Degree Programme,

Dear Sir/Madam,

Our Students have undergone internship training in your esteemed Organization in the previous years. I acknowledge the help and the support extended to our students during training in previous years.

In view of the above, I request your good self to allow our following students for practical training in your esteemed organization. Kindly accord your permission and give at least 30 hours of training for the students to complete internship.

S.NO	NAME OF THE STUDENT	REG.NO	DISCIPLINE

If vacancies exist, kindly do plan for Campus/Off Campus Interview for_____ batch passing out students in above branches.

A line of confirmation will be highly appreciated.

With warm regards,

Yours sincerely,

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Head of the Department.

FORM - 1

INTERNSHIP DETAILS (THIS WILL BE PREPARED IN CONSULTATION WITH FACULTY MENTOR AND TO BE MAINTAINED BY tHe department)

Student

Name:_____ __Reg.No._____ _Class_____

Campus Address: _____

_____

Phone:_____ __Email: _____

Internship Provider

Name:_____

Title:_____

Company/Organization:_____

Internship Company Adress___ _____

_____

_____

Phone:_____ _Email:_____

Faculty Mentor

Name:_____ __Phone: _____

Designation:_____ __Department:_____

Academic Credit Information

Internship Title: _____

Date of Initiation:_____ _Date of Completion: _____

Total Hours: _____

FORM - 2

STUDENT'S DAYWISE LOG ENTRY

Name andReg.No. of the Student: Name and address of the Internship Provider:

Period of Internship: From:			**To:**	
Date	**Hours**	**Details of work done**	**Signature of the Student**	**Signature of the Supervisor**

Signature of the Mentor: Signature of the Internship Provider:

FORM -3

SUPERVISOR EVALUATION OF CANDIDATE

Student Name: _____ Date:_____

Work Supervisor:_____ _____Title:_____

Company/Organization:_____

Internship Address:_____

Dates of Internship: From _____To_____

Please evaluate your candidate by indicating the frequency with which you observed the following behaviors:

Parameters	**Needs improvement**	**Satisfactory**	**Good**	**Excellent**
Interest in work				
Punctuality				
Reliability				
Responsibility				
Communication				
Team work				
Overall performance				

Additional comments, if any:

\

Signature of Internship Provider

FORM - 4

STUDENT FEEDBACK OF INTERNSHIP (TO BE FILLED BY STUDENTS AFTER INTERNSHIP COMPLETION)

Student Name:_____ Class: _____

Internship Provider: _____

Address: _____

Title of Internship :_____

Supervisor Email:_____

Faculty Mentor:_ _____

Indicate the degree to which you agree or disagree with the following statements.

This experience has	**Strongly Agree**	**Agree**	**Disagree**
Given me the opportunity to explore a career field			
Allowed me to apply classroom theory to Practice			
Expanded my knowledge			
Helped me develop my written and oral communication skills			
Given me a chance to improve my interpersonal skills			
Provided me with contacts which may lead to future employment			
Helped me clarify my career goals			

Considering your overall experience, how would you rate this internship?

(Tick one).(Satisfactory/ Good/ Excellent)

Signature of the Student

FORM – 5

EVALUATION SHEET (FOR MENTOR)

S.NO	NAME OF THE STUDENT	REG.NO	NO. OF ACTUAL INTERNSHIP HOURS	GRADE*

* Evaluation based on report submitted by the student and evaluation by Internship provider. (Excellent/ Very good/ Good)

Signature of the Head of the Department Signature of the Mentor

CC – IX PARTIAL DIFFERENTIAL EQUATIONS

Theory Hours : 6	**Course Code : P21MC309**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

1. To give an in-depth knowledge of solving partial differential equations.
2. To introduce different types of second order partial differential equations.
3. The problem arising in physical phenomena widely involve partial differential equations (PDES).

UNIT I :

First order P.D.E – Curves and Surfaces – Genesis of First order P.D.E. – Classification of Integrals – Linear Equation of the First Order

UNIT II :

Pfaffian Differential Equations – Compatible Systems – Charpit's Method – Jacobi's Method – Integral surfaces through a given curve.

UNIT III:

Second order P.D.E: Genesis of second order P.D.E. – Classification of second order P.D.E. One - Dimensional wave Equation – Vibrations of an Infinite string – Vibrations of a semi – Infinite string - Vibrations of string of finite length.

UNIT IV :

Vibrations of a string of finite Length (Method of separation of variables) Laplace's Equation : Boundary value problems – Maximum and Minimum principles – The Cauchy problem – The Dirichlet problem for the upper Half plane – The Neumann problem for the upper Half plane

UNIT V :

The Dirichlet interior problem for a circle – The Dirichlet Exterior problem for a circle – The Neumann problem for a circle – The Dirichlet problem for a Rectangle – Harnack's Theorem – Laplace's Equation – Green's Functions.

TEXT BOOK:

[1] T.Amaranath, An Elementary Course in Partial Differential Equations, second Edition, Narosa publishing House, New Delhi, 1997.

UNIT I : Chapter 1 (sections 1.1 to 1.4)
UNIT II : Chapter 1 (sections 1.5 to 1.9)
UNIT III : Chapter 2 (sections 2.1 to 2.3.3)
UNIT IV : Chapter 2 (sections 2.3.5, 2.4 to 2.4.5)
UNIT V : Chapter 2 (sections 2.4.6 to 2.4.11)

REFERENCES:

[1] I.N. Snedden, Elements of Partial Differential Equation, Mc Graw Hill, 1985.

[2] Tyn. Myint.U: Partial Differential Equation for scientists and engineering, 3rd edition,North Holland 1989.

[3] F.John , Partial Differential Equation, Springer Verlage, 1975.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Classify first order partial differential equation and their solutions.

CO2: Solve first order equations and non linear partial differential equation using various methods.

CO3: Identify and solve the three main classes of second order equations, elliptic, parabolic and hyperbolic.

CO4: Solve the Dirichlet Problem for the upper half plane.

CO5: Solve the Laplace equation and green's function.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – X MEASURE THEORY AND INTEGRATION

Theory Hours : 6	**Course Code : P21MC310**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

1. To study a basic course in Lebesgue Measure and Integration a study of inequalities and the L^p-spaces.
2. To study signed measures and the Hahn Decomposition theorems, Fubini's theorem and Random – Nikodyam theorem.

UNIT I :

Measure on the Real Line: Lebesgue Outer Measure – Measurable Sets – Regularity – Measurable Function – Borel and Lebesgue Measurability.

UNIT II :

Integration of Functions of a Real Variable: Integration of Non-negative Functions – The General Integral – Integration of Series – Riemann and Lebesgue Integrals.

UNIT III :

Inequalities and the L^p Spaces: The L^p spaces – Convex functions – Jensen's Inequalities – The Inequalities of Holders and Minkowski.

UNIT IV :

Convergence in Measure – Almost Uniform Convergence – Singed Measures and Hahn Decomposition – The Jordan Decomposition.

UNIT V :

Measurability in a Product Space – The Product Measure and Fubini's Theorem. The Radon – Nikodym Theorem.

TEXT BOOK:

[1] G.de. Barra, Measure Theory and Integration, First Edition, New Age International Private Limited, Reprint 2003.

UNIT I : Chapter 2 (sections 2.1 to 2.5)
UNIT II : Chapter 3 (sections 3.1 to 3.4)
UNIT III : Chapter 6 (sections 6.1 to 6.4)
UNIT IV : Chapter 7 (sections 7.1 , 7.2) and Chapter 8(sections 8.1, 8.2)
UNIT V : Chapter 10 (sections 10.1, 10.2) and Chapter 8(section 8.3)

REFERENCES :

[1] Inder K. Rana, An Introduction to Measure and Integration, Narosa Publishing House, New Delhi, 1997.

[2] M.E. Munroe, Measure and Integration, Second Edition, Addition – Wesley Publishing Company, 1971.
[3] P.K. Jain, V.P Gupta, Lebesgue Measure and Integration, New Age International Pvt. Ltd. Publishers, New Delhi, 1986 (Reprint 2000)
[4] Richard L. Wheeden and Andoni Zygmund, Measure and Integral: An Introduction to Real Analysis, Marcel Dekker Inc 1977.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Discuss the Measure on the Real Line. They will be able to capture the need for the modern integration theory.
CO2: Analyze the Riemann and Lebesgue Integrals**.**
CO3: Observe that the idea of Inequalities and the L^p Spaces.
CO4: Discuss about the importance of Convergence in Measure and Singed Measures.
CO5: Apply the Product Measure in Fubini's theorem and Radon Nikodyn theorem.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC - XI TOPOLOGY

Theory Hours : 6	**Course Code : P21MC311**
Exam Hours : 3	**Credits : 5**
	Internal : 25
	External : 75

Objectives:

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

UNIT I :

Topological Spaces: Topological Spaces – Basis for a Topology – The order Topology. The Product Topology on X x Y – The Subspace Topology.

UNIT II :

Closed Sets and Limit points – Continuous Functions : Continuous Functions – The Product Topology.

UNIT III :

Connectedness: Connected Spaces – Connected Subspaces of the Real Line – Components and local Connectedness

UNIT IV :

Compactness: Compact Spaces – Compact Subspaces of the Real Line – Limit point Compactness – local Compactness

UNIT V :

Countability and Separation Axioms: The Countability Axioms – The Separation Axioms – Normal Spaces – The Urysohn Lemma – The Urysohn Metrization Theorem – The Tietz Extension Theorem.

TEXT BOOK :

[1] James R. Munkres, Topology, Second Edition, Prentice – Hall of India private Limited, New Delhi, 2013.

UNIT I : Chapter 2 (Sections 12 to 16)
UNIT II : Chapter 2 (Sections 17 to 19)
UNIT III : Chapter 3 (Sections 23 to 25)
UNIT IV : Chapter 3 (Sections 26 to 29)
UNIT V : Chapter 4 (Sections 30 to 35)

REFERENCES :

[1] J. Dugundji, Topology, Prentice Hall of India, New Delhi, 1976.
[2] Sheldon W. Davis, Topology, UBS Publishers Distributors Private Limited, New Delhi, 1989.
[3] G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill, 1963.
[4] S. Willard, General Topology, Addison-Wesley, 1970.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Understand of topological spaces and having a grasp on basic.

CO2: Identify and characterize convergence of sequences, which are closed and explore the Continuity of functions in various topological spaces.

CO3: Determine the connectedness and path connectedness of the product of an arbitrary family of spaces.

CO4: Understand and generalize the generalization of the concept of compactness on Topological Spaces.

CO5: The concept of a Topological space which generalizes the spaces arising in Real and Functional Analysis

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – XII CLASSICAL DYNAMICS

Theory Hours : 6	**Course Code : P21MC312**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1. To give a detailed knowledge about the mechanical system of Particles and predict the effects of force and motion.
2. To study the familiarity with the dynamical concepts of Newton's law and Lagrange equation.
3. To study the applications of Lagrange's equations and Hamilton's equations as well as the theory of Hamilton - Jacobi Theory.

UNIT I :

Introductory concepts: The mechanical system – Generalized coordinates - constraints – Virtual work – Energy and momentum.

UNIT II :

Lagrange's equation : Derivation and examples – Integrals of the Motion – Small oscillations.

UNIT III :

Special Applications of lagrange's Equations: Rayleigh's dissipation function – Impulsive motion – Gyroscopic systems – Velocity dependent potentials.

UNIT IV :

Hamilton's equations: Hamilton's principle – Hamilton's equation – Other variational principles – Phase Space .

UNIT V :

Hamilton – Jacobi Theory: Hamilton's principal Function – The Hamilton – Jacobi equation – Separability.

TEXT BOOK:

[1] Donald T. Greenwood, Classical Dynamics, PHI pvt Ltd New Delhi -1985.

UNIT I : Chapter 1 (sections 1.1 to1.5)
UNIT II : Chapter 2 (sections 2.1 to 2.4)
UNIT III : Chapter 3 (sections 3.1 to 3.4)
UNIT IV : Chapter 4 (sections 4.1 to 4.4)
UNIT V : Chapter 5 (sections 5.1 to 5.3)

REFERENCE (S)

[1] H.Goldstein, Classical Mechanics, (2nd Editions), Narosa Publishing House, New Delhi.
[2] Narayan ChandraRana and Promod sharad Chandra Joag, Classical Mechanics, Tata McGraw Hill, 1991.
[3] John L synge and Byron A grilfith, principles of Mechanics, Mc-grew Hill New York 1959.

COURSE OUTCOMES:

At the end course, students will be able to

CO1: Understand the basic mechanical concepts releatd to discrete and continuous mechanical system.

CO2: Determine the nature of equations of motion for holonomic and non-holonomic system.

CO3: Use the important definitions and introductory concept like virtual work and impact of motion.

CO4: Classify the motion of a mechanical system using Lagrange –Hamilton formalism.

CO5: Understand the concept of Hamilton –Jacobi theory.

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)

SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))

SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

MBEC – III FUZZY MATHEMATICS

Theory Hours : 6	**Course Code : P21M3MBE3:1**
Exam Hours : 3	**Credits : 3**
	Internal : 25
	External : 75

Objectives:

1.To give an introduction to the basic concepts of fuzzy set theory.

2.To make the students understand the nuances of Fuzzy Analysis.

3.To make them understand the applications of these techniques in computer.

UNIT – I :

Fuzzy sets – Basic types – Basic concepts – α - cuts – Additional properties of α cuts – Extension principle for Fuzzy sets**.**

UNIT – II :

Operations on Fuzzy sets – Types of operations – Fuzzy complements – t- Norms – Fuzzy Unions – Combinations of operations.

UNIT – III :

Fuzzy Arithmetic – Fuzzy numbers – Arithmetic operations on intervals - Arithmetic operations on Fuzzy numbers.

UNIT – IV :

Fuzzy relations – Binary fuzzy relations – Fuzzy equivalence relations - Fuzzy compatibility relations – Fuzzy ordering relation – Fuzzy morphisms

UNIT – V :

Fuzzy Relation Equations – General discussion – Problem partitioning - Solution method – Fuzzy Relation Equations based on sup-i compositions – Fuzzy Relation Equations based on inf- ω_i compositions.

TEXT BOOK :

[1]George J. Klir and B. Yuan, Fuzzy sets and Fuzzy Logic, Theory and Applications prentice Hall of India, New Delhi, Reprint 2013.

UNIT -I	:	Chapter 1 (sections 1.3, 1.4) Chapter 2 (sections 2.1, 2.3)
UNIT -II	:	Chapter 3 (sections 3.1 to 3.5)
UNIT -III	:	Chapter 4 (sections 4.1 ,4.3, 4.4)
UNIT -IV	:	Chapter 5 (sections 5.3, 5.5 to 5.8)
UNIT-V	:	Chapter 6 (sections 6.1 to 6.5)

REFERENCES:

[1] H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publisher Limited, New Delhi, 1991.
[2] H.T. Nguyen & E. A. Walker, First Course in Fuzzy Logic, Chapman & Hall, 2nd Edn., 1999.
[3] T.J. Ross, Fuzzy Logic with Engineering Applications, McGraw Hill, 1997.
[4] J.J. Buckley, E. Eslami, An Introduction to Fuzzy logic and Fuzzy sets, Springer, 2002.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1:Gain the main subject of fuzzy sets learn crisp and fuzzy set theory decide the difference between crisp set and fuzzy set theory, make calculation on fuzzy set theory.

CO2: Discuss the operations of fuzzy compliments, fuzzy unions and combinations.

CO3: Use the fuzzy set theory on the statistical method which is analyze statistical data by using fuzzy logic methods.

CO4: Understand the concepts of fuzzy relations and fuzzy binary relations and fuzzy ordering relation.

CO5: Apply the concept of fuzzy relation equations and solution methods of fuzzy relation equations.

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)
SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))
SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

MBEC – III OPERATOR THEORY

Theory Hours : 6	**Course Code : P21M3MBE3:2**
Exam Hours : 3	**Credits : 3**
	Internal : 25
	External : 75

Objectives:

1. The idea behind the second course on functional analysis is to emphasize very basic results which are left out in the first course and are important for analysts who apply these tools.
2. To study compact operators, special theory of Banach space operatoes and Hillbert space operators, Banach algebra and Gelfand Naimark theorem.

UNIT I :

Compact Operators: Characterizations – Some Properties.

UNIT II :

Spectral Results for Banach Space Operators – Spectrum – Eigen spectrum – Resolvent set – Risez – Schauder Theory.

UNIT III :

Operators on Hillbert Speces – Adjoint – Self Adjoint – Normal – Unitary – Operators – Numerical range – Hilbert – Schmidt operators.

UNIT IV :

Spectral Results for Hilbert space Operators – Normal and Adjoint Operators – Spectral Representations.

UNIT V :

Banach Algebra – Regular and Singular elements – Spectrum – Gelfand mapping – Gelfand – Neumark Theorem.

TEXT BOOK :

[1] M. Thambian Nair, Functional Analysis: A first course, prentice Hall of India, New Delhi, 2002.

[2] G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Internationaln Ed. 1963.

UNIT I : Chapter 9 from [1]
UNIT II : Chapter 10 from [1]
UNIT III : Chapter 11 from [1]
UNIT IV : Chapter 12 and 13 from [1]
UNIT V : Chapter 12 and 13 from[2]

REFERENCES:

[1] Bela Bollobas, Linear Analysis, An introductory course, Cambridge University

Press, 1990.
[2] B.V Limaye, Functional Analysis, Wiley Eastern Limited, Bombay, Second Print,1985.
[3] K. Yosida, Functional Analysis, Springer – Verlag,1974.
[4] E. Kresyzig, Introductory Functional Analysis with applications, John Wiley,1978.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Basic concept of compact Operators.

CO2: Get a working knowledge on Spectral results for Banach Space Operators.

CO3: Gain Hillberts Space and Schmidt Operators.

CO4: Study in detail spectral properties of Hilbert space operators.

CO5: Learn Gelfand mapping and Gelfand Neumark theorems.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

MBEC – III RESEARCH METHODOLOGY

Theory Hours : 6	**Course Code : P21M3MBE3:3**
Exam Hours : 3	**Credits : 3**
	Internal : 25
	External : 75

Objectives:

1.To understand the Basic aspects in research

2.To learn Mathematical and Statistical technique for research

3.To acquire basic knowledge about various instruments and techniques in Mathematical research.

UNIT-I

Research Methodology: An introduction meaning of Research – Objects of Research – Motivation in Research- Types of Research – Research Approaches – Significance of Research – Research Methods Versus Methodology – Research and Scientific Method – Importance of Knowing how research is done – Research process – criteria of good research – problems Encountered by researchers in India

UNIT-II

Research Design : Meaning of Research Design- Need for Research Design- Features of a good design – Important concepts relating to Research Design – Different research Designs- Basic principles of Experimental Designs – Conclusion – **Appendix:** Developing Research Plan.

UNIT –III

Special Continuous Probability distributions: Normal Distribution: – Normal Distribution as a Limiting form of binomial distribution – Chief Characteristics of the Normal Distribution – Mode of Normal Distirbution- Median of Normal Distribution – M.G.F. of Normal Distribution – Cumulant Generating Function (CGF) of normal distribution – Moments of Normal distribution

UNIT –IV

Large Sample Theory and Types of Sampling : Purposive sampling – Random Sampling – Simple Sampling – Stratified sampling – Parameter and Statistics : Sampling distribution of a statistics – Standard error –Procedure for testing of Hypothesis : Tests of Significance for large samples.

UNIT –V

Random Variables and Distribution Functions: Distribution Function : Properties of Distribution Function – Discrete Random Variable : Probability Mass function – Discrete distribution function – Continuous Random Variable: Probability density Function- Various measures of Central Tendency, Dispersion, Skewness and Kurtosis for continuous probability Distributions- Continuous Distribution Function.

TEXT BOOKS:

[1[. Research Methodology(2nd revised methods and techniques edition)-C.R.Kothari,New Age International Publications,New Delhi.

[2]. Fundamentals of Mathematics statistics.S.C.Gupta, V.K.Kapoor, Eleventh edition 2002,Sultanchand&sons Publishers,New Delhi.

UNIT I :Chapter 1

UNIT II :Chapter 3

UNIT III :Chapter 9 (Sections 9.2, 9.2.1 to 9.2.7, 9.5.1 to 9.5.3)

UNIT IV :Chapter 14 (Sections 14.2, 14.3,14.5, 14.6)

UNIT V :Chapter 5 (Sections 5.2 to 5.4)

REFERENCES:

[1].Writing up Your University Assignments and Research Projects-A Practical handbook,Neil Murray and Geralding Hughes, McGraw Hillopen University Press.

[2]. Introductionl to Mathematival Statistics, Fourth Edition,Rober V.Hogg and Allen T.Craig,Pearson Education Asia.

COURSE OUTCOMES:
After studying this course the student will be able to
CO1: Understand the various type of Research Methodology , criteria of good research and problems encountered by researchers in India

CO2: Develope the Research Design and Developing Research Plan.
CO3 : Analyze the Special Continuous Probability distributions.
CO4 : Discuss the Large Sample Theory and Types of Sampling, Procedure for testing of Hypothesis.

CO5 : Good knowledge of Random Variables and Distribution Functions

Question Paper Pattern

SECTION

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

SSC – II MATHEMATICAL SCIENCES

Objectives:

- **To create an awareness of the NET/SET Examinations.**
- **To make the students prepared for Competitive Examinations.**

UNIT : I MATRICES AND VECTOR SPACE

Algebra of Matrices – Rank and Determinant of Matrices – Linear Equations – Eigen value and Eigen Vectors - Clayey - Hamilton Theorem -Vector Space – Subspaces- Linear Dependences – Basis – Dimensions.

UNIT : II SET THEORY AND REAL NUMBER SYSTEM

Elementary Set Theory – Finite Countable and Uncountable Sets – Real Number System as a Complete Ordered Field – Archimedean Property – Supremum, Infimum.

UNIT : III COMPLEX INTEGRATION AND CALCULAS OF RESIDUES.

Contour Integral – Cauchy's theorem – Cauchy's Integral Formula Lioville's Theorem – Maximum Modulus Principle – Schwarz Lemma – Open Mapping Theorem – Taylor Series – Laurent's Theorem – Calculus of Residues.

UNIT : IV TOPOLOGY

Basis – Dense Set – Subspace – Product Topology – Separation Axioms – Connectedness – Compactness.

UNIT : V THEORY OF PROBABLITY

Sample Space – Discrete Probability – Independent events – Baye's Theorem.

TEXT BOOK :

[1] UGC CSIR NET / SET (JRF & LS), MATHEMATICAL SCIENCES, by Pawan Sharma , Neha Sharma and Suraj Singh, Arihant publications Limited .

UNIT I : (Pages : 247- 304).

UNIT II : (Pages : 1 – 24.)

UNIT III : (Pages : 418 – 455.)

UNIT IV : (Pages : 631 – 666.)

UNIT V : (Pages: 921 – 928 & 963 – 970.)

REFERANCES :

[1] I.N Herstein, Topics in Algebra, Second Edition John Wiley and Sons, 1975.

[2] Walter Rudin, Principles of Mathematical Analysis, Third Edition, McGraw Hill, 1976.

[3] Lars.V.Ahlfors, Complex Analysis, Third Edition McGraw-Hill book Company,Tokyo, 1979.

[4] James R. Munkres, Topology, Second Edition, Prentice – Hall of India private Limited, New Delhi, 2013.

[5] S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical statistics – Sultan chand and Sons, Educational publishers, Reprint – 2005.

COURSE OUTCOMES:

The students will be able to

CO1: Discuss in detail the basic concept of linear system of equations, Vector spaces, Bases and Dimension.

CO2: Learn Elementary set Theory and Real Number System..

CO3: Understand the Contour Integral and Maximum Modulus Principal, Open Mapping Theorem.

CO4: Evaluate Product Topology and Connectedness, Compactness.

CO5: Capture the idea of Sample Space and Baye's Theorem.

Question Paper Pattern

Objective type questions (50 x2 =100).

CC – XIII FUNCTIONAL ANALYSIS

Theory Hours : 6	**Course Code : P21MC413**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1. To study Banach spaces and to study their structure theorems of functional Analysis.
2. To study Hilbert spaces and operator theory leading to the spectral theory operator on a Hilbert spaces.

UNIT I :

Banach Spaces: The definition and some examples – Continuous Linear Transformations – The Hahn- Banach Theorem.

UNIT II :

The Natural Imbedding of N in N** – The open Mapping Theorem – The conjugate of an operator.

UNIT III :

Hilbert Spaces: The definition and some simple properties – Orthogonal Complements – Orthonormal sets – The Conjugate space H^* – The 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: The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the Spectrul radius – The radical and semi – Simplicity. The structure of Commutative **Banach Algebras:** The Gelfand Mapping – Applications of the formula $r(x) = \lim ||x^n||^{1/n}$.

TEXT BOOK:

[1] G.F. Simmons, Introduction to Topology and Modern Analysis, Tata McGraw Hill International Edition, 2005.

UNIT I : Chapter 9 (sections 46 to 48)
UNIT II : Chapter 9 (sections 49 to 51)
UNIT III : Chapter 10
UNIT IV : Chapter 11
UNIT V : Chapter 12 and chapter 13 (sections 70, 71)

REFERENCE(S):

[1] B.V Limaye, Functional Analysis, New Age International Private Limited, 1996.
[2] Walter Rudin, Functional Analysis, TMH Edition, 1974.
[3] K. Yosida, Functional Analysis, Springer - Verlag, 1974.
[4] Laurent Schwarz, Functional Analysis, Courant Institute of Mathematical Sciences, New York University, 1964.

COURSE OUTCOMES:

After studying this course the student will be able to

CO1: Understand functional analytic language required to study problems of practical interest and prove that norms on a finite dimensional space are equivalent.

CO2: Comprehend the important of four pillars of functional analysis namely Hahn Banach theorem, Open mapping theorem, closed graph theorem, Uniform Bounded theorem.

CO3: Gain mastery in basic Hilbert space theory, projection theorem.

CO4: Analyze the Finite – Dimensional Spectral Theory

CO5: Get a working knowledge on algebra of bounded linear operator.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – XIV DIFFERENTIAL GEOMETRY

Theory Hours : 6	**Course Code : P21MC414**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1. To help the students to understand the use of differential calculus in the field of genetics.
2. To help the students to distinguish between plane curves and space curves using differentiations**.**

UNIT I :

Space Curves: Definition of a Space Curve – Arc length – Tangent – Normal and Bi-normal – Curvature and Torsion.

UNIT II :

Contact between curves and surfaces – Tangent Surface – Involutes and Evolutes – Intrinsic Equations – Fundamental Existence Theorem for space curves – Helices.

UNIT III :

Intrinsic properties of a surface: Definition of a Surface – curves on a Surface – Surface of revolution – Helicoids – Metric – Direction Coefficients – Families of curves.

UNIT IV :

Geodesics: Geodesics – Canonical Geodesic Equations – Normal Property of Geodesics – Existence Theorems - Geodesic parallels – Geodesic curvature.

UNIT V:

Non Intrinsic properties of a surface: The second Fundamental form – Principal curvature – Lines of curvature – Developable – Developable associated with space curves and with curves on surface

TEXT BOOK:

[1] T.J Willmore, An Introduction to Differential Geometry, Oxford University press (20^{th} Impression), New Delhi 2005 (Indian Print)

UNIT I : Chapter 1 (sections 1 to 5)
UNIT II : Chapter 1 (sections 6 to 9)
UNIT III : Chapter 2 (sections 1 to 7)
UNIT IV : Chapter 2 (sections 10 to 15)
UNIT V : Chapter 3 (sections 1 to 6)

REFERENCE(S) :

[1] Wihelm Klingenbery, A course in Differential Geometry, Graduate Texts in Mathematics, Springer verlag, 1978.
[2] Struik, D.T Lectures on classical Differential Geometry, Addison – Wesley, Mass, 1950.

[3] J.A Thorpe, Elementary topics in Differential Geometry, Under graduate Texts in Mathematics, Springer – verlag, 1979.
[4] S.G. Venkatachalapathy, Differential Geometry, Margham Publications, First Published 2007 and Reprint 2012.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1:. Understand the basic Classical concepts of Space Curves.
CO2: Sketch and workout the graph of Contact between curves and surfaces, Fundamental Existence Theorem in space curve.
CO3: Apply Intrinsic properties using Helicoids and Families of curves.
CO4: Using Geodesic curves in Normal Property and Existence Theorems.
CO5: Describe surfaces as a solution sets of differential equations, geodesic on surface and Complete the Gaussian curvature of various surfaces.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CC – XIV FLUID DYNAMICS

Theory Hours : 6	**Course Code : P21MC414**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

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

UNIT I:

Real Fluids and Ideal fluids – Velocity of a Fluid at a point – Streamlines and path lines; steady and Unsteady Flows – The velocity potential – The Vorticity vector – Local and Particle Rates of Change - The Equation of continuity – Worked examples- Acceleration of a Fluid – Pressure at a point in a Fluid at Rest – Pressure at a point in Moving Fluid – Conditions at a Boundary of Two Inviscid Immiscible Fluids – Euler's Equations of motions – Bernoulli's equation – Worked examples.

UNIT II:

Some Flows Involving Axial Symmetry – Some special Two – Dimensional Flows – Impulsive Motion. Some three-dimensional Flows: Introduction – Sources, Sinks and Doublets – Images in a Rigid Infinite Plane – Axi – Symmetric Flows: Strokes stream function.

UNIT III:

Some Two-Dimensional Flows: Meaning of a Two-Dimensional Flow – Use of cylindrical Polar Coordinates – The stream function – The Complex Potential for Two-Dimensional, Irrotational, Incompressible Flow – Complex velocity potentials for Standard Two-Dimensional Flows – Some worked examples – The Milne-Thomson circle theorem and applications – The Theorem of Blasius.

UNIT IV:

The use of Conformal Transformation and Hydrodynamical Aspects – Stress components in a Real Fluid – Relations between Cartesian components of stress – Translational Motion of Fluid Element – The Rate of Strain Quadric and Principal Stresses – Some Further Properties of the Rate of Strain Quadric-Stress Analysis in Fluid motion -Relations between Stress and Rate of strain – The coefficient of viscosity and Laminar Flow–The Navier – Stokes equations of Motion of a Viscous Fluid.

UNIT V:

Some solvable problems in Viscous Flow – Steady Viscous Flow in Tubes of Uniform cross section – Diffusion of Vorticity – Energy Dissipation due to Viscosity – Steady Flow past a Fixed Sphere – Dimensional Analysis; Reynolds Number – Prandtl's Boundary Layer.

TEXT BOOK:

[1] F. Chorlton, Textbook of Fluid Dynamics, CBS Publishers & Distributors, New Delhi, Reprint 2004.

UNIT I : Chapter 2 (Sections 2.1 to 2.9), and Chapter 3 (Sections 3.2 to 3.6)
UNIT II : Chapter3(Sections 3.9to3.11) and Chapter4 (Sections 4.1,4.2,4.3 and 4.5)
UNIT III : Chapter 5 (Sections 5.1 to 5.9) (omit 5.7)
UNIT IV : Chapter 5 (Section 5.10), and Chapter 8 (Sections 8.1 to 8.9)
UNIT V : Chapter 8 (Sections 8.10 to 8.16)

REFRENCES:

[1] J.D. Anderson, Computational Fluid Dynamics, The Basics with Applications, McGraw Hill, 1995.
[2] R.K. Rathy, An Introduction to Fluid Dynamics, Oxford and IBG Publishing Co., New Delhi, 1976.
[3] S.W. Yuan, Foundations of Fluid Mechanics, Prentice Hall of India Pvt Ltd.,NewDelhi,1976.

COURSE OUTCOMES

After studying this course the student will be able to

CO1: Understand the basic mechanical concepts related to real fluids and ideal fluids.

CO2: Determine the nature of two dimensional and three dimensional flows.

CO3: Use the important definitions and introductory concept the Milne - Thomson circle theorem.

CO4: Classify the motion of a mechanical system using the Navier – Stokes equations of motion of a Viscous Fluid.

CO5: Understand the concept of the Prandtl's Boundary Layer.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

CORE COURSE – XV PROJECT / DISSERTATION WITH VIVA VOCE

Theory Hours : 12	**Course Code : P21MPW415**
Exam Hours :	**Credits : 6**
	Internal : 80
	External : 20

Objectives:

To promote original thinking, insemination of knowledge, modulation and innovation of thought, as an exercise, in order to transport the young minds to the expanding horizon of their chosen area of knowledge and transform them into knowledge generators.

Project / Dissertation	**80 Marks**
2 Reviews	20+20 = 40marks
Report Valuation	40Marks
Viva voce	**20 Marks**

MBEC – IV AUTOMATA THEORY AND COMPILER CONSTRUCTIONS

Theory Hours : 6	**Course Code : P21M4MB4:1**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1.To provide an insight to theoretical computer science.

2.To get across to the students the notion of effective computability, using mathematical models.

UNIT I :

Finite State Automata: Introduction – Finite State Machine – Deterministic Finite Automata – Transition System –Acceptability of a String by Finite Automata – Non Deterministic Finite Automata – Difference between DFA and NFA– Equivalence of DFA and NFA – Finite Automata with $\in$-moves – Two way Finite Automata – Finite Automata with Outputs.

UNIT II :

Grammar and Chomsky Classification: Introduction – Grammar – Chomsky Classification – Languages and their Relations.

UNIT III :

Regular Languages and Expression: Introduction – Regular Languages – Regular Expressions – Finite Automata and Regular Expressions – Pumping Lemma –Regular Sets and Regular Grammar.

UNIT IV :

Context Free Languages: Introduction – Context free Grammar – Context free Languages – Simplification of Context free Grammars – Normal forms – Pumping Lemma for Context free Languages – Closure properties of Context free Languages.

UNIT V :

Pushdown Automata and Turing Machine: Introduction- Pushdown Automata – Working Principle of Pushdown Automata – Turing Machine Model – Instantaneous Description – Representation of Turing Machines – Acceptance of Language by Turing Machine.

TEXT BOOK:

[1] D. P. Achariya , Theory of Computation, MJP Publishers, 2010

UNIT I : Chapter 2 (Sections 2.0 to 2.10)
UNIT II : Chapter 3 (Sections 3.0 to 3.3)
UNIT III : Chapter 4 (Sections 4.0 to 4.5)
UNIT IV : Chapter 5 (Sections 5.0 to 5.6)
UNIT V : Chapter 6 (Sections 6.0to 6.2) and Chapter 7(Sections7.0to 7.4)

REFERENCES:

[1] C. L. Liu, Elements of Discrete mathematics, Mcgraw Hill, International Editions, 2000.

[2] A.M. Natarajan, A. Tamilarasi and P. Balasubramanian, Theory of Automata and Formal Languages, New Age International (P) Limited Publishers, New Delhi.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Construct the mathematical proof for computation and algorithms.

CO2: Understand Mathematical foundations of computation including automata theory; the theory ` of formal languages and grammars

CO3: Analyze the regular languages and expressions.

CO4: Simplifying the techniques of the context free grammars and have an exposure in normal forms.

CO5: Analyze and design finite automata, pushdown automata, Turing machines.

Question Paper Pattern

SECTION A : 10 × 2 = 20 (Each Unit Carries Two Questions)
SECTION B 5 × 5 = 25 (Each Unit Carries Two Questions (Either or Type))
SECTION C 3 × 10 = 30 (Each Unit Carries One Questions)

Total = 75

MBEC – IV OPTIMIZATION TECHNIQUES

Theory Hours : 6	**Course Code : P21M4MBE4:2**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1.To enlighten the students in the field of operations research this has many applications in management techniques.

2. To help the students to find optimum solution in business management problems.

UNIT I :

Integer Programming.

UNIT II :

Dynamic (multistage) programming.

UNIT III :

Decision Analysis – Games and strategies.

UNIT IV:

Inventory Control.

UNIT V:

Non-linear Programming.

TEXT BOOK:

[1]Operations Research by Kanit Swarup, P.K. Gupta and Manmohn, Ninth thoroughly Revised Edition.

UNIT I : Chapter 7
UNIT II : Chapter 13
UNIT III : Chapter 16 and 17 (sections: 16.2 to16.6&17.2 to 17.7)
UNIT IV : Chapter 19 (sections:19.2 to19.9)
UNIT V : Chapter 24 (Sections:24.2 to 24.7)

REFERENCES:

[1] Hamdy A. Taha, Operations Research, Macmillan Publishing Company, 4th Edition.
[2] O.L. Mangasarian, Non Linear Programming, McGraw Hill, New York .
[3] Mokther S. Bazaraa and C.M. Shetty, Non Linear Programming, Theory and Algorithms, Willy New York .
[4] Prem Kumar Gupta and D.S. Hira, Operations Research-An Introduction, S. Chand and Co., Ltd., New Delhi.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Do mathematical formulation of a real life problem into a linear programming problem and to Solve linear programming problem using graphical method and simplex method.

CO2: Find solutions to linear programming problem by dynamic programming.

CO3: Analysis for LPP Using Game theory .

CO4: Discuss the variety of deterministic and probabilistic inventory control problems both with and without breaks.

CO5: Understand the concepts of nonlinear programming problems.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75

MBEC - IV INTEGRAL TRANSFORMS

Theory Hours : 6	**Course Code : P21M4MBE4:3**
Exam Hours : 3	**Credits : 4**
	Internal : 25
	External : 75

Objectives:

1.The central theme of the course is to get an intensive training in the techniques of integral transforms and to apply them in practical problems eminating from various fields.

2.The laplace transforms and the fourier transforms are dealt both with rigour and with lot examples and applications.

UNIT I :

Laplace transforms-Important properties-Simple Applications-Asymptotic Properties-Watson's Lemma

UNIT II :

Inversion Integral-The Riemann – Lebesgue Lemma - Dirichlet Integrals-the Inversion-Watson's Lemma for loop integrals-Heaviside series expansion.

UNIT III:

Application to ordinary differential equations - Elementary examples- Higher order equations-Partial differential equations- The diffusion equation – Wave Propagation.

UNIT IV :

Fourier transforms- Exponential- Sine and Cosine transforms- Important properties-Spectral analysis.

UNIT V :

Partial differential equations- Potential problems- Water waves –Basic equations- Waves generated by a surface displacement.

TEXT BOOK :

[1] B. Davies, Integral Transforms and Their Applications, Springer, Texts in Applied Mathematics, 41 Third Edition,2009.

UNIT I : Chapter 1(Sections 1.1, 1.2,1.3)
UNIT II : Chapter 2(Sections 2.1, 2.2, 2.3) & Chapter 6 (6.3, 6.5)
UNIT III : Chapter 3(Sections 3.1,3.2) & Chapter4 (Sections 4.1,4.2)
UNIT IV : Chapter 7 (sections 7.1,7.2,7.3)
UNIT V : Chapter 8 (sections 8.1,8.2,8.3)

REFERENCES:

[1] [1] Ian N.Snedden, The Use of Integral Transforms, McGraw Hill, 1972.
[2] T.Amaranath, An Elementary Course in Partial Differential Equations, second

Edition, Narosa publishing House, New Delhi, 1997.
[3] I.N. Snedden, Mixed Boundary value problems in potential theory, North Holland, 1966.

COURSE OUTCOMES:
After studying this course the student will be able to

CO1: Discuss in detail the basic concept of Laplace transforms and Important properties.

CO2: Analyze Inversion Integral,The Riemann , Lebesgue Lemma and Lemma for loop integrals , Heaviside series expansion.

CO3: Workout in detail the Application to ordinary differential equations , Elementary examples-Higher order equations, The diffusion equation ,Wave Propagation

CO4: Good knowledge on Fourier transforms, Exponential,Sine and Cosine transforms,Important properties.

CO5: Discuss the Potential Problems , Water Waves and Waves generated by a surface displacement.

Question Paper Pattern

SECTION A : $10 \times 2 = 20$ (Each Unit Carries Two Questions)

SECTION B $5 \times 5 = 25$ (Each Unit Carries Two Questions (Either or Type))

SECTION C $3 \times 10 = 30$ (Each Unit Carries One Questions)

Total = 75
