MANNAR THIRUMALAI NAICKER COLLEGE

PASUMALAI, MADURAI– 625 004

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

(Re-accredited with 'A' Grade by NAAC)

M.Sc., Mathematics

SYLLABUS AND REGULATIONS

UNDER
CHOICE BASED CREDIT SYSTEM (CBCS)
(For those who joined during 2018-2019 and after)

Eligibility condition for admission

For admission to Post Graduate Programmers (P.G) a candidate should have passed the 3years degree course (under 10 + 2 + 3 pattern) (B.Sc Mathematics and B.Sc Mathematics with CA) recognized by the university as equivalent there to.

Duration

Two years. Each year consists of 2 semesters. The duration of a semester is 90 working days.

Attendance

75% of the classes in each semester shortage of attendance can be condoned as per existing university rules.

Evaluation procedure :

A mark Statement with CGPA = $\frac{\sum(MarksXcredits)}{\sum(Credits)}$

Where the summations are over all paper appeared up to the current semester.

Examinations: 3 hours duration. Total marks 100 for all papers
External Internal ratio 75:25 with 2 Internal tests.

The scheme of Examination

The components for continuous internal assessment are:

Two tests and their average	--15 marks
Seminar /Group discussion	--5 marks
Assignment	--5 marks
Total	--25 marks

Pattern of the questions paper for the continuous Internal Assessment

The components for continuous internal assessment are:

Part –A

Six multiple choice questions (answer all) 6 x01= 06 Marks

Part –B

Two questions (‘either …. or ‘type) 2 x 07=14 Marks

Part –C

One question out of two 1 x 10 =10 Marks

Total 30 Marks

Pattern of the question paper for the Summative Examinations:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions 10 x01 = 10 Marks

(No Unit shall be omitted; not more than two questions from each unit.)

Part –B

Five Paragraph questions (‘either …. or ‘type) 5 x 07 = 35 Marks

(One question from each Unit)

Part –C

Three Essay questions out of five 3 x 10 =30 Marks

(One question from each Unit)

Total 75 Marks

Minimum Marks for a Pass

50% of the aggregate (Internal +Summative Examinations).
No separate pass minimum for the Internal Examinations.
34 marks out of 75 is the pass minimum for the Summative Examinations.

PROGRAMME SPECIFIC OUTCOMES

PSO1: To provide students with a knowledge, abilities and insight in Mathematics and computational techniques so that they are able to work as mathematical professional.

PSO2: To train students to deal with the problems faced by software industry through knowledge of mathematics and scientific computational techniques.

PSO3: To provide students with knowledge and capability in formulating and analysis of mathematical models of real life applications.

PSO4: Helps the students to acquire sufficient knowledge on computer skills so as to get placement in MNCs and to inculcate the research aptitude in various subjects in Mathematics.

MANNAR THIRUMALAI NAICKER COLLEGE(Autonomous)
DEPARTMENT OF M.Sc MATHEMATICS
(For those who joined in 2018-2019 and after)

Table: 1 : Course pattern

Study component	I Sem	II Sem	III Sem	IV Sem	Total Hours	Total Credit	No. of Course	Total Marks
Core Subjects	6(5) 6(5) 6(5) 6(4)	6(5) 6(5) 6(4) 6(4)	6(5) 6(5) 6(5) 6(4)	6(5) 6(5) 6(4) 6(4)	96	74	16	1600
Major Elective	6(4)	6(4)		6(4)	18	12	03	300
Non-Major Elective			6(4)		06	04	01	100
TOTAL	**30(23)**	**30(22)**	**30(23)**	**30(22)**	**120**	**90**	**20**	**2000**

SEMESTER – III							
Subject Code	**Subjects**	**No.of course**	**Hours / week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
18PMTC31	Field Theory and Lattices	1	6	5	25	75	100
18PMTC32	Complex Analysis	1	6	5	25	75	100
18PMTC33	Topology	1	6	5	25	75	100
18PMTC34	Statistics	1	6	4	25	75	100
18PMTN31	**Non Major Elective:** 1.Mathematics for Competitive Examinations	1	6	4	25	75	100
	TOTAL	**5**	**30**	**23**			**500**

SEMESTER –IV							
Subject Code	**Subjects**	**No.of course**	**Hours / week**	**Credits**	**Maximum Marks**		
					Int	**Ext**	**Total**
18PMTC41	Measure Theory and Integration	1	6	5	25	75	100
18PMTC42	Functional Analysis	1	6	5	25	75	100
18PMTC43	Operations Research	1	6	4	25	75	100
18PMTPR1	Project & Viva-voce	1	6	4	40	60	100
18PMTE41 18PMTE42 18PMTE43 18PMTE44	**Major Elective:** Any one of the Papers from the List given below **1. Number Theory** 2.Advanced Topology 3.Stochastic Processes 4. Fuzzy Sets and Logic	**1**	**6**	**4**	**25**	**75**	**100**
	TOTAL	**5**	**30**	**22**			**500**

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF MATHEMATICS
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Programme	**: PG**	**Part III**	**: Core**
Semester	**: III**	**Hours per week**	**: 06**
Sub code	**: 18PMTC31**	**Credit**	**: 05**

FIELD THEORY AND LATTICES

Course Outcomes
CO1: To make the students familiar with the concepts of Galois Theory.
CO2: To introduce its application in solvability by radicals.
CO3: To study about linear transformations and Lattices.
CO 4: To make them understand the aspects of field theory.

Unit –I

Fields, Extension fields, Roots of polynomials.

Unit –II

More about roots, The elements of Galois theory.

Unit –III

Solvability by Radicals, Galois groups over the rationals.

Unit –IV

Finite fields, Wedderburn's Theorem on finite division rings.

Unit – V

Lattices: Lattices and posets, lattices as posets. Sub lattices; direct products, distributive lattices, modular and geometric lattices, Boolean lattices.

Text book s:

1. Herstein.I.N, **Topics in Algebra**, Second Edition, John Wiley and Sons, 1999, New Delhi.
2. Garrot Birkoff and Thomas Bartee, **Modern Applied Algebra,** CBC Publishers and Distributors, 1999, New Delhi.

Unit I- Text Book 1 : Chapter 5 : Sections 5.1,5.3
Unit II -Text Book 1 : Chapter 5 : Sections 5.5,5.6
Unit III - Text Book 1 : Chapter 5 : Sections 5.7,5.8
Unit IV - Text Book 1 : Chapter 7 : Sections 7.1,7.2
Unit V- Text Book 2 : Chapter 9 : Sections 9.1 to 9.7

Reference Books:

1. Vijay K.Khanna, "**Lattices and Boolean Algebras",** Second Edition, Vikas Publishing House Pvt. Ltd, 2008.
2. John B.Fraleigh, "**A First Course in Abstract Algebra"**, Third Edition, Narosa Publishers, 2003, New Delhi.
3. Patrick Morandi , **"Field and Galois Theory"** ,Springer International Edition, 1996, New Delhi.

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Programme	**: PG**	**Part III**	**: Core**
Semester	**: III**	**Hours per week**	**: 06**
Sub code	**: 18PMTC32**	**Credit**	**: 05**

COMPLEX ANALYSIS

Course Outcomes

CO1: To understand the concept of analyticity, line integrals, residues.
CO2: To familiarize its applications.
CO3: To introduce Taylor and Laurent Series.
CO4: To introduce the theory of analytic function, complex integration and Riemann Zeta Function.

Unit –I

Introduction to the concept of Analytic Function – Elementary theory of Power Series.

Unit –II

The Exponential and Trigonometric Function – Conformality – Linear Transformation.

Unit –III

Fundamental Theorems – Cauchy Integral Formula – Local properties of Analytical Function.

Unit-IV

The General form of Cauchy's Theorem – The Calculus of Residues - Harmonic Functions.

Unit –V

Power Series Expansions – Partial Fractions and Factorization - Entire Functions – The Riemann Zeta Function .

Text Book:

1. Ahlfors, L.V., "**Complex Analysis"**, Third Edition, McGraw Hill International Company, 1979, New Delhi.

Unit I -	Chapter 2 : Section 1 and 2 (2.4 & 2.5)
Unit II -	Chapter 2 : Section 3
	Chapter 3 : Section 2 and 3 (3.1 to 3.3)
Unit III -	Chapter 4 : Section 1,2,3
Unit IV -	Chapter 4 : Section 4 (4.1 to 4.5) , Section 5 & Section 6
Unit V -	Chapter 5: Section 1,2(2.1 & 2.2) and Section 3 & 4.

Reference Books:

1. Churchill, R.V, J.W. Brown and R.F. Verhey, **Complex Variables and Applications**, McGraw – Hill International Company, 1974, New Delhi.

2. Conway, J.B, **Functions of one Complex Variable**, Narosa Publishing House, 2006, Chennai.

3. Karunakaran.V, Complex Analysis, Narosa Publishing House, 2005, Chennai.

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Programme	**: PG**	**Part III**	**: Core**
Semester	**: III**	**Hours per week**	**: 06**
Sub code	**: 18PMTC33**	**Credit**	**: 05**

TOPOLOGY

Course Outcomes

CO1: To familiarize the concepts of Topology.
CO2: To learn the various aspects of Topological spaces.
CO 3: To define and categorize the separation axioms which separate a point from another Point.
CO4: To introduce the metrization theorem.

Unit –I

Topological spaces – Basis for a topology - The order topology –The product topology on $X \times Y$ – The sub space topology – Closed sets and limit points – Continuous functions – The product topology.

Unit –II

The metric topology – connected spaces – connected subspaces of the real line.

Unit-III

Compact spaces – Compact sub spaces of the real line – Limit point compactness – Local compactness.

Unit –IV

Countability axioms - The separation axioms – Normal spaces .

Unit – V

The Urysohn Lemma – The Urysohn metrization theorem – Tietze Extension theorem.

Text Book:

1. James R.Mukres, "**Topology**" (Second Edition), Prentice –Hall of India Private Ltd, January 1987, New Delhi.

Unit I-	Chapter 2 : Sections 12 to 19
Unit II -	Chapter 2 : Sections 20 and 21 &
	Chapter 3: Sections23 and 24
Unit III -	Chapter 3 : Sections 26 to 29
Unit IV -	Chapter 4 : Sections 30 to 32
Unit V -	Chapter 4 : Sections 33 to 35

Reference Books:

1. Gupta. K.P, **Topology**, First Edition, Pragati Prakashan Educational, 1974, Meerut-250001.
2. James Dugundji, **Topology**, Universal book stall, Reprint 1990, New Delhi.
3. . Chandrasekhara Rao, "Topology", Narosa Publishing House, 2009, New Delhi.

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Programme	**: PG**	**Part III**	**: Core**
Semester	**: III**	**Hours per week**	**: 06**
Sub code	**: 18PMTC34**	**Credit**	**: 04**

STATISTICS

Course Outcomes
CO1: To develop knowledge on various standard distributions.
CO2: To introduce Sampling Theory.
CO3: To familiarize the application through various statistical methods.
CO4: To create statistical models for real life problems.

Unit – I

Introduction : Set theory, Probability set function, Conditional probability and Independence , Random variables of the discrete type , Random Variables of the continuous type , Properties of the distribution function, Expectation of a Random variable, Some special expectations , Chebyshev's inequality.

Unit – II

Distributions of random variables, Conditional distributions and expectations , The correlation coefficient , Independent random variables, Extension to several random variables.

Unit – III

The Binomial and Related distributions, The Poisson distribution, The Gamma and Chi-square distribution, The Normal distribution, The Bivariate normal distribution.

Unit – IV

Sampling theory , Transformations of variables of the discrete type, Transformations of variables of the continuous type, The Beta , t, F distributions, Extensions of the change of variable technique, The moment generating function technique, Some Specific distributions - The distributions of $\bar{X}$ and $\frac{n s^2}{\sigma^2}$, Expectation of functions of Random Variables.

Unit –V

Convergence of distribution, Convergence of probability, Limiting moment generating functions , the Central limit theorem , Some theorems of limiting distributions.

Text Book :

1. Hogg, R.V and Craig, A.T, **Introduction to Mathematical Statistics**, Fifth Edition , Pearson Education, 2005, New Delhi.

Unit I - Chapter 1 : Sections 1.1 to 1.10

Unit II - Chapter 2 : Sections 2.1 to 2.5

Unit III - Chapter 3 : Sections 3.1 to 3.5

Unit IV - Chapter 4 : Sections 4.1 to 4.9

Unit V - Chapter 5 : Sections 5.1 to 5.5

Reference Books:

1. Irwin Miller, **Mathematical Statistics**, Pearson Publisher, 2004.
2. David Freeman, **Statistics**, Viva Book Publisher, 2010.
3. R.S.N.Pillai & Bagavathy , Statistics Theory and Practice, S.Chand Publications, 7th Revised Edition , 2008.

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Programme	**: PG**	**Part IV**	**: NME**
Semester	**: III**	**Hours per week**	**: 06**
Sub code	**: 18PMTN31**	**Credit**	**: 04**

MATHEMATICS FOR COMPETITIVE EXAMINATIONS

Course Outcomes

CO1: To develop knowledge on various standard distributions.
CO2: To introduce Sampling Theory.
CO3: To familiarize the application through various statistical methods.
CO 4: To apply the concepts in Competitive Examinations.

Unit –I

H.C.F. and L.C.M. of numbers – Simplifications.

Unit – II

Percentage – Profit and loss – Ratio and proportion.

Unit – III

Time and work – Time and distance – Problems on Trains.

Unit – IV

Simple interest – Compound interest – Stocks and Shares.

Unit –V

Data interpretation: Tabulation – Bar Graphs – Pie charts.

Text Book:

1. Aggarwal. R.S, **Quantitative Aptitude**, S.Chand and Company Ltd, 2009, New Delhi.
   Unit I – Chapters 2 & 4 (Except exercises)
   Unit II – Chapters 10, 11 & 12 (Except exercises)
   Unit III – Chapters 15, 17 & 18 (Except exercises)
   Unit IV – Chapters 21, 22 & 29 (Except exercises)
   Unit V – Chapters 36, 37 & 38 (Except exercises)

Reference Books:

1. Abhigit Guha, **Quantitative Aptitude**, 4th Edition, Tata McGraw Hill Publications, 2011, New Delhi.
2. Mohan Rao.U, **Quantitative Aptitude**, Scitech Publications, Reprint 2013, Chennai.

Aggarwal. R.S, **Verbal & Non Verbal Reasoning**, S.Chand & Co, 2009, New Delhi.

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Programme	**: PG**	**Part III**	**: Core**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTC41**	**Credit**	**: 05**

MEASURE THEORY AND INTEGRATION

Course Outcomes

CO1: To introduce the idea connected to the concepts of measures.
CO2: To explain about measurable sets and functions.
CO3: To learn more about Riemann and Lebesgue integration.
CO4: Ability to use a wide range of references and thinking.

Unit –I

Measure on the Real line **–** Lebesgue outer Measure **–** Measurable sets-Regularity.

Unit – II

Measurable functions – Borel and Lebesgue Measurability.

Unit – III

Integration of non-negative functions – The general integral **–** Integration of series.

Unit – IV

Riemann and Lebesgue integrals – The four derivatives – Continuous non – differentiable functions.

Unit – V

Functions of bounded variations – Lebesgue differentiation theorem **–** Differentiation and Integration – The Lebesgue set.

Text book:

1. De Barra. G, **Measure Theory and Integration**, New Age International Pvt Ltd, Chennai, Reprint, 2010.
   Unit I – Chapter 2 Sections 2.1 to 2.3
   Unit II – Chapter 2 Sections 2.4 & 2.5
   Unit III – Chapter 3 Sections 3.1 to 3.3
   Unit IV – Chapter 3 Section 3.4 & Chapter 4 Sections 4.1 & 4.2
   Unit V – Chapter 4 Sections 4.3 to 4.6

Reference Books:

1. Royden, H.L., **Real Analysis**, Pretice-Hall of Indian Pvt. Ltd, 2008, New Delhi.
2. Jain, P.K and Gupta. P.K, **Lebesgue Measure and Integration**, New Age International Pvt .Ltd, Reprint 2010, Chennai.
3. Malik. A. K & S.K.Gupta, "**Measure Theory and Intregration**", I.K International Publishibg House Pvt , Ltd, Reprint 2017, New Delhi.

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Programme	**: PG**	**Part III**	**: Core**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTC42**	**Credit**	**: 05**

FUNCTIONAL ANALYSIS

Course Outcomes
CO1: To develop the skills in analyzing the basic structure of Normed spaces.
CO2: To get knowledge in using some special classes of functions.
CO3: To explain about various types of operators.
CO4: To understand Banach and Hilbert spaces and self-adjoint Operators.

Unit I

Normed Spaces, Banach Spaces – Further properties of normed spaces – finite dimensional normed spaces and Subspaces - Compactness and Finite Dimension - Linear operators.

Unit II

Bounded and Continuous linear operators-Linear functionals – linear operators and functionals on finite dimensional spaces –normed spaces of operators and dual spaces - Inner product space, Hilbert space - Further properties of inner product spaces.

Unit III:

Orthogonal complements and direct sums – Orthonormal sets and sequences –series related to orthonormal sets and sequences – Total orthonormal sets and sequences - Representation of functionals on Hilbert spaces.

Unit IV

Hilbert Adjoint operator - Self adjoint operators, unitary and normal operators - Zorn's Lemma - Hahn-Banach Theorem- Hahn-Banach theorem for complex vector spaces and normed spaces - Bounded Linear Functional on C[a, b] and its Applications.

Unit V

Adjoint operator - Reflexive spaces – Uniform boundedness theorem - Strong and weak convergence – Convergence of sequences of operators and functional - Open mapping theorem - Closed graph theorem.

Text Book:

1. Introductory Functional Analysis with Applications by Erwin Kreyszig , John Wiley & Sons Publication (2006).

Unit I -	Chapter 2:Sections 2.2 - 2.6
Unit II -	Chapter 2: Section 2.7 - 2.10
	Chapter 3: Sections 3.1 - 3.2
Unit III -	Chapter 3: Sections 3.3 - 3.6 & 3.8
Unit IV -	Chapter 3: Section 3.9 - 3.10
	Chapter 4: Sections 4.1 - 4.4
Unit V -	Chapter 4: Sections 4.5 - 4.9 & 4.12 -4.13

Reference Books:

1. Limaye. B.V, **Functional Analysis,** New age International PVT. Ltd, 2007, New Delhi.
2. PawanK.Jain & OM.P.Ahuja, **Functional Analysis**, New Age International (P) Limited, New Delhi.
3. Thamban Nair. M, "**Functional Analysis**- A First course, PHI Learning Private Limited, 2002, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF MATHEMATICS
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Programme	**: PG**	**Part III**	**: Core**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTC43**	**Credit**	**: 04**

OPERATIONS RESEARCH

Course Outcomes

CO1: To familiarize various decision– making tools.
CO2: To introduce some techniques used in OR.
CO3: To introduce the application on inventory control system and etc.
CO4: To Identify the resources required for a project and generate a plan and work schedule.

Unit – I

Network definitions- minimal spanning tree algorithm-Shortest route problem-maximal flow model-minimum cost capacitated flow problem- CPM and PERT.

Unit – II

Recursive nature of computations in DP - Forward and Backward recursion - Selected DP applications. General inventory models – Static Economic Order Quantity(EOQ) models.

Unit –III

Decision making under certainty-Analytic Hierarchy Process(AHP)-Decision making under risk- decision under uncertainty-Game theory.

Unit –IV

Queuing systems – Elements of Queuing model – Role of Exponential Distribution – Pure Birth and Death Models – Generalized Poisson Queuing Models – Specialized Poisson Queues.

Unit –V

Unconstrained Problems – Constrained Problems.

Text Book:

1. Hamdy A. Taha, **Operations Research – An introduction**, 8th Edition, PHI, New Delhi.
   Unit I - Chapter 6: sections 6.1 to 6.5
   Unit II - Chapter 10: sections 10.1 to 10.3
   Chapter 11:sections 11.1 to 11.3
   Unit III - Chapter 13:sections 13.1 to 13.4
   Unit IV - Chapter 15:sections 15.1 to 15.6
   Unit V - Chapter 18: sections 18.1 to 18.2

Reference Books:

1. Kanti Swarup , P.K. Gupta and Man Mohan, "**Operations Research"** , Sultan Chand & sons Publications, Reprint 2006, New Delhi.

2. Harvey M. Wagner, "**Principles of Operations Research", Second** Edition, Prentice Hall of Pvt Ltd, 1998, New Delhi.

3. Prem Kumar Gupta and D.S.Hira, "**Operations Research**", S.Chand Publications, 2009, New Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
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Programme	**: PG**	**Part III**	**: Core**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTPR1**	**Credit**	**: 04**

PROJECT & VIVA-VOCE

Evaluation of the Project & Viva-Voce shall be made jointly by the research supervisor and the External Examiner.

Evaluation of Project & Viva-Voce

Maximum Marks : 100 Marks

Internal : 40 Marks
External : 60 Marks

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
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Programme	**: PG**	**Part III**	**: Elective**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTE41**	**Credit**	**: 04**

NUMBER THEORY

Course Outcomes

CO1: To introduce some importance tools in number theory.
CO2: To learn about number theoretical functions.
CO3: To recognise the importance of the Division Algorithm, and be able to apply it in a variety of scenarios.
CO4: To familiarize about primitive roots.

Unit – I

Preliminaries: Well – ordering principle, induction , binomial coefficients, Greatest integer function – Divisibility : Notion of divisibility, G.C.D, Euclids Algorithm , G.C.D via Euclid's Algorithm, L.C.M, Representations of integers .

Unit – II

Primes: Definition, Prime counting function , Prime number theorem ,Test of Primality, Sieve of Eratosthenes, Canonical factorization, Fundamental theorem of Arithmetic.

Unit – III

Congruences : Congruences and Equivalence relations, Linear Congruence, Linear Diophantine equations, Chinese Remainder Theorem, Polynomial Congruences, Modular Arithmetic, Fermat's Theorem, Wilson's Theorem, Pythagorean equation.

Unit – IV

Arithmetic functions: Sigma, Tau functions, Dirichlet product, Dirichlet inverse, Mobius function, Euler's function, Euler's theorem.

Unit –V

Primitive roots: Definition, properties, Existence-Quadratic Congruences : Quadratic Residues, Legendre symbols, Gauss lemma, Law of quadratic reciprocity .

Text Book:

1. Neville Robbins, **Beginning of Number Theory**, Second Edition, Narosa publications, New Delhi, 2006.
   Unit I - Chapters : 1,2
   Unit II - Chapter : 3
   Unit III - Chapter :4
   Unit IV - Chapter : 5
   Unit V - Chapter 6: sections 1,2 & 3 only.
   Chapter 7: sections 1,2 and 3 only.

Reference Book:

1. Ivan Niven**, Introduction to Theory of numbers,** Wiley Eastern, 2009.
2. Tom M. Apostal, Introduction to Analytic Number Theory, Springer International Edition,
3. Martin Erichson & Anthony Vazzana**, " Introduction to Number Theory",** Saurabh printers Private Ltd, 2010.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
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Programme	**: PG**	**Part III**	**: Elective**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTE42**	**Credit**	**: 04**

ADVANCED TOPOLOGY

Course Outcomes

CO1: To introduce the concept of Local finiteness and Completeness.
CO2: To familiarize compactness.
CO3: To study about Baire spaces.
CO4: To define and categorize the separation axioms which separate a point from another point, a point from a set that does not contain this point and a set from another set.

Unit –I

The stone-cech Compactification- Local finiteness.

Unit – II

The Nagata- smirnov Metrization theorem – Para Compactness- The Smirnov Metrization theorem.

Unit –III

Complete metric spaces- A space filling curve.

Unit – IV

Compactness in metric spaces – point wise and compact convergence- Ascoli's theorem.

Unit – V

Barie spaces – A Nowhere differentiable function

Text Book :

1. James R.Mukres, **Topology,** Second Edition, Prentice –Hall of India Private Ltd, New Delhi, 2010.

Unit I - Chapter 8 : section 38
Chapter 6 : section 39
Unit II - Chapter 6 : section 40, 41 and 42
Unit III - Chapter 7 : section 43 and44
Unit IV - Chapter 7 : section 45,46 and 47
Unit V - Chapter 8 : section 48 and 49.

Reference Books:

1. Gupta. K.P, **Topology**, First Edition, Pragati Prakashan Educational, 1974, Meerut.
2. James Dugundji, **Topology,** Universal book stall, Reprint 1990, New Delhi.
3. Chandrasekhara Rao.K, "**Topology**",Narosa Publishing House, 2009, New Delhi.

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Programme	**: PG**	**Part III**	**: Elective**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTE43**	**Credit**	**: 04**

STOCHASTIC PROCESSES

Course Outcomes

CO1: To introduce the concepts of Stochastic Process.
CO2: To familiarize its applications.
CO3: To learn about real life problems.
CO4: To provide the classification and properties of, discrete and continuous time Markov chains, simple Markovian queueing models.

Unit – I

Stochastic Processes : Some notions – Specification of Stochastic processes – Stationary process – Markov Chains – Definitions and examples – Higher Transition probabilities – Generalization of Independent Bernoulli trails- Sequence of chain – Dependent trains.

Unit-II

Markov Chains : Classification of state and chains – determination of higher transition probabilities – stability of a Markov system – Reducible chains – Markov chains with continuous state space.

Unit –III

Markov processes with Discrete state space : Poisson processes and their extensions – Poisson process and related distribution – Generalization of Poisson process – Birth and Death process- Markov processes with discrete state space (continuous time Markov Chains)

Unit –IV

Renewal processes and theory : Renewal process – Renewal processes in continous time – Renewal equation – stopping time – Wald's equation – Renewal theorems.

Unit-V

Stochastic processes in Queuing – Queuing system – General concepts – the queuing model M/M/1 – Steady state behaviour – transient behaviour of M/M/1 Model – Non Markovian models – the model GI/M/1.

Text Books:

1. Medhi.J, **Stochastic Processes**, Wiley Eastern, 1987, New Delhi.

Unit I -	Chapter 2 : Sections 2.1 to 2.3, Chapter 3 : Sections 3.1 to 3.3
Unit II -	Chapter 3 : Sections 3.4 to 3.6, 3.8, 3.9 and 3.11
Unit III -	Chapter 4 : sections 4.1 to 4.5
Unit IV -	Chapter 6 : sections 6.1 to 6.5
Unit V -	Chapter 10 : Sections10.1 to 10.3, 10.7 and 10.8

Reference Books:

1. Basu.A.K., **Stochastic Process**, Narosa Publisher, 2007, New Delhi.
2. Bhat. B.R, Stochastic Model, New Age International Publisher, 2010, Delhi, reprint.
3. Zdzistaw Brzezniak and Tomsz Zastawniak, Basic Stochastic process, Springer, 2009, Delhi.

MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF MATHEMATICS
(For those who joined in 2018-2019 and after)

Programme	**: PG**	**Part III**	**: Elective**
Semester	**: IV**	**Hours per week**	**: 06**
Sub code	**: 18PMTE44**	**Credit**	**: 04**

FUZZY SETS AND LOGIC

Course Outcomes:
CO1: To develop the basic knowledge of fuzzy sets and its operations.
CO2: To familiarize fuzzy numbers and fuzzy operations.
CO3: To explain about the nature and difference between crisp and fuzzy relations.
CO4: Be thorough with the concept of Logical connectives and fuzzy graphs.

Unit – I

Fuzzy sets: Basic types – Basic concepts – Additional properties of α–cuts – Representation of fuzzy sets – Extension principle for fuzzy sets – Types of operations – Fuzzy complements.

Unit – II

Fuzzy numbers – Linguistic variables – Arithmetic operation on intervals – Arithmetic operation on fuzzy numbers..

Unit – III

Fuzzy relation: Crisp versus Fuzzy relation – projection and cyclinderic extensions - Binary fuzzy relation on a single set – fuzzy equivalence relations – Fuzzy compatibility relation – Fuzzy ordering relation.

Unit – IV

Fuzzy logic: Classical logic – An over view – multi-valued logic –Fuzzy propositions – Fuzzy quantifiers – Linguistic hedges.

Unit – V

Applications: Approximate Reasoning –An Overview – Fuzzy Implications – Selection of Fuzzy Implications – Multi-conditional Approximate Reasoning – The Role of Fuzzy Relation Equations – Interval-Valued Approximate Reasoning.

Text Book:

1. George J Klir and B.Yuan, Fuzzy sets and Fuzzy logic – Theory and application, Second edition, Prentice Hall, 1995, New Delhi.

Unit I -	Chapter 1: Sections 1.2 to 1.4
	Chapter 2: Sections 2.1 to 2.3
	Chapter 3: Sections 3.1 & 3.2
Unit II -	Chapter 4: Section 4.1 to 4.4
Unit III -	Chapter 5: Sections 5.1 to 5.7
Unit IV -	Chapter 8: Section 8.1 to 8.5
Unit V -	Chapter 11: Sections 11.1 to 11.6

Reference Books:

1. Zimmermann, H.J, **Fuzzy Set Theory and its Applications**, Fourth Edition, Springer Publishers, 2006, New Delhi.
2. DuBois.D and Prade.H.M, Fuzzy Sets and Systems: Theory and Applications, Academic Press, 1994.
3. Ganesh.M, Introduction to Fuzzy sets and Fuzzy logic, Prentice Hall of India, 2006), New Delhi.