MANONMANIAM SUNDARANAR UNIVERSITY,
TIRUNELVELI
UG COURSES – AFFILIATED COLLEGES
B.Sc. MATHEMATICS
(Choice Based Credit System)
(with effect from the academic year 2017-2018 onwards)

Sem	Part	Sub.No	Subject Status	Subject title	Hrs /Week	Credits	Mark				
							Maximum s Passing			minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
V	III	27	Core-7	Abstract Algebra II	5	4	25	75	100	30	40
		28	Core-8	Real Analysis II	5	4	25	75	100	30	40
		29	Core-9	Statics	5	4	25	75	100	30	40
		30	Core-10	Transforms and their Applications	5	4	25	75	100	30	40
		31	Major Elective -I	Any one of the following 1.1. Astronomy -I 1.2.Discrete Mathematics 1.3.Combinatorial Mathematics	4	4	25	75	100	30	40
		32	Major Elective-II	Any one of the following 2.1.Operations Research - I 2.2.Stochastic Process 2.3. MS Office	4	4	25	75	100	30	40
	IV	33	Skill Based Common	Personality Development /Effective Communication / Youth Leadership	2	2	25	75	100	30	40

VI	III	34	Core-11	Complex Analysis	5	4	25	75	100	30	40
		35	Core-12	Number Theory	4	4	25	75	100	30	40
		36	Core-13	Graph Theory	5	4	25	75	100	30	40
		37	Core-14	Dynamics	4	4	25	75	100	30	40
		38	Core-15	Numerical Methods	4	4	25	75	100	30	40
		39	Major Elective-III	Any one of the following 3.1 Astronomy II 3.2Fuzzy Mathematics 3.3 Mathematical Modeling	4	4	25	75	100	30	40
		40	Major Elective-IV	Any one of the following Operations Research II Coding Theory Programming in	4	4	25	75	100	30	40

SEMESTER – V

L	T	P	C
3	2	0	4

CORE PAPER – VII
ABSTRACT ALGEBRA II (75 Hours) (SMMA51)

Objectives:

- To facilitate a better understanding of vector space
- To solve problems in matrices

Unit I **Vector Spaces :** Definition and examples – elementary properties – subspaces – linear transformation – fundamental theorem of homomorphism **16L.**

Unit II Span of a set – linear dependence and independence – basis and dimension – theorems **14L**

Unit III Rank and nullity Theorem – matrix of a linear transformation
Inner product space : Definition and examples – orthogonality – orthogonal complement – Gram Schmidt orthognalisation process**.** **15L**

Unit IV **Matrices :** Elementary transformation – inverse – rank -Cayley Hamilton Theorem-Applications of Cayley Hamilton Theorem **15L**

Unit V **E**igen values and Eigen vectors – Properties and problems-Bilinear Forms-Quadratic Forms-Reduction of quadratic form to diagonal form **15L**

Text Book:

Arumugam & Issac – Modern Algebra

Books for Reference :

- Shama .J.N and Vashistha .A.R, "Linear Algebra", Krishna Prakash Nandir, 1981.
- John B. Fraleigh, "A First Course in Abstract Algebra", 7th edition, Pearson, 2002.
- Strang G., "Introduction to Linear Algebra", 4th edition, Wellesly Cambridge Press, Wellesly, 2009.
- Artin M., "Abstract Algebra", 2nd edition, Pearson, 2011

SEMESTER – V

L	T	P	C
3	2	0	4

CORE PAPER – VIII

REAL ANALYSIS - II (75 Hours) (SMMA52)

Objectives:

- To understand the real number of system and metric spaces
- To know the concepts of continuity and Riemann integrals
- To study the concept of connectedness and compactness

Unit I Metric spaces – Examples – bounded sets – open ball – open sets – subspaces – Interior of a set**.** **13L**

Unit II Closed sets – closure – Limit points – Dense sets – complete metric space – Cantor‟s intersection theorem – Baire‟s Category Theorem. **16L**

Unit III Continuous functions on metric spaces : Functions - continuous at a point on the real line – Functions - Continuous – uniform continuous in a metric space – Discontinuous function of R. **15L**

Unit IV Connectedness and compactness : Connectedness – connected subset of R – connectedness and continuity – compact metric spaces – compact subset of R – Heine Borel theorem. **16L**

Unit V **Riemann Integral :**

Sets of measure zero – Existence of the Riemann integral – Derivatives – Rolle‟s theorem – Fundamental theorem of Calculus – Mean value theorem – Cauchy‟s mean value theorem – Taylor‟s theorem**.** **15L**

Text Books:

Arumugam & Issac – Modern Analysis

- Malic .S.C - Mathematical Analysis, Wiley Eastern Limited, New Delhi.

Books for Reference :

- Tom .M. Apostal – Mathematical Analysis, II Edition, Narosa Publishing House, New Delhi (Unit I) (1997)
- Goldberg .R – Methods of Real Analysis Oxford and IBH Publishing Co. New Delhi (200)
- Viswanath Naik .K – Real Analysis, Emerald Publishers, Chennai.
- Berberian .S.K – First course in Real Analysis, Springer Verlag, New York.

L	T	P	C
3	2	0	4

SEMESTER – V

CORE PAPER – IX

STATICS (75 Hours) (SMMA53)

Objectives:

- To provide the basic knowledge of equilibrium of a particle
- To develop a working knowledge to handle practical problems

Unit I : Forces acting at a point – parallelogram Law f forces – Triangle of forces – Lami‟s Theorem – Problems. **16L**

Unit II: Parallel forces and moments – resultant of two parallel forces – resultant of two unlike unequal parallel forces – Varignon‟s Theorem – Problems. **14L**

Unit III : Equlibrium of three forces acting on a regid body – three coplanar forces theorem – problems. **16L**

Unit IV : Friction – Laws of friction – angle of friction – equilibrium of a particle (i) on a rough inclined plane (ii) under a force parallel to the plane (iii) under any force – problems **15L**

Unit V : Equilibrium of strings – equation of the common catenary – tension at any point – Geometrical properties of common catenary – problems. **14L**

Text Book:

Venkatraman, M.K. - Statics, Agasthiar Publications, Trichy.

Books for Reference:

.S – Statics, Emerald Publishers.
3. Duraipandian, P, Laxmi Duraipandian and Muthamizh Jayapragasam- Mechanics, S.Chand & Company.
1. Narayanan, S-Statics, S.Chand & Company, New Delhi.
2. Viswanatha Naik, K and Kasi, M

L	T	P	C
3	2	0	4

SEMESTER-V

CORE PAPER-X

TRANSFORMS AND THEIR APPLIATIONS (75 HOURS) (SMMA54)

Objectives:

- To develop the knowledge of Transformations
- To solve the problems connected

Unit I	Fourier transforms-Properties of Fourier transforms	**13L**
Unit II	Infinite Fourier Cosines and Sine transforms-Properties	**12L**
Unit III	Finite Fourier transforms	**13L**
Unit IV	Z tranforms-Properties	**12L**
Unit V	Inverse Z transforms	**10L**

Text Book:

A.Singaravelu-Engineering Mathematics (Volume III)-Meenakshi Agency,Chennai

Reference Book:

A.Gangatharan-Engineering Mathematics (Volume II)-PHI (2007)

L	T	P	C
4	0	0	4

SEMESTER – V

Paper – XI

MAJOR ELECTIVE - I

Combinatorial Mathematics (60 Hours) (SMMA5C)

Objectives:
-To know the basic concepts of Pairings
-To understand relations
-To study the concepts of designs

Unit I Selections and Binomial coefficients – Permutations – Ordered Selections – Unordered Selections – Miscellaneous Problems. **13L**

Unit II Pairings Problems - Pairings within a set – Pairings between sets **12L**

Unit III Recurrence – Fibonacci – type relations. Using generating functions – Miscellaneous methods. **12L**

Unit IV The inclusion – Exclusion Principles **11L**

Unit V Block designs – Square Block designs **11L**

Text Book:

- Ian Andersen – A first course in combinatorial Mathematics – Clarendon Press, Oxford.

SEMESTER – V

L	T	P	C
4	0	0	4

Paper – XII

MAJOR ELECTIVE - II

2.1 Operations Research-I (60 Hours) (SMMA5D)

Objectives:

- To introduce the various techniques of operations research
- To make the students solve real life problems in Business Management
- To understand different types of LPP

Unit I **Linear Programming Problem :** Mathematical formulation of LPP –Graphical Method- Simplex Method – Artificial variable technique **13L**

Unit II Concept of Duality – Primal and Dual Problems – Duality – Dual Simplex Method. **12L**

Unit III **Transportation Problem :** North-West Corner Rule – Matrix Minima method – Vogel‟s Approximation Method – MODI Method – Degeneracy and Unbalanced Transportationproblem. **12L**

Unit IV **Assignment Problem :** Hungarian Method – Unbalance Assignment Problem **11L**

Unit V Sequencing Problem: n jobs and 2 machines- n jobs and 3 machines- 2 jobs and m machines **12L**

Text Book :

- KantiSwarup, P.K. Gupta and Manmohan – Operations Research – Sultan Chand & Sons – 2006, 12th edition.

Books for Reference :

- Gupta .P.K and D.S. Hira – Operations Research – S. Chand and Company.
- B.J. Ranganath and A.S.Srikantappa -Operations Research, Yesdee Publishing House,Chennai(2017)
- Hillier, F.S. and G.J. Lieberman - Introduction to Operations Research, 9th Ed., Tata McGrawHill, Singapore, 2009.
- Hamdy A. Taha, - Operations Research, An Introduction, 8th Ed., Prentice – Hall India, 2006.
- Hadley .G. - Linear Programming, Narosa Publishing House, New Delhi, 2002.

SEMESTER – VI

L	T	P	C
3	2	0	4

CORE -XI
Major Paper – XIII

COMPLEX ANALYSIS (75 Hours) (SMMA61)

Objectives:

-To understand thefunctions of complex variables

-To learn about elementary transformations concepts in complex variables

-To understand the singularity concepts and residues

Unit I **(Analytic functions)**

Functions of a complex variable – Derivatives – Cauchy – Riemann equations – sufficient conditions – Polar form – Analytic functions – Harmonic functions**.** **13L**

Unit II **(Integrals)**

Definite integrals – Contours – Cauchy – Goursat theorem – antiderivatives and independence of path – Cauchy Integral formula – Morera‟s theorem. **17L**

Unit III **(Series)**

Taylor‟s series – Examples – Laurent‟s series – Zeros of analytic functions – Residues – Residue theorem – Principal part of functions – Residues at poles. **16L**

Unit IV **(Evaluation of Integrals)**

Evaluation of improper real integrals – improper integrals involving sines and cosines – Definite integrals involving sines and coines**.** **14L**

Unit V **(Transformations)**

Conformal mappings–basic properties–Bilinear maps – fixed points – Applications 1**5L**

Text Book:

- Arumugam.S and T. Issac – “Complex Analysis” – Scitech Publishing House – Chennai.

Books for Reference :

- Churchill .R.V. and J.W. Brown – “Complex variables and Applications” – IV edition – McGraw Hill International Editions.
- Ponnuswamy .S – “Foundations of Complex Analysis”, Narosa Publication House, New Delhi, II edition 2005.
- Duraipandian .P and Lakshmi Duraipandian – “Complex Analysis” – Emerald Publications, Chennai (2001)

SEMESTER – VI

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CORE -XII
Major Paper – XIV

NUMBER THEORY (60 Hours) (SMMA62)

Objectives:

-To highlight the beauties in the world of numbers

-Toprepare the students for coding through cogruences

Unit I Peano‟s Axioms – Mathematical Induction – The Binomial Theorem – Early NumberTheory. **11L**

Unit II Division Algorithm – GCD – Euclidean Algorithm – The Diaphantine Equation ax+by=c. **12L**

Unit III The fundamental Theorem of Arithmetic – The Sieve of Eratosthenes – The Goldbach conjecture. **13L**

Unit IV Basis properties of congruences – Linear congruence and the Chinese Remainder Theorem. **11L**

Unit V Fermat‟s Theorem – Wilson‟s Theorem – The Fermat – Kraitchik Factorization Method. **13L**

Text Book:

- David .M. Burton - Elementary Number Theory (Sixth Edition) Tata McGraw Hill Education Pvt. Ltd.

Books for Reference :

- Ivan Niven and H, Zuckerman - An Introduction to Theory of Numbers.
- Kumaravelu .S, and Susheela Kumaravelu - Elements Theory - Nagercoil, 2002.

SEMESTER – VI

L	T	P	C
3	2	0	4

CORE -XIII
Major Paper – XV

GRAPH THEORY (75 Hours) (SMMA63)

Objectives:

-To introduce the notion of graph theory and its applications

-To learn the techniques of combinatorics in graph theory

Unit I: Definition and examples of graphs – degrees – subgraphs – isomorphism – independent sets and coverings – matrices – operation on graphs.
18L

Unit II: Degree sequences – graphic sequences – walks – trails and paths – connectedness and components – connectivity. **18L**

Unit III: Eulerian graphs – Hamiltonian graphs – characterisation of trees – centre of a tree**.**
13L

Unit IV: Definition and properties of planar graphs – chromatic number and chromatic index **13L.**

Unit V: Chromatic polynomials – definition and basic properties of digraphs – paths and connectedness in digraphs**.**
13L

Text book:

Arumugam,S and S. Ramachandran – Invitation to graph Theory, Scitech publications, Chennai.

Books for reference:

- Kumaravelu. S and Susheela Kumaravelu – Graph theory.
- Narasingh Deo – Graph theory with application to engineering and computer science, Prentice – Hall of india pvt. Ltd., New Delhi.

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SEMESTER -VI

CORE -XIV

MAJOR PAPER -XVI

DYNAMICS(60 Hours) (SMMA64)

Objectives:

-To provide a basic knowledge of the behaviour of objects in motion

-To develop a working knowledge to handle practical problems

Unit I : Projectiles- Equation of path – range – maximum height- time of flight- range on an inclined plane-problems. **14L**

Unit II : Collision of elastic bodies- Laws of impact- direct and oblique impact-Problems. **11L**

Unit III : Simple Harmonic Motion (SHM) in a straighrt line- Geometrical representation – composition of SHM‟s of the same period in the same line and along two perpendicular directions – problems**.** **13L**

Unit IV : Motion under the action of central forces – velocity and acceleration in polar co-ordinates – problems. **10L**

Unit V : DifferentialEquation of central orbit - pedal equation of central orbit – problems to find the law of force towards the pole when the orbit is given. **12L**

Text Book:

Venkatraman, M.K. - A Text Book on Dynamics, Agasthiar Publication, Trichy.

Books for Reference:

1. Narayanan, S- Dynamics, S.Chand & company, 16th Edition,1986, New Delhi.
2. Duraipandiyan, P, Laxmi Duraipandian and Muthamiz Jayaprgasam- Mechanics 2003, S.Chand & Company.

SEMESTER -VI
CORE -XV
MAJOR PAPER -XVII

L	T	P	C
4	0	0	4

NUMERICAL METHODS (60 Hours) (SMMA65)

Objectives:

-To introduce the finite differences

-To solve numerical problems by different methods

Unit I Solution of Numerical algebraic and Transcendental Equations : bisection method – Newton‟s method. Criterion of order of convergence of Newton‟s method. Regula False method – Gauss elimination – Gauss Jacobi – Gauss Seidal method **13L**

Unit II **Finite Difference :** First and higher order differences – Forward and backward differences – Properties of Operator – Differences of a polynomial –Factorial Polynomial **11L**

Unit III Interpolation : Newton‟s Forward – backward, Gauss forward – backward interpolation formula – Bessel‟s formula. Divided differences – Newton‟s divided difference formula – Legrange‟s interpolation formule **11L**

Unit IV Numerical Differentation and Integration : Newtons forward and backward differences for differentiation – Derivatives using Bessel‟s formula – Trapezoidal rule, simpson‟s 1/3 rule & 3/8 rule **13L**

Unit V **Difference Equations :** Definition – order and degree of difference equation – Linear difference equation – Finding complementary function – particular Integral –simpleapplications. **12L**

Text Book:

- Venkatraman .M.L - Numerical methods in Science and Engineering National Publishing Company V Edition 1998

Books for Reference :

- Kandasamy .P.K. Thilagavathy and K. Gunavathy „Numerical Methods‟ S. Chand & Company Ltd. Edn. 2006.
- B. Stephen John – Numerical Analysis
- Autar Kaw and Egwwn Enc Kalu - Numerical methods with Application Abidet. Autokaw.com 2nd 2011.

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4	0	0	4

SEMESTER – VI

Paper – XIX

MAJOR ELECTIVE - III

3.2 FUZZY MATHEMATICS (60 Hours) (SMMA6B)

Objectives:

-To introduce fuzzy concepts to students

-To facilitate the students to study fuzzy operations and fuzzy numbers

Unit I **Crisp Sets – Fuzzy Sets –** Basic Types – Basic Concepts – Characteristics and Significance of the Paradigm shift. **11L**

Unit II Additional properties of α-cuts – representations of fuzzy sets – Extension principle for fuzzy sets**.** **13L**

Unit III **Fuzzy set operations –** Fuzzy complements – Fuzzy intersections : t-norms – Fuzzy Unions : t-conorms – Combinations of operations – Aggregation operations. **11L**

Unit IV **Fuzzy Numbers –** Linguistic variables – Arithmetic operations on intervals – Arithmetic operations of fuzzy numbers – Lattice of fuzzy numbers – Fuzzy Equations. **13L**

Unit V Fuzzy Decision Making – Individual Decision Making – Multi-person decision making – Fuzzy linear Programming. **12L**

Text Book:

- George J. Klir and Bo Bo Yuan – Fuzzy sets and Fuzzy Logic Theory Applications, Prentice Hall of India, 2002, New Delhi.

Book for Reference:

- George J. Klir and Tina .A Folger – Fuzzy sets, uncertainty and Informations – Prentice Hall of India, 2003, New Delhi.

SEMESTER-VI

L	T	P	C
4	0	0	4

PAPER-XXI
MAJOR ELECTIVE-IV
4.1 OPERATIONS RESEARCH-II (60 Hours) (SMMA6D)

Objectives:

-To introduce Games and strategies

-To understand networking problems

-To make the students solve real life problems in business and management

Unit I **Games and Strategies :** Two Person Zero sum Games – The Maximin – Minimax Principle – Games without Saddle Points – Mixed Strategies – Graphical Solution of2xnandmx2games–DominanceProperty **12L**

Unit II **Replacement** of items that deteriorate with time-replacement age of a machine taking money value into consideration-replacement of items that completely fail suddenyandStaffingProblems **13L**

Unit III **Queing models :**General concept and definitions-characteristics-properties of Poisson process Models(M/M/1: /FCFS), (M/M/1 : N/FCFS),(M/M/S : /FCFS) **11L**

Unit IV **Network scheduling by PERT / CPM :** Network and basic components – Rules of Network Construction – Time Calculation in network – Critical Path Method – PERTCalculation. **13L**

Unit V **Inventory Control :** Introductions – Types of Inventories – Inventory decisions – Deterministic inventory Problem– EOQ problems with shortages**.** **13L**

Text Book:

- KantiSwarup, P.K. Gupta and Manmohan – Operations Research – Sultan Chand & Sons – 2006, 12th edition.

Books for Reference :

- Gupta .P.K and D.S. Hira – Operations Research – S. Chand and Company.
- B.J. Ranganath and A.S.Srikantappa -Operations Research, Yesdee Publishing House,Chennai(2017)
- Hillier, F.S. and G.J. Lieberman - Introduction to Operations Research, 9th Ed., Tata McGrawHill, Singapore, 2009.
- Hamdy A. Taha, - Operations Research, An Introduction, 8th Ed., Prentice – Hall India, 2006.

. Hadley .G. - Linear Programming, Narosa Publishing House, New Delhi, 2002