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	Cre-dits	Mark				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
III	I	13	Language	Tamil/Other Languages	6	4	25	75	100	30	40
	II	14	Language	English	6	4	25	75	100	30	40
	III	15	Core-5	Real Analysis-I	6	4	25	75	100	30	40
		16	Allied-II	Statistics-I OR	6	3	25	75	100	30	40
				Physics/ Chemistry/Computer With Practicals	6	4	25	75	100	30	40
		17	Skill Based core	Vector Calculus	4	4	25	75	100	30	40
	IV	18	Non-major Elective	Any one of the following 1.1) Mathematics for Competitive Examinations- I 1.2) Fundementals of Statistics-I	2	2	25	75	100	30	40
		19	Common	Yoga*	2	2	25	75	100	30	40

IV	I	20	Language	Tamil/Other Languages	6	4	25	75	100	30	40
	II	21	Language	English	6	4	25	75	100	30	40
	III	22	Core-6	Abstract Algebra- I	6	4	25	75	100	30	40
		23	Allied-II	Statistics II OR	6	3	25	75	100	30	40
				Physics/ Chemistry/ Computer with Practicals	6	4	25	75	100	30	40
		24	Skill Based Core	Trigonometry, Fourier Series and Laplace Tranforms	4	4	25	75	100	30	40
	IV	25	Non-major Elective	Any one of the following2.1) Mathematics for Competitive Examinations- II 2.2) Fundementals of Statistics II	2	2	25	75	100	30	40
		26	Common	Computers for Digital Era*	2	2	25	75	100	30	40
	V		Extension Activities	NCC/NSS/YRC/ YWF/PE	-	1	-	-	-	-	-

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 4.1 Operations Research II 4.2 Coding Theory 4.3 Programming in	4	4	25	75	100	30	40

SEMESTER – III

CORE PAPER –V
REAL ANALYSIS - I (90 Hours) (SMMA31)

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Objectives:
-To lay a god foundation of classical analysis
-To study the behaviour of sequences and series

Unit I   **Real number system :**
The field of axioms, the order axioms, the rational numbers, the irrational numbers, upper bounds, maximum element, least upper bound (supremum). The completeness axiom, absolute values, the triangle inequality. Cauchy – schwartz's inequality. **11L**

Unit II   **Sequences :** Bounded sequences – monotonic sequences – convergent sequences – divergent and oscillating sequences – The algebra of limits. **17L**

Unit III   Behaviour of monotonic sequences – Cauchy's first limit theorem – Cauchy's second limit theorem – Cesaro's theorem – subsequences - Cauchy sequence – Cauchy's general principle of convergence. **19L**

Unit IV   **Series :** Infinite series – n^{th} term test – Comparison test – Kummer's test – D'Alemberls ratio test – Raabe's test - Gauss test – Root test **23L**

Unit V   Alternating series – Leibnitz's test - Tests for convergence of series of arbitrary terms – Multiplication of series- Abel's Throrem-Mertens theorem-Power Series-Radius of convergence **20L**

Text Books:

• Arumugam .S and Thengapandi Issac – "sequences and series", New Gamma publishing House, Palayamkottai – 627 002.

• Tom M. Apostol – Mathematical Analysis, II Edition, Narosa Publishing House, New Delhi (unit I)

Book for Reference :

• Goldberg .R – Methods of Real Analysis, Oxford and IBH Publishing Co., New Delhi.

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SEMESTER – I/III

Statistics

(For Mathematics Students)

Paper – I (90 Hours)

Objectives:

-To study the concept of measures of dispersion and measures of central tendencies
-To develope the concept Probability distributions

Unit I	Moments, Skewness and Kurtosis - Curve fitting - method of least squares – Fitting lines – Parabolic, Exponential and Logarithmic curves. **16L**

Unit II Correlation and Regression – Scatter Diagram – Karl Pearson's coefficient of correlation – Properties – Lines of Regression – Coefficient of Regression and properties – Rank Correlation. **16L**

Unit III Association of Attributes – Consistency of data – criteria for independence – Yule's coefficient of Association. **14L**

Unit IV Random variable – Distribution function – properties of Distribution function – Mathematical Expectation – Addition theorem of Expectation – Multiplication theorem of Expectation – Moment generating function – cumulants – characteristic function – Properties of characteristic function**. 22L**

Unit V Discrete and continuous Probability Distributions - Binomial and Poisson Distribution and their moments, Generating function, characteristic function, properties and simple applications. Normal Distribution – Standard normal distribution and their properties – simple problems**. 22L**

Text Book:

Gupta .S.C and V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.

Books for Reference :

- Vittal, V.R. – Mathematical Statistics (2004) Maragatham Publications
- D.C. Sancheti & Kapoor – Statistics
- M.L. Khanna – Statistics
- S. Arumugam & others – Statistics

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SEMESTER – I/III

Allied Mathematics

(For Science Students)

Paper – I

Algebra and Differential Equations (90 Hours)

Objectives:
-To know the order and degree of the ODE
-To understand the basic Theory of equations
-To study the concept of Laplace transforms
-To know the theory of matrices

Unit I	Theory of Equations – Formation of Equations – Relation between roots and coefficients – Reciprocal equations. **20L**
Unit II	Transformation of Equations – Approximate solutions to equations – Newton's method and Horner's method.18L
Unit III	Matrices – Characteristic equation of a matrix – Eigen values and Eigen vectors – Cayley Hamilton theorem and simple problems **15L.**
Unit IV	Differential equation of first order but of higher degree – Equations solvable for p, x, y – Partial differential equations – formations – solutions – Standard form P_p + Q_q = R**. 20L**
Unit V	Laplace transformation – Inverse Laplace transform**. 17L**

Text book:
- Dr. S. Arumugam & others – Allied Mathematics – I

SEMESTER III

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Skill Based Core
Paper – I
VECTOR CALCULUS (60 Hours) (SSMA3A)

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Objectives:

-To provide basic knowledge of vector differentiation and vector integration

-To solve problems related to that

Unit I Vector point functions – Scalar point functions – Derivative of a Vector & Derivative of sum of vectors – Derivative of product of a Scalar and Vector point function – The vector operator 'del' – Gradient **13L**

Unit II Divergence – Curl, solenoidal, irrotational vectors – Laplacian operator. **12L**

Unit III Integration of point function – Line integral – Surface integral, **13L**

Unit IV Volume integral – Gauss divergence theorem (statement only) – Problems. **12L**

Unit V Greens theorem and Stoke's theorem (statements only) – problems. **10L**

Text Book:

• Durai Pandian.P and Laxmi Durai Pandian – Vector Analysis (Revised Edition – Reprint 2005) Emerald Publishers.

Books for Reference :

• Dr. S. Arumugam and others – Vector Calculus, New Gamma Publishing House.

• Susan .J.C - Vector Calculus, (4th Edn.) Pearson Education, Boston 2012.

• Anil Kumar Sharma, - Text book of Vector Calculus, Discovery Publishing House, 1993.

SEMESTER – III

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Non – Major Elective Paper – I

Mathematics for Competitive Examinations -I (30 Hours) (SNMA3A)

Objectives:

-To learn the problems solving techniques for aptitude problems

-To enable the students prepare themselves for various competitive examinations

Unit I	Simplifications, averages	**7L**
Unit II	Ratio and proportion	**5L**
Unit III	Partnership – Percentage	**5L**
Unit IV	Profit and Loss	**6L**
Unit V	Problems on numbers	**7L**

Text Book:

Objective Arithmetic – R.S. Aggarwal – S.Chand & Co

Books for Reference :

- Quantitative Aptitude for Competitive examinations – Abhijit Guha – TMH

- Mathematics for life – M. Immaculate – Nanjil offset Printers

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SEMESTER – III

Non – Major Elective Paper – I

Fundamentals of Statistics - I (30 Hours) (SNMA3B)

Objectives:

-To introduce measures of central tendency to other major students

-To study correlation and regression and solving simple problems

Unit I	Classification of datas – Bar diagram – Pie chart	**7L**
Unit II	Measures of Central tendency : Mean, median, mode (with frequency)	**5L**
Unit III	Measures of dispersion : Range – standard deviation, variance – Quartile deviation **7L.**	
Unit IV	Correlation – rank correlation (Problems only**)**	
		6L
Unit V	Regression equations (Problem only)	**5L**

Text Book:

- Dr. S. Arumugam – Statistics

Books for Reference :

- S.P. Gupta – Statistics

- M.L. Khanna – Statistics
- T.Veerarajan-Fundamentals of Mathematical Statistics

SEMESTER – IV

CORE PAPER – VI
ABSTRACT ALGEBRA-I (90 Hours) (SSMA41)

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Objectives:

-To introduce the concept of Groups ,Ring and Field

-To study the concept of homomorphism

Unit I   Groups – definition and Examples – Subgroup – order of an element – centre of a group – Normalizer and centralizer. Product of two subgroups – order of HK – Intersection and union of subgroups.   **18L**

Unit II   Cyclic groups – generators of a cyclic group – Number of generators of a cyclic groups – Cosets – Partitioning of a group by Cosets – Lagrange's theorem – Euler's theorem – Fermat's theorem   **16L**

Unit III   **Normal subgroups :** Quotient groups – Group Homomorphis – Canonical homomorphism – kernel of a homomorphism – Isomorphism – Automorphism – Inner automorphism – Permutation groups – Cayley's theorem**.**   **20L**

Unit IV   **Rings:** Definition and examples – Types of rings – Elementary properties of a ring – Integral domain – Field – Sub rings – Subfields – Ideals – Principal ideal – quotient ring – Maximal and prime ideals - characteristic of a ring – PID – UFD**.   18L**

Unit V   Homomorphism of rings – Isomorphism – kernel of a homomorphism – Fundamental theorem – Field of quotients of an integral domain – polynomial rings – Division algorithm   **18L**

Text Book:

• Arumugam .S and Tangapandi Issac .A – "Modern Algebra"scitech publications Pvt. Ltd.

Books for Reference :

• Anton .H and C. Rorres - Elementary Linear Algebra (9th Edn) John Wiley and Sons, Inc., New York 2005.

• Manicavasagam Pillai .T.K and others – Modern Algebra, S. Viswanathan Publishers, Chennai 1993.

• Herstein .I.N – Topics in Algebra, Vikas Publishing Pvt. Ltd. 1975, New Delhi.

SEMESTER – II / IV

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Statistics

(For Mathematics Students)

Paper – II (90 Hours)

Objectives:
-To know the concept of index numbers
-To study the distribution functions
-To understand the Analysis of varience

Unit I   Characteristics of index numbers – Laspeyer's and Paasche's – Fisher's and Bowley's Marshall and Edgeworth's index numbers – Tests – Unit test, Commodity Reversal test, Time Reversal test, circular test**.   12L**

Unit II   Testing of Hypothesis – Null hypothesis and Alternate hypothesis – Type I and Type II errors - Critical Region, Level of significance – Test of significance for large samples – Testing a single proportion – Difference of proportions. Testing a single mean and Difference of means.   **18L**

Unit III   Tests based on t-distribution – single mean and Difference of means – Tests based on F-distribution – Variance Ratio test – Tests based on Chi-square Distribution – Independence – Goodness of fit**.   16L**

Unit IV   Analysis of varience – one way and two way classified data – Basis of experimental design – Randomized Block Design – Latin square – simple problems.   **22L**

Unit V   Statistical Quality control – Definition – Advantages, Process control – Control chart, Mean chart, Range chart, P-chart, Product Control – Sampling Inspection Plans .   **22L**

Text Book:
- Gupta .S.C & V.K. Kapoor – Fundamentals of Mathematical Statistics – (2002) Sultan Chand & Sons, New Delhi.

Books for Reference :

- Vittal .P.R – Mathematical Statistic (2004) – Maragatham Publications
- DC Sancheti & Kapoor – Statistics
- M.L. Khanna – Statistics
- S. Arumugam & others – Statistics

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Allied Mathematics

(For Science Students) Paper – II
Vector Calculus & Fourier Series (90 Hours)

Objectives:

-To provide basic knowledge of vector differentiation and integration
-To solve integration problems

Unit I Vector differentiation – Gradient – Divergence and curl   **20L**

Unit II Evaluation of double and triple integrals   **18L**

Unit III Vector integration – Line, surface and volume integrals   **18L**

Unit IV Green's, Stokes and Divergence theorems (without proof) – simple problems
17L

Unit V Fourier series – Even and odd functions – Half range Fourier series.
17L

Text Books:

- Dr. S. Arumugam & Issac – Vector Calculus

- T.K. Manicavachagom Pillai – Calculus (Vol II)

SEMESTER – IV

Skill Based Core
Paper – II
TRIGONOMETRY, LAPLACE TRANSFORMS AND FOURIER SERIES
(60 Hours) (SSMA4A)

Objectives:

-To understand the concept of Trigonometry

-To know the concept of Laplace transform

-To study the concept of Fourier series

Unit I   Trigonometry : Expansions of sin nx, cos nx, tan nx and expansions of $\sin^n x$ & $\cos^n x$.   **10L**

Unit II   Hyperbolic functions – Relations between hyperbolic functions and circular functions – Inverse hyperbolic functions – Logarithm of complex numbers – Summation of series by $C + iS$ method.   **13L**

Unit III   Laplace Transforms – Inverse Laplace Transforms.   **13L**

Unit IV   Solving linear differential equations with constant coefficients and simultaneous equations using Laplace Transforms.   **12L**

Unit V   Fourier Series – Definition - Finding Fourier coefficients for a given periodic function with period 2π and $2l$ – Odd and even functions – Half range series.   **12L**

Text Books:

Arumugam .S and Tangapandi Issac .A -Trigonometry and Fourier Series

Manichavasagam Pillai, T.K., and S. Narayanan-Differential Equations and its Applications

Books for Reference :
- Manichavasagam Pillai, T.K., and S. Narayanan, - Trigonometry, Viswanathan Publishers and Printers Pvt. Ltd.
- Loney - Trigonometry.
- Robert T. Seeley - Fourier Series and Integrals, Dover Publications, New York, 2006.
- Ray Hanna J., - Fourier Series, Transforms and Boundary Value Problems, Dover Publications, New York, 2008.

SEMESTER – IV

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Non – Major Elective Paper – II

Mathematics for Competitive Examinations -II (30 Hours) (SNMA4A)

Objectives:

-To learn the problems solving techniques for aptitude problems

-To enable the students prepare themselves for various competitive examinations

Unit I	Simple Interest – Compound interest	**6L**
Unit II	Time and work	7L
Unit III	Time and distance	**7L**
Unit IV	Chain Rule	**5L**
Unit V	Pipes and Cistern	5L

Text Book:

- Objective Arithmetic – R.S. Aggarwal

Books for Reference :

- Descriptive Mathematics - R.S. Aggarwal, Deepak Aggarwal

- Mathematics for life – M. Immaculate – Nanjil offset Printers

SEMESTER – IV

Non – Major Elective Paper – II

Fundamentals of Statistics - II (30 Hours) (SNMA4B)

Objectives:

-To introduce measures of central tendency to other major students

-To study index numbers and simple problems

- To know the concepts of attributes

Unit I	Theory of attributes for two attributes (simple problems)	**7L**
Unit II	Characteristics of index numbers – Laspeyer's and Paasche's	**6L**
Unit III	Bowley's – Marshall index numbers	**6L**
Unit IV	Fisher's index number – Time Reversal test (Problems only)	**5L**
Unit V	Fitting a straight line	**6L**

Text Book:

S.Arumugam & Issac -Statistics

Books for Reference :

- S.P. Gupta – Statistics

- M.L. Khanna – Statistics

- T.Veerarajan-Fundamentals of Mathematical Statistics

SEMESTER – V

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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

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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.

SEMESTER – V

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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

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)

SEMESTER – V

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Paper – XI
MAJOR ELECTIVE - I
1.1 ASTRONOMY - I (60 Hours) (SMMA5A)

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Objectives:

- To introduce the exciting world of Astronomy to students
- To understand the movements of the celestial sphere
- To study the Kepler's laws of motion

Unit I **Spherical Trigonometry**

Spherical triangle – The fundamental formula of Spherical trigonometry, the sine, cosine, four parts and Napier formula (without proof) and simple problems. **13L**

Unit II **The celestial sphere**

Celestial co-ordinates – Diurnal motion – Rising and setting of a star – sidereal time – circumpolar stars – Morning and evening stars - Twilight. **12L**

Unit III Earth – length of a day – Refraction – Tangent formula – Cassini's formula – Effects of refraction **12L**

Unit IV Geocentric parallax – Effects – Heliocentric parallax – Effects **11L**

Unit V Kepler's laws – verification of Kepler's laws – True anomaly, mean anomaly, Eccentic anomaly – Relation between them. **12L**

Text Book:

- Kumaravelu .S and Susheela Kumaravelu – Astronomy for degree classes, Rainbow Printers, Nagercoil (2005)

Book for Reference :

- Ramachandran .G.V – Astonomy

SEMESTER – V

Paper – XI
MAJOR ELECTIVE - I
1.2 DISCRETE MATHEMATICS (60 Hours) (SMMA5B)

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Objectives:
-To study the concept of Mathematical logic
-To understand the basics of Lattices and Boolean Algebra
-To know the number system and codes

Unit I   **(Mathematical logic)** Statement and notation – Connectives – Negation – Conjunction – Disjunctions – Statement formula and truth table – conditional and Biconditional – Well defined formulae – Tautologies
12L

Unit II   Normal forms- The theory of inference for the statement calculus- The Predicate- The theory of inference for the Predicate calculus
13L

Unit III   **(Algebraic Structures)**
Groups and Monoids – Simple properties–group codes.
11L

Unit IV   **(Lattices and Boolean algebra)**
Lattices and Posets – Properties of lattices – special lattices – Boolean algebra – Gating networks – Minimal sums of products**.**
12L

Unit V   **(Number system and codes)**
Decimal, Binary, octal, Hexadecimal – Conversion from one to another – Binary addition, subtraction multiplication and division – BCD – weighted excess time – Gray code
12L

Text Book:
- Tremblay and Manohar – Discrete Mathematical Structures with application to Computer Science, (Tata McGraw Hill, New Delhi) 1997.

Books for Reference :
- Ralph P. Grumaldi Pearson Edelen – Discrete and Combinatorial Mathematics – an applied Introduction (IV edition)
- Maluino .A and Leech – Digital Principles and Application McgraHill.
- Venkataraman .M.K. and others – Discrete mathematics 2000 The National Publishing Company.
- Balaji .G – Discrete Mathematics – Balaji Publishers, Chennai (2013)
- Veerarajan .T – Discrete mathematics – Tata McGraw Hill – (2009)

SEMESTER – V

Paper – XI

MAJOR ELECTIVE - I

1.3 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

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Paper – XII

MAJOR ELECTIVE - II

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

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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 -V

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Paper -XII
MAJOR ELECTIVE -II
2.2 STOCHASTIC PROCESS (60 Hours) (SMMA5E)

Objectives:
-To know probability and distribution functions
-To understand the concepts of stochastic process
-To identify Markov chains

Unit I Generating functions-Laplace transform of probability distribution-classification of distribution-Stochastic process-introduction-specification of Stochastic process.
12L

Unit II Markov chains-Definition and examples-Higher transition probabilities-Generalisation of Independent Bernoulli Trials-classification of states and chains-Determination of Higher transition probabilities-Stability of Markov systems-Graph theoretic approach.
12L

Unit III Markov chain with Denumerable number states-Reducible chains-Statistical inference for Markov chains-Markov chain with continuous state space-Nonhomogeniouschains **11L**

Unit IV Markov process with discrete state space-Poisson process-
Poisson process and related distributions-Generalisation of Poisson process-Birth and Death process
13L

Unit V Markov process with Discrete state space-Derived Markov chains-Erlang process
12L

Text Book :
Stochastic Proces-J.Medhi-New Age International Publishers (p) Ltd Third Edition
Reference Books:
Applied Stochastic Process-Suddhendu Biswas –New Central Book Agency (P) Ltd Kolkatta
Introduction to Stochastic Process-Hoel Port and Stone-Universal Book Stall, New Delhi

SEMESTER -V

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Paper -XII
MAJOR ELECTIVE -II
2.3 M.S.OFFICE (60 Hours) (SMMA5F)

Objectives:

-To know the basic knowledge of computer

-To study word,excel andpowerpoint

Unit I: MS Word

Creating a document-saving, printing, editing and closing the document -copying, pasting, finding and replacing a text -adding headers and footers**. 11L**

Unit II:

Formatting a document-Turning Bold on/off, Underline on/off, highlight on/off-changing font size ,page setup-changing margins-bullets and numbering, working with tables-changing the column width and row height-inserting or deleting a row/column-mailmerge**. 12L**

Unit III: MS Excel

Creating a worksheet-entering, editing, deleting data in cells-saving and previewing the worksheet- entering formulas , working with basic functions SUM,AVERAGE,MAX and MIN -sorting **10L.**

Unit IV :

Formatting a worksheet-inserting ,deleting a row/column changing font size -Graphs and charts-Simple calculations using mathematical, statistical, logical functions. **12L**

Unit V: MS Power point

Creating a simple presentation -adding transition effects to a presentation-adding sound effects to a presentation-creating hyperlinks between slides-changing the background-inserting images on slides. **15L**

Text Book :

Dr.P.Rizwan Ahmed, "Office Automation 2010", Margham Publications 2016.

Reference Books :

1. Stephen . L . Nelson, "Office 2010, Computer Reference", Tata McGraw Hill Publishing company Ltd.
2. Sumner Mary- "Enterprise Resource Planning", Pearson Education, inc. I Edition 2012.

SEMESTER – VI

CORE -XI
Major Paper – XIII

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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

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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.

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
NUMERICAL METHODS (60 Hours) (SMMA65)

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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.

SEMESTER – VI

Paper – XVIII

MAJOR ELECTIVE - III

3.1 Astronomy - II (60 Hours) (SMMA6A)

Objectives:

-To understand the exiting world of Astronomy to the students

-To study the concepts of eclipses

-To facilitate the movements of celestial objects

Unit I	Equation of time – Seasons – Convertion of time.	**10L**
Unit II	Moon – sidereal month, Lunation and relation between them – Phases of moon – Lunar Liberation - surface of moon – metonic cycle – Tides. **14L**	
Unit III	Eclipses – shadow cone – Minimum and maximum number of eclipses.	**12L**
Unit IV	Planetary Phenomena – Bode's law – Elongation – Sidereal period, synodic period and the relation between them **14L**	
Unit V	Phases – Stationary points – solar system**..**	**10L**

Text Book:

• S. Kumaravelu and Susheela Kumaravelu – Astronomy Rainbow Printers, Nagercoil (2005)

Book for Reference :

• George - O - Abell – Exploration of the Universe (Second Edition)

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

Paper – XX

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MAJOR ELECTIVE - III

3.3 Mathematical Modelling (60 Hours) (SMMA6C)

Objectives:

-To study the mathematical models through ODE and difference equations

-To train the students to develop mathematical models in real life problems

Unit I **(Mathematical modelling through O.D.E (First order))**
Linear growth and Decay models – Non-linear growth and Decay models – Compartment Models – Dynamics Problems – Geometrical Problems.
11L

Unit II Population dynamics – Epidemics – Compartment Models – Economics, Medicine, Arms race, Battles and International Trade.
13L

Unit III **(Mathematical Modelling through O.D.E. (Second order))**
Planetary motion – circular motion – Motion of satellites – Modelling through linear difference equations of second order.
11L

Unit IV **(Mathematical Modelling through difference equations)**
Basic theory of difference equation with constant coefficients – Economics and Finance – Population dynamics and genetics – Probability theory.
13L

Unit V **(Modelling through graphs)**
Solutions that can be modelled through graphs - models in terms of directed graphs, signed graphs – weighted digraphs and unoriented graphs.
11L

Text Book:

• Kapur .J.N – Treatment as in "Mathematical Modelling" – New Age International Publishes, 2004.

Books for Reference :

• Kapur .J.N – Mathematical Modelling in Biology and Medicine – East West Press – 1985.
• Singh – Mathematical Modelling, International Book house – 2003.
• Frank R. Giordano, Maurice D.Weir and William P. Fox, - A first course in mathematical modelling, Thomson Learning, London and New York, 2003.

SEMESTER-VI

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

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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

SEMESTER – VI

PAPER-XXII

MAJOR ELECTIVE - IV

4.2 Coding Theory (60 Hours) (SMMA6E)

Objectives:

-To introduce coding and decoding concepts

-To develop the students in the field of coding theory

Unit I Basic assumptions – Correcting and detecting error patterns – information rate – effects of error correction and detection – finding the most likely code word transmitted. **12L**

Unit II Linear codes – two important – subspaces independence – basic, dimension – matrices – Bases for C and C^+ generating matrices on coding. **12L**

Unit III Parity check matrices – equivalent codes – distance of a linear code – Linear codes – cosets – MLD for linear codes – Reliability of IMLD for linear codes. **11L**

Unit IV Some bounds for codes – perfect codes – hamming codes – extended codes – The extended Golay code – decoding the extended Golay code – Golay code **13L**

Unit V Polynomials and words – introduction to cyclic codes – introduction to cyclic codes – Polynomial encoding and decoding – finding cyclic codes – Dual cyclic codes**.** **12L**

Text Book:

• Coding theory, the essentials – Marcel Dekker, Inc. Madtrison Avenue, Newyork.

SEMESTER – VI

Paper- XXIII
MAJOR ELECTIVE-IV
4.3 Programming in C (60 Hours) (SMMA6F)

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Objective:
-To introduce the exiting world of programming to the students
-To train the students to run simple C programmes

Unit I

    C Declarations:- Introduction – Character Set – C tokens – Keywords and Identifiers – Identifiers – Constants – Variables – Data types – Declaration of Variables – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaring VariableasConstant. **11L**

Unit II

    Operators and Expressions:- Introduction – Arithmetic Operators – Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operator – Bitwise Operators – Special Operators – Arithmetic Expressions – Evaluation of Expressions–PrecedenceofArithmeticExpressions.
13L

Unit III

Managing Input and Output Operations:-getchar( ) – putchar( ) – scanf( ) – printf( ). **Decision Making and Branching:-** Introduction – Decision Making with IF Statement – Simple IF statement – The IF…Else Statement – Nesting of IF…Else Statements – The ELSE IF ladder – The Switch Statement – The ?: Operator – The GOTO statement. **Decision Making and Looping:-** Introduction – The WHILE Statement – The DO Statement – The FOR statement – Jumps in Loops. **13L**

Unit IV

Arrays :- Introduction – One-dimensional arrays – Declaration of One-dimensional arrays – Initialization of One-dimensional arrays - Two-dimensional arrays – Initialization of Two-dimensional arrays – Multi-dimensional arrays. **Character Arrays and Strings:-** Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing Strings to Screen–StringHandlingFunctions
12L

Unit V

   User-Defined functions:- Introduction – Need for User-defined functions – Definition of functions – Return Values and their Types – Function Calls – Function Declaration – Category of functions – No Arguments and No return values – Arguments but No return Values – Arguments with return values – No arguments but a return a value – Recursion –The Scope, Visibility   and   lifetime   of   a   variables.
11L

Text Book:

Programming in ANSI C – 6th Edition by E Balagurusamy – Tata McGraw Hill Publishing Company Limited.

Reference Books:

- Programming with C, Third Edition, Byron S Gottfried, Tata McGraw Hill Education Private Limited.
- . Programming in C ReemaThareja, Oxford University press.