ALAGAPPA UNIVERSITY, KARAIKUDI
NEW SYLLABUS UNDER CBCS PATTERN (w.e.f. 2017-18)

B.Sc. MATHEMATICS – PROGRAMME STRUCTURE

Sem.	Part	Course Code	Title of the Course	Cr.	Hrs. / Week	Max. Marks		
						Int.	Ext.	Total
I	I	711T	**Tamil / Other Languages – I**	3	6	25	75	100
	II	712E	**English – I**	3	6	25	75	100
	III	7BMA1C1	**Core–I-**Calculus	4	6	25	75	100
		7BMA1C2	**Core–II-**Algebra and Trigonometry	4	6	25	75	100
			Allied – I (Theory only) **(or)** **Allied – I** (Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I	-	2**	--	--	---
	IV	7NME1A/ 7NME1B/ 7NME1C	**(1) Non-Major Elective – I**	2	1	25	75	100
			Total (Allied Theory only)	**21**	**30**	--	--	**600**
			Total (Allied Theory cum Practical)	**20**				**575**
II	I	721T	**Tamil / Other Languages – II**	3	6	25	75	100
	II	722E	**English – II**	3	6	25	75	100
	III	7BMA2C1	**Core–III-**Analytical Geometry of 3D and Vector Calculus	4	6	25	75	100
		7BMA2C2	**Core–IV-**Sequences and Series	4	5	25	75	100
			Allied – II (Theory only) **(or)** **Allied– II** (Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I	2	2	20	30	50
	IV	7BES2	**(3) Environmental Studies**	2	2	25	75	100
			Total (Allied Theory only)	**21**	**30**	--	--	**600**
			Total (Allied Theory cum Practical)	**22**				**625**
III	I	731T	**Tamil / Other Languages – III**	3	6	25	75	100
	II	732E	**English – III**	3	6	25	75	100
	III	7BMA3C1	**Core–V-**Abstract Algebra	4	5	25	75	100
	III	7BMA3C2	**Core–VI-**Differential Equations and its Applications	4	5	25	75	100
	III		**Allied – III** (Theory only) **(or)** **Allied–III** (Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – II	-	2**	--	--	---
	IV	7NME3A/ 7NME3B/ 7NME3C	**(1) Non-major Elective – II**	2	1	25	75	100
		7SBS3A1/ 7SBS3A2/ 7SBS3A3	**(2) Skill Based Subjects– I**	2	2	25	75	100
	V	7BEA3	**Extension Activities**	1	-	100	-	100
			Total (Allied Theory only)	**24**	**30**	-	-	**800**
			Total (Allied Theory cum Practical)	**23**				**775**
IV	I	741T	**Tamil / Other Languages – IV**	3	6	25	75	100
	II	742E	**English – IV**	3	6	25	75	100
	III	7BMA4C1	**Core–VII-**Transform Techniques	4	5	25	75	100

	III	7BMA4C2	**Core–VIII-**Linear Algebra	4	4	25	75	100
	III		**Allied – IV(Theory only) (or)** **Allied –IV(Theory cum Practical)**	5 4	5 3	25 15	75 60	100 75
			Allied Practical - II	2	2	20	30	50
	IV	7SBS4B1/ 7SBS4B2/ 7SBS4B3	**(2) Skill Based Subjects – II**	2	2	25	75	100
		7BVE4/ 7BMY4/ 7BWS4	**(4) Value Education / Manavalakalai Yoga / Women's Studies**	2	2	25	75	100
			Total (Allied Theory only)	**23**	**30**	**-**	**-**	**700**
			Total (Allied Theory cum Practical)	**24**				**725**
V	III	7BMA5C1	**Core–IX-**Real Analysis	4	6	25	75	100
	III	7BMA5C2	**Core–X-**Statistics I	4	5	25	75	100
	III	7BMA5C3	**Core–XI-**Operations Research I	4	5	25	75	100
	III	7BMAE1A/ 7BMAE1B	**Elective (I) - A)** Graph Theory **(or) B)** Special Functions	5	5	25	75	100
	III	7BMAE2A/ 7BMAE2B	**Elective (II)** – **A)** Numerical Analysis **(or) B)** Combinatorics	5	5	25	75	100
	IV	7SBS5A4/ 7SBS5A5/ 7SBS5A6/ 7SBS5A7	**(2) Skill Based Subjects – I**	2	2	25	75	100
			(2) Skill Based Subjects – I	2	2	25	75	100
			Total	**26**	**30**	**-**	**-**	**700**
VI	III	7BMA6C1	**Core – XII** Mechanics	4	6	25	75	100
	III	7BMA6C2	**Core – XIII** Complex Analysis	4	5	25	75	100
	III	7BMA6C3	**Core – XIV** Statistics II	4	5	25	75	100
	III	7BMA6C4	**Core – XV** Operations Research II	4	5	25	75	100
	III	7BMAE3A/ 7BMAE3B	**Elective – III A)** Discrete Mathematics **(or) B)** Fuzzy Algebra	5	5	25	75	100
	IV	7SBS6B4/ 7SBS6B5/ 7SBS6B6/ 7SBS6B7	**(2) Skill Based Subjects – II** **(2) Skill Based Subjects – II**	2 2	2 2	25 25	75 75	100 100
			Total	**25**	**30**	**-**	**-**	**700**
			Grand Total	**140**	**180**	**-**	**-**	**4100**

**** University Examinations will be held in the Even Semesters only.**

B.Sc. MATHEMATICS

I YEAR - I SEMESTER
COURSE CODE: 7BMA1C1

CORE COURSE - I –CALCULUS

Unit – I

Successive Differentiation – Leibnitz formula – Envelopes – curvatures – circle, radius and centre of curvature – Evolutes.

Unit – II

Polar Coordinates – Radius of curvature in polar coordinates, p-r equation of a curve – Asymptotes – Method of finding asymptotes – problems

Unit – III

Definite Integrals and their properties –problems – Integration by parts — Reduction formulae - Bernoulli's formula.

Unit – IV

Double and triple integrals and their properties – Jacobian – Change of order of integration.

Unit – V

Beta and Gamma functions – properties – problems

Text Book:

1. Calculus, Volume I (edi.2015) andVolume II (edi.2016) by S.Narayanan and T.K.ManicavachagomPillay, S.Viswanathan (Printers and Publishers) Pvt. Ltd.

Unit I	Chapter 3 (Volume I) sections 1 & 2 Chapter 10 up to section 2.5 (Volume I)
Unit II	Chapter 10 sections 2.6, 2.7 (Volume I) Chapter 11 upto section 7
Unit III	Chapter 1 sections 11, 12, 13, 14, 15.1(Volume II)
Unit IV	Chapter 5 sections 1, 2, 3, 4 (Volume II) Chapter 6 sections 1, 2 (Volume II)
Unit V	Chapter 7 sections 2, 3, 4, 5, (Volume II)

Books for Reference:

1. Calculus and Fourier series by Dr. M.K.Venkataraman and Mrs. Manorama Sridhar, The National Publishing Company, Chennai.
2. Calculus Volume I and Volume II by Dr. S.Arumugam and A.Thangapandi Isaac, New Gamma Publishing House, Palayamkottai.

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I YEAR - I SEMESTER
COURSE CODE: 7BMA1C2

CORE COURSE - II – ALGEBRA AND TRIGONOMETRY

Unit – I

Summation of Series – Binomial Series – Exponential Series – Logarithmic Series.

Unit – II

Relation between roots and coefficients – Sum of the powers of the roots – Reciprocal Equation – Transformation of Equations.

Unit – III

Multiple Roots – Nature and position of roots –Descarte's rule of Signs, Rolle's theorem – Sturm's functions – Problems – Finding number and position of the real roots – Finding the nature and position of the roots (Cardans&Ferrar's method not included) – Approximate solution of Numerical equations – Newton's method – Horner's method.

Unit – IV

Applications of Demoivre's Theorem – Expression for $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ - Expression for $\sin^n\theta$, $\cos^n\theta$ - Expansion of $\sin\theta$, $\cos\theta$, $\tan\theta$ in powers of θ.

Unit – V

Hyperbolic functions – Inverse hyperbolic functions, and logarithm of a complex number.

Text Books:

1. Summation of Series and Trigonometry by Dr.S.Arumugam and A.Thangapandi Isaac – New Gamma Publishing House,Palayamkottai.
2. Theory of Equations, Theory of Numbers and Trigonometry by Dr. S.Arumugam and A.ThangapandiIssac – New Gamma Publishing House, Palayamkottai July 2011.

Unit I	Chapter 1 sections 1.1 – 1.3 of (1)
Unit II	Chapter 5 sections 5.2 to 5.5 of (2)
Unit III	Chapter 5 sections 5.6, 5.7, 5.10 of (2)
Unit IV	Chapter 6 of(2)
Unit V	Chapter 7 and Chapter 8 of (2)

Books for Reference:

1. Trigonometry by S.Narayanan, T.K.ManicavachagomPillay.
2. Algebra Volume – I by T.K.ManicavachagomPillay, T.Natarajan, KS.Ganapathy.

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I YEAR - II SEMESTER
COURSE CODE: 7BMA2C1

CORE COURSE-III–ANALYTICAL GEOMETRY OF 3D AND VECTOR CALCULUS

Unit – I

Preliminaries – Direction cosines – Direction – ratios – angle between the lines – Various forms of equation of a plane – angle between two planes – Angle bisectors of two planes – Equation of a plane through the line of intersection of two planes – Straight lines – Equation of a straight line in various forms – problems.

Unit – II

A Plane and a line – Coplanar lines, Skew lines – S.D. between two Skew lines, Spheres Equation of a Sphere – Tangent line and Tangent plane – Section of a Sphere.

Unit – III

Cone – Definition – Equation of the Cone in various forms – Equation of a right circular Cone – Cylinder – Definition – Equation of a right circular cylinder – simple problems.

Unit – IV

Vector Calculus – Vector Differentiation– Vector Algebra – Differentiation of vectors - Gradient – Divergence and Curl – Solenoidal – irrotational – Harmonic Vector.

Unit – V

Line and Surface Integrals – Line Integrals – Surface Integrals - Theorems of GREEN, GAUSS and STOKE'S(Statements only) problems.

Text Books:

1. Analytical Geometry of 3D and Vector Calculus by Dr. S.Arumugam and A.ThangaPandi Isaac, New Gamma Publishing House, Palayamkottai,2014
2. Analytical Geometry 3D and Vector Calculus by Dr. M.K.Venkataraman and Mrs. Manorama Sridhar, National Publishing Company, Chennai, 2001.

Unit I	Chapter 1,Chapter 2, Chapter 3, Section 3.1 of (1)
Unit II	Chapter 3 section 3.2,Chapter 4 sections 4.1 to 4.3 of (1)
Unit III	Chapter 4 sections 4.13 to 4.16, 4.18 to 4.21 of (2)
Unit IV	Chapter 5 of (1)
Unit V	Chapter 7 of (1)

Books for Reference:

1. A text book of Analytical Geometry Part II – Three Dimensions by T.K.ManicavachagomPillay and T.Natarajan, S.Viswanathan (Printers & Publishers) Pvt. Ltd. 2001
2. Vector Calculus by S.Narayanan and T.K.ManicavachagomPillay, S.Viswanathan (Printers & Publishers) Pvt. Ltd. 1997

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I YEAR - II SEMESTER
COURSE CODE: 7BMA2C2

CORE COURSE - IV – SEQUENCES AND SERIES

Unit – I

Sequences – bounded sequences – Monotonic sequences – Convergent sequences – Divergent and Oscillating sequences – The algebra of limits.

Unit – II

Behaviour of monotonic sequences – Some Theorems on limits – Subsequences – limit points –Cauchy sequences – The upper and lower limits of a sequence.

Unit – III

Series of positive terms –infinite series – Comparison test –Kummer's test – Root test and Condensation test – Integral test

Unit – IV

Series of arbitrary terms – Alternating series – Absolute convergence – Tests for convergence of series of arbitrary terms

Unit – V

Rearrangement (Derangement) of Series – Multiplication of series.

Text Book:

1. Sequences and Series by Dr. S.Arumugam and Prof. A.ThangapandiIssac, New Gamma Publishing House, Palayamkottai, December 2015.

Unit I	Chapter 3sections 3.1 to 3.6
Unit II	Chapter 3 sections 3.7 to 3.12
Unit III	Chapter 4 sections 4.1 to 4.5
Unit IV	Chapter 5 sections 5.1 to 5.3
Unit V	Chapter 5 sections 5.4 & 5.5

Books for Reference:

1. Algebra Volume-I by T.K.Manicavachagom Pillay, T.Natarajan and K.S.Ganapathy.

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II YEAR - III SEMESTER
COURSE CODE: 7BMA3C1

CORE COURSE - V – ABSTRACT ALGEBRA

Unit – I

Groups : Definition and Examples – Elementary Properties of a Group – Equivalent Definitions of a Group – Permutation Groups.

Unit – II

Subgroups – Cyclic Groups – Order of an Element – Cosets and Lagrange's Theorem.

Unit – III

Normal Subgroups and Quotient Groups – Isomorphism – Homomorphism.

Unit – IV

Rings : Definitions and Examples – Elementary properties of rings – Isomorphism – Types of rings – Characteristic of a ring – Subrings – Ideals – Quotient rings.

Unit – V

Maximal and Prime Ideals – Homomorphism of rings – Field of quotients of an Integral domain – Unique factorization domain – Euclidean domain.

Text Book:

1. S.Arumugam and A.ThangapandiIssac, Modern Algebra, SciTech Publications Pvt. Ltd., Chennai, 2003.

Unit I	Chapter 3sections 3.1 to 3.4
Unit II	Chapter 3 sections 3.5 to 3.8
Unit III	Chapter 3 sections 3.9 to 3.11
Unit IV	Chapter 4 sections 4.1 to 4.8
Unit V	Chapter 4 sections 4.9 to 4.11, 4.13 & 4.14

Books for Reference:

1. N.Herstein, Topics in Algebra, John Wiley & Sons, Student 2nd edition, 1975.
2. Vijay, K.Khanna and S.K.Bhambri, A course in Abstract Algebra, Vikas Publishing House Pvt. Ltd.
3. Dr. R.Balakrishnan and N.Ramabadran, A text book of Modern Algebra, Vikas Publishing House Pvt. Ltd, New Delhi, 1994.

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II YEAR - III SEMESTER
COURSE CODE: 7BMA3C2

CORE COURSE - VI – DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS

Unit – I

Exact Differential Equations – Conditions for equation to be exact –Working rule for solving it – problems – Equations of the first order but of higher degree – Equations solvable for p, x, y, clairaut's form – Equations that do not contain (i) x explicitly (ii) y explicitly – Equations homogenous in x and y–Linear Equation with constant coefficients.

Unit – II

Linear equations with variable coefficients – Equations reducible to the linear equations – Simultaneous Differential Equations – First order and first degree – Simultaneous linear Differential Equations.

Unit – III

Linear equations of the second order – Complete Solution given a known integral – Reduction to Normal form – Change of the independent variable – Variation of parameters – Total Differential Equations – Necessary and Sufficient condition of integrability of Pdx + Qdy + Rdz = 0, Rule for solving it.

Unit – IV

Partial Differential Equations of the First oder – classifications of integrals – Derivations of Partial Differential Equations – Special methods – Standard forms – Charpit's method.

Unit – V

Flow of water from an Orifice – Falling bodies and other rate problems – Brachistochrone Problem – Tautochronous property of the Cycloid – Trajectories.

Text Book:

1. Differential Equations and its Applications by S.Narayanan&T.K.ManickavachagomPillay, S.Viswanathan (Printers& Publishers) Pvt. Ltd., 2015.

Unit I	Chapter 2 –sections 6.1 to 6.3; Chapter 4; Chapter5 –sections 1, 2, 3, 4
Unit II	Chapter 5–sections 5, 6; Chapter 6 – sections 1to 6
Unit III	Chapter 8–sections 1 to 4; Chapter 11
Unit IV	Chapter 12 – sections 1, 2, 3, 4, 5.1 to 5.4 & Section 6
Unit V	Chapter 3 – sections 2, 3, 4, 5; Chapter 10 – sections 1.1 – 1.3

Book for Reference:

1. Differential Equations and its Applications by Dr. S.Arumugam and Mr. A.ThangapandiIssac, New Gamma Publishing House, Palayamkottai, Edition, 2014.

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II YEAR - IV SEMESTER
COURSE CODE: 7BMA4C1

CORE COURSE - VII – TRANSFORM TECHNIQUES

Unit – I

Laplace Transform – Definition – Laplace Transform of Standard functions – Elementary Theorems – Laplace Transform of periodic functions – problems.

Unit – II

Inverse Laplace Transforms – Standard formulae – Basic Theorems – Solving Ordinary Differential Equations with constant coefficients, variable coefficients and simultaneous linear equations using Laplace Transform.

Unit – III

Fourier Series – Definition – To find the Fourier coefficients of Periodic functions of period 2 π - even and odd functions – Half range series – problems.

Unit – IV

Fourier Transforms – Complex form of Fourier Integral Formula – Fourier Integral theorem – properties of Fourier Transform – Fourier sine and cosine Transforms – properties – Parsivals Identity - Problems

Unit – V

Z Transforms – Definition – Proprieties – Z Transforms of some basic functions – Problems – Inverse Z Transforms – Methods to find the inverse Z Transform – Use of Z – Transforms to solve finite Difference Equations – problems.

Text Books:

1. Calculus Volume III by S.Narayanan and T.K.ManicavachagomPillay, S.Viswanathan (Printers & Publishers) Pvt. Ltd., 2014.
2. Engineering Mathematics 3rd Edition by T.Veerarajan, Tata McGraw Hill Publishing Company Limited, New Delhi.

Unit I	Chapter 5sections 1 to 5 of (1)
Unit II	Chapter 5 sections 6 to 10 of (1)
Unit III	Chapter 6 sections 1 to 4, 5.1,5.2 of (1)
Unit IV	Chapter 6 sections 9.1 to 9.3, 10, 11.1, 11.2, 12, 13, 14, 14.1, 15 of (1)
Unit V	Chapter 7 sections 7.1 to 7.5 of (2)

Book for Reference:

1. Transforms and Partial Differential Equations by Dr.A.Singaravelu, Meenakshi Agency, Chennai

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II YEAR - IV SEMESTER
COURSE CODE: 7BMA4C2

CORE COURSE - VIII – LINEAR ALGEBRA

Unit – I

Vector Spaces – Definition and examples – Subspaces – Linear Transformation – Span of a set.

Unit – II

Linear Independence – Basis and Dimension – Rank and Nullity.

Unit – III

Matrix of a Linear Transformation – Inner Product Space – Definition and examples – Orthogonality – Orthogonal complement.

Unit – IV

Algebra of Matrices – Types of Matrices – The inverse of a matrix – Elementary Transformations – Rank of a Matrix– Simultaneous linear equations.

Unit – V

Characteristic Equation and Cayley – Hamilton theorem Eigen values and Eigen Vectors, Bilinear forms – Quadratic forms.

Text Book:

1. Dr. S.Arumugam and Mr. A.ThangapandiIssac, Modern Algebra, SciTech Publications (India) Pvt. Ltd., Chennai, 2003.

Unit I	Chapter 5sections 5.1 to 5.4
Unit II	Chapter 5 sections 5.5 to 5.7
Unit III	Chapter 5 sections 5.8, Chapter VI sections 6.1 to 6.3
Unit IV	Chapter 7 sections 7.1 to 7.6
Unit V	Chapter 7 sections 7.7, 7.8 Chapter VIII sections 8.1, 8.2

Books for Reference:

1. S.Lang, Introduction to Linear Algebra 2nd Edition, Springer 2005.
2. AR.Vasistha, Modern Algebra, Krishna Prakashan Publication.

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III YEAR - V SEMESTER
COURSE CODE: 7BMA5C1

CORE COURSE - IX – REAL ANALYSIS

Unit – I

Introduction – Sets and functions – Countable and Uncountable sets – Inequalities of Holder and Minkowski – Metric spaces – Definition and examples – Bounded sets in a metric space – Open Ball in a metric space – Opensets.

Unit – II

Subspace – Interior of a set – Closed sets – Closure – limit point – Dense sets – Completeness – Baire's Category Theorem

Unit – III

Continuity – Homeomorphism – Uniform continuity.

Unit – IV

Connectedness – Definition and examples – Connected subsets of R – Connectedness & Continuity.

Unit – V

Compact Metric spaces – Compact subsets of R – Equivalent Characterization for Compactness – Compactness and Continuity.

Text Book:

1. Modern Analysis, Dr. S.Arumugam& Mr. A.ThangapandiIssac, New Gamma Publishing House, Palayamkottai, Edition 2015.

Unit I	Chapter 1sections 1.1 to 1.4 Chapter 2 sections 2.1 to 2.4
Unit II	Chapter 2 sections 2.5 to 2.10 & Chapter 3
Unit III	Chapter 4 sections 4.1 to 4.3
Unit IV	Chapter 5
Unit V	Chapter 6

Book for Reference:

1. Richard R.Goldberg, Methods of Real analysis, IBM Publishing, New Delhi.

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III YEAR - V SEMESTER
COURSE CODE: 7BMA5C2

CORE COURSE - X – STATISTICS - I

Unit – I

Central Tendencies – Introduction – Arithmetic Mean – Partition Values – Mode – Geometric Mean and Harmonic Mean – Measures of Dispersion.

Unit – II

Moments – Skewness and Kurtosis – Curve fitting – Principle of least squares.

Unit – III

Correlation – Rank correlation Regression – Correlation Coefficient for a Bivariate Frequency Distribution.

Unit – IV

Interpolation – Finite Differences – Newton's Formula – Lagrange's Formula – Attributes – Consistency of Data – Independence and Association of Data.

Unit – V

Index Numbers – Consumer Price Index Numbers – Analysis of Time series – Time series – Components of a Time series – Measurement of Trends.

Text Book:

1. Statistics by Dr. S. Arumugam and Mr. A.ThangapandiIssac, New Gamma Publishing House, Palayamkottai, June 2015.

Unit I	Chapter 2sections 2.1 to 2.4 Chapter 3 section 3.1
Unit II	Chapter 4 sections 4.1 & 4.2 Chapter 5 section 5.1
Unit III	Chapter 6 sections 6.1 to 6.4
Unit IV	Chapter 7 sections 7.1 to 7.3 Chapter 8 sections 8.1 to 8.3
Unit V	Chapter 9 sections 9.1 & 9.2 Chapter 10 sections 10.1 to 10.3

Book for Reference:

1. Statistics Theory and Practice by R.S.N.Pillai and Bagavathi, S.Chand and Company Pvt. Ltd. New Delhi, 2007.

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III YEAR - V SEMESTER
COURSE CODE: 7BMA5C3

CORE COURSE - XI – OPERATIONS RESEARCH - I

Unit – I

Introduction – Origin and Development of O.R – Nature and features of O.R. – Scientific Method in O.R. – Modelling in O.R. – Advantages and Limitations of Models – General solution methods of O.R. models – Applications of Operations Research – Linear Programming problem – Mathematical formulation of the problem – Illustration on Mathematical formulation of linear programming problems – Graphical solution method – Some exceptional cases – General linear programming problem – Canonical and Standard forms of L.P.P – Simplex method.

Unit – II

Use of Artificial variables (Big M method – Two Phase method) Duality in linear programming – General primal and dual pair – Formulating a Dual problem – Primal – Dual pair in matrix form – Duality Theorems – Complementary Slackness Theorem – Duality and Simplex method – Dual simplex method.

Unit – III

Introduction – L.P. formulation of T.P. – Existence of solution in T.P. – The Transportation table – Loops in T.P. – Solution of a Transportation problem – Finding an initial basic – feasible solution (NWCM – LCM – VAM) – Degeneracy in TP – Transportation Algorithm (MODI Method) – Unbalanced T.P – Maximization T.P.

Unit – IV

Assignment problem – Introduction – Mathematical formulation of the problem – Test for optimality by using Hungarian method – Maximization case in Assignment problem.

Unit – V

Sequencing problem – Introduction – problem of sequencing – Basic terms used in Sequencing– n jobs to be operated on two machines – problems – n jobs to be operated on K machines–problems–Two jobs to be operated on K machines (Graphical method)–problems.

Text Book:

1. Operations Research (14^{th} edition) by KantiSwarup, P.K.Gupta and Man Mohan, Sultan Chand & Sons, New Delhi, 2008.

Unit I	Chapter 1sections 1.1 to 1.7, 1.10 Chapter 2 sections 2.1 to 2.4 Chapter 3 sections 3.1 to 3.5 Chapter 4 sections 4.1 to 4.3
Unit II	Chapter 4 sections 4.4 Chapter 5 sections 5.1 to 5.7, 5.9
Unit III	Chapter 10 sections 10.1 to 10.3, 10.5, 10.6, 10.8, 10.9, 10.12, 10.13, 10.15
Unit IV	Chapter 11 sections 11.1 to 11.4
Unit V	Chapter 12 sections 12.1 to 12.6

Books for Reference:

1. P.K.Gupta and D.S.Hira, Operations Research, 2^{nd} Edition, S.Chand& Co., New Delhi, 2004.
2. Taha H.A.,Operations Research–An Introduction,8^{th} edition,Pearson Prentice Hall.

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III YEAR - V SEMESTER
COURSE CODE: 7BMAE1A

ELECTIVE COURSE - I (A) – GRAPH THEORY

Unit – I

Graphs – Definition and examples – Degrees – Sub graphs – Isomorphism – Ramsey Numbers – Independent Sets and Coverings – Intersection graphs and Line graphs – Matrices – Operations on Graphs.

Unit – II

Dergee Sequences – Graphic sequences – Walks, Trials and Paths – Connectedness and Components – Blocks – Connectivey – Eulerian Graphs – Hamiltonian Graphs.

Unit – III

Trees – Characterisation of Trees – Centre of a Tree – Matchings–Matchings in Bipartite Graphs.

Unit – IV

Planer graphs and properties – Characterization of Planer graphs – Thickness, crossing and outer planarity – Chromatic number and ChromaticIndex – The Five colour theorem and four colour problem.

Unit – V

Chromatic polynomials – Definitions and Basic properties of Directed Graph – Paths and Connections – Digraphs and Matrices – Tournaments.

Text Book:

1. Invitation to Graph Theory by Dr. S.Arumugam & S.Ramachandran, Scitech Publications (India) Pvt. Ltd,2001 .

Unit I	Chapter 2
Unit II	Chapters 3, 4 & 5
Unit III	Chapters 6 & 7
Unit IV	Chapter 8, Chapter 9, sections 9.1 to 9.3
Unit V	Chapter 9 section 9.4; Chapter 10

Book for Reference:

1. Graph Theory with Applications to Engineering and Computer Science byNarasinghDeo, Prentice Hall of India, New Delhi.

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III YEAR - V SEMESTER
COURSE CODE: 7BMAE1B

ELECTIVE COURSE – I (B) – SPECIAL FUNCTIONS

Unit – I

Power Series solution of Ordinary Differential equations of First and Second Order – Properties of Power Series – Illustrative Examples

Unit – II

Singular Points of Linear Second Order Differential Equations – The Method of Frobenius.

Unit – III

Bessel's Equation – Solution of Bessel's General Differential Equation – Recurrence Formula for $J_n(X)$ – Generating Function $J_n(X)$

Unit – IV

Hermite's Polynomials – Orthogonal properties of Hermite's polynomials – Recurrence formula for Hermite's polynomials – Laguerre polynomials – Orthogonal properties of Laguerre polynomials.

Unit – V

Legendre's Equation – Solutions of Legendre's Equation – Definition of $P_n(X)$ and $Q_n(X)$ – Laplace Definite Integral for $P_n(X)$ – Orthogonal Properties of Legendre's Polynomials – Recurrence Formula for Legendre's Polynomials – Beltrami's Result – Christoffel's Expansion.

Text Books:

1. Special Functions by J.N.Sharma and R.K.Gupta, Krishna Prakashan Media (Pvt.) Ltd. Meerut, Twenty Sixth Edition 2006.
2. Advanced Calculus for Applications by F.B.Hilde Brand, Prentice Hall, INC. Englewood Cliffs, New Jersey

Unit I	Chapter 4 sections 4.1,4.2 of (2)
Unit II	Chapter 4 sections 4.3,4.4 of (2)
Unit III	Chapter 5 sections 5.1,5.2,5.6,5.7 of (1)
Unit IV	Chapter 6 sections 6.7,6.8 Chapter 7 sections7.3,7.7 of (1)
Unit V	Chapter 2 sections 2.1 to 2.3,2.6 to 2.10 of (1)

Books for Reference:

1. Differential Equations and Calculus of Variations by L.Elsgolts.
2. Differential Equations by Diwan and Agashe.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMAE2A

ELECTIVE COURSE - II (A) – NUMERICAL ANALYSIS

Unit – I

Solution of Algebraic and Transcendental equations – Introduction, Bisection Method, Iteration Method, Method of False position, Newton Raphson Method.

Unit – II

Interpolation : Finite differences – Forward differences, Backward differences, Central differences, Symbolic relations, Newton's formula for Interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula.

Unit – III

Numerical Differentiation and Integration – Introduction, Numerical Differentiation – Errors in Numerical Differentiation – Cubic Spline method – maximum and minimum values of a tabulated function, Numerical Integration – Trapezoidal Rule and Simpson's 1/3 and 3/8 rules.

Unit – IV

Matrices and Linear system of Equations – Gaussian Elimination method, Gauss – Jordan method, Modification of the Gauss method to compute the inverse – Method of Factorization – Iterative method – Jacobi and Gauss Seidal methods.

Unit – V

Numerical Solutions of Ordinary Differential Equations – Solution by Taylor Series, Picard's method of Successive approximations, Euler method, Modified Euler method Runge – Kutta Methods.

Text Book:

1. Introductory Methods of Numerical Analysis, (4^{th} Edition) by S.S.Sastry, PHI Learning Pvt. Ltd., New Delhi, 2009.

Unit I	Chapter 2sections 2.1 to 2.5
Unit II	Chapter 3 sections 3.3, 3.6, 3.9, 3.9.1.
Unit III	Chapter 5 sections 5.1, 5.2 - 5.2.2, 5.3, 5.4 – 5.4.1, 5.4.2, 5.4.3.
Unit IV	Chapter 6 sections 6.3.2, 6.3.3, 6.3.4, 6.4.
Unit V	Chapter 7 sections 7.2 to 7.4, 7.4.2, 7.5

Books for Reference:

1. Numerical Methods by P.Kandasamy and Others S.Chand Publications.
2. Numerical Analysis with Programming in C by Dr. S.Arumugam, A.Thangapandi Issac, Dr. A.Somasundaram, New Gamma Publishing House, Palayamkottai, 2013.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMAE2B

ELECTIVE COURSE - II (B) – COMBINATORICS

Unit – I

Basic Combinatorial Numbers – Stirling Numbers of the First kind – Stirling Numbers of the Second kind – Recurrence Formula for S_n^m – Recurrence formula for P_n^m – Patterns of Distributions.

Unit – II

Generating Functions and Recurrence Relations – The Algebra of Formal Power Series – Generating functions for Permutations – Generating functions for Partitions - Inventory of Maps – Recurrence Relations.

Unit – III

Symmetric functions – The Monomial Symmetric functions K_λ– The complete Homogeneous Symmetric Functions h_λ – The Elementary Symmetric Functions a_λ – The Power sum Symmetric Function s_λ – Multinomials.

Unit – IV

Inclusion and Exclusion Principle - Permutations with Forbidden Positions – The Menage problem – Problem of Fibonacci – Polya Theory – Necklace problem and Burnside's Lemma – Cyclic Index of a Permutation Group.

Unit – V

Polya's Theorems and their Immediate Applications – Binary operations on Permutation Groups.

Text Book:

1. Combinatorics Theory and Applications by V.Krishnamurthy, Affliated East-West Press Private Limited, New Delhi, 1985.

Unit I	Chapter 1 section 1
Unit II	Chapter 1 section 2
Unit III	Chapter 1 sections 3 & 4
Unit IV	Chapter 1 sections 5 & 6 Chapter 2 sections 1, 2
Unit V	Chapter 2 sections 3, 4

Books for Reference:

1. A First Course in Combinatorial Mathematics by IanAnderson, Oxford Applied Mathematics and Computing Science Series, U.K., 1974
2. Combinatorics by V.K.Balakrishnan, Schuam Series, 1996.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMA6C1

CORE COURSE - XII – MECHANICS

Unit – I

Forces acting at a point – Resultant and Components – Definition – Simple cases of finding the resultant – Parallelogram law of forces – Analytical Expression for the resultant of two forces acting at a point – Triangle of forces – Perpendicular Triangle of forces – Converse of Triangle of forces – The polygon of forces – Lami's Theorem – An Extended form of the parallelogram law of forces – Parallel forces – Resultant of like parallel forces – unequal unlike parallel forces – Resultant of a number of parallel forces acting on a rigid body –Conditions of equilibrium of three coplanar parallel forces – Centre of two Parallel forces – moments – Physical significance – Geometrical representation – sign and unit of the moment – Varigon's theorem.

Unit – II

Equilibrium of three forces acting on a Rigid body - Rigid body subjected to any three forces – Three coplanar forces theorem – conditions of Equilibrium – Two Trigonometrical Theorem – Friction – Laws of friction – Theorems – Equilibrium of a particle on a rough inclined plane – (i) under a force parallel to the plane – (ii) under any forces – problems on friction – Uniform string under the action of gravity – Equation of the common catenary – axis, vertex, directrix, span and sag – Tenson at any point – Important formulae – Geometrical properties of the Common Catenary

Unit – III

Projectile – Definition – fundamental principles – path of the projectile – Characteristics of the motion of a projectile – Range on an inclined plane – greatest distance maximum range

Unit – IV

Impulsive force – Impulse – Impact of two bodies – Loss of Kinetic energy in Impact – Collision of elastic bodies – Fundamental laws of Impact – Newton's experimental law – Impact of a smooth sphere on a fixed smooth plane – Direct Impact of two smooth spheres – Loss of kinetic energy due to direct impact – Oblique impact of two smooth spheres – Loss of kinetic energy due to oblique impact.

Unit – V

Motion under the action of Central forces – Velocity and acceleration – Equation of motion in Polar Coordinates – Note on equiangular spiral – Motion under a central force – Differential Equation of Central Orbits – Perpendicular from the pole on the tangent – Formulae in Polar Coordinates – Pedal Equation of the central orbit – Pedal equation of some of the well known curves – Velocities in a central orbit – Two folded problems.

Text Books:

1. Statics (17^{th}edition) by Dr. M.K.Venkataraman, Agasthiyar Publications, Tiruchirapalli, 17^{th} Edition, July 2014.
2. Dynamics (18^{th} edition) byDr. M.K.Venkataraman, Agasthiyar Publications, Tiruchirapalli, 2017

Unit I	Chapter 2sections 1 – 10 of (1) Chapter 3 sections 1 – 12of (1)
Unit II	Chapter 5 sections 1 – 5 & Chapter 7of (1) Chapter 11 sections 1 – 6 of (1)
Unit III	Chapter 6 sections 1 – 5, 12, 13, 14, of (2)
Unit IV	Chapter 7 sections 1 – 4 of (2) Chapter 8 sections 1 – 8 of (2)
Unit V	Chapter 11 sections 1 – 11 of (2)

Books for Reference:

1. Mechanics by P.Duraipandian, Emerald Publishers, Chennai, 1984.
2. Statics by S.Narayanan S.Chand & Co., Chennai, 1986.
3. Dynamics by S.Narayanan S.Chand & Co., Chennai, 1986.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMA6C2

CORE COURSE – XIII – COMPLEX ANALYSIS

Unit – I

Functions of a Complex variable – Limits – Theorems on Limits – Continuous functions – Differentiability – The Cauchy – Riemann equations – Analytic functions – Harmonic functions.

Unit – II

Elementary Transformations – Bilinear Transformations – Cross ratio – Fixed points of Bilinear Transformation – Some special Bilinear transformations.

Unit – III

Complex integration – Definite integral – Cauchy's Theorem – Cauchy's Integral formula – Higher derivatives.

Unit – IV

Series expansions – Taylor's Series – Laurent's Series – Zeros of an analytic function Singularities.

Unit – V

Residues – Cauchy's Residue Theorem – Evaluation of definite integrals.

Text Book:

1. Complex Analysis by Dr.S.Arumugam,A.Thangapandi Isaac &Dr. A.Somasundaram, Scitech Publications (India) Pvt. Ltd, Chennai, 2017.

Unit I	Chapter 1sections 2.1 to 2.8
Unit II	Chapter 3 sections 3.1 to 3.5
Unit III	Chapter 6 sections 6.1 to 6.4
Unit IV	Chapter 7 sections 7.1 to 7.4
Unit V	Chapter 8 sections 8.1 to 8.3

Books for Reference:

1. P.P.Gupta – Kedarnath&Ramnath , Complex Variables, Meerut – Delhi.
2. J.N.Sharma, Functions of a Complex Variable, Krishna Prakasan Media (P) Ltd, 13th Edition, 1996-97.
3. T.K.ManickavachagomPillay, Complex Analysis, S.Viswanathan Publishers Pvt. Ltd, 1994.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMA6C3

CORE COURSE - XIV – STATISTICS - II

Unit – I

Probability – Conditional Probability – Random variables – Discrete Random Variable – Continuous Random Variable – Mathematical Expectations – Moment Generating Function – Characteristic function.

Unit – II

Some Special Distributions – Binomial Distribution – Poisson Distribution – Normal Distribution – Gamma Distribution – Chi-Square Distribution – Student's t-Distribution – Snedecor's F Distribution – Fischer's Z – Distribution.

Unit – III

Tests ofSignificance of large samples – Sampling – Sampling Distribution – Testing of Hypothesis – Procedure for Testing of Hypothesis for large samples – Tests of Significance for large samples.

Unit – IV

Tests of Significance based on 't' Distribution – Test of Significance based on F-Test – Test for Significance of an Observed sample correlation.

Unit – V

Test based on Chi - Square Distribution – Chi - Square Test forPopulation variance – Chi - Square Test – To test the Goodness of fit – Test for Independence of Attributes – Analysis of Variance – One Criterion of Classification – Two Criteria of Classification – Three criteria of Classification – Latin Square.

Text Book:

1. Statistics by Dr. S.Arumugam and Mr. A.Thangapandi Isaac, New Gamma Publishing House, Palayamkottai, June 2015.

Unit I	Chapter 11sections 11.1 & 11.2 Chapter 12sections 12.1 to 12.6
Unit II	Chapter 13 sections 13.1 to 13.4
Unit III	Chapter 14 sections 14.1 to 14.5
Unit IV	Chapter 15 sections 15.1 to 15.3
Unit V	Chapter 16 sections 16.1 to 16.3 Chapter 17sections 17.1 to 17.3

Book for Reference:

1. Statistics Theory and Practice by R.S.N.Pillai and Bagavathi, S.Chand and Company Pvt. Ltd., New Delhi, 2007.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMA6C4

CORE COURSE- XV– OPERATIONS RESEARCH - II

Unit – I

Replacement problem and System Reliability – Introduction – Replacement of Equipment / Assert that Deteriorates Gradually – Replacement of Equipment that fails suddenly.

Unit – II

Inventory Control – Introduction – Types of Inventories – Reason for carrying Inventories – Costs Associated with Inventories – Factors affecting Inventory Control – The Concept of EOQ – Deterministic Inventory problems with no shortages, with shortages Problems of EOQ with Price Breaks.

Unit – III

Queuing Theory – Introduction – Queuing System – Elements of Queuing System – Operating Characteristics of a Queuing System – Deterministic Queuing System – Probability Distributions of Queuing Systems – Classification of Queuing models – Definition of Transient and Steady states – Poisson Queuing systesm – (M/M/1) : (∞/FIFO), (M/M/1) : (∞/SIRO), (M/M/1) : (N/FIFO) Generalized model Birth – Death Process.

Unit – IV

Network Scheduling by PERT / CPM – Network Basic components – Drawing network – Critical path Analysis – PERT Analysis – Distinction between PERT and CPM

Unit – V

Game Theory – Two person Zero – Sum Games – Basic terms – Maximin – Minimax Principle – Games without saddle points – Mixed strategies – Graphical solution of 2× n and m × 2 games – Dominance Property – General solution of m×n rectangular games.

Text Book:

1. Operations Research (14th Edition) by KantiSwarup, P.K.Gupta & ManMohan, Sultan Chand & Sons, Educational Publishers, New Delhi, 2008.

Unit I	Chapter 18sections 18.1 to 18.3
Unit II	Chapter 19 sections 19.1 – 19.3, 19.6, 19.7, 19.9, 19.10 – 19.12
Unit III	Chapter 21 sections 21.1 –21.9 upto model IV
Unit IV	Chapter 25 sections 25.1 – 25.8
Unit V	Chapter 17 sections 17.1 to 17.7, 17.9

Books for Reference:

1. Operations Research (2nd edition) by P.K.Gupta and D.S.Hira, S.Chand& Co., New Delhi, 2004.
2. Operations Research (2nd edition) by S.Kalavathy, Vikas Publishing House, New Delhi, 2002.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMAE3A

ELECTIVE COURSE - III (A) – DISCRETE MATHEMATICS

Unit – I

IF statements – connectives – Atomic and compound statements – Well formed formulae –Truth table of a formula – Tautology – Implications and Equivalence formulae – Replacement process – Functionally complete sets of connectives and Duality law – Normal forms – Principle Normal forms – Theory of Inference.

Unit – II

Relations – Representation of a relation – Operations on relations – Equivalence relation – Lattices – Some properties of Lattices, New Lattices – Modular and Distributive Lattices – Boolean Algebra, Boolean Polynomials.

Unit – III

Coding theory – Introduction – Hamming Distance – Encoding a message – Group codes – Procedure for Generating Group codes – Decoding and Error correction.

Unit – IV

Finite Automata – Definition – Representation – Acceptability of a string –Languages accepted by a Finite Automata – Non-Deterministic Finite Automata – Equivalence of FA and NFA

Unit – V

Phase Structure grammars – Chomsky Hierarchy of Languages – Finite Automata and Regular languages

Text Book:

1. Discrete Mathematics by M.K.Venkataraman, N.Sridharan&N.ChandraSekaran, The National Publishing Company, Chennai 2000.

Unit I	Chapter 9sections 1 to 13
Unit II	Chapter 2 sections 2 to 5; Chapter10 sections 1 to 6
Unit III	Chapter 8 sections 1 to 6
Unit IV	Chapter 12 sections 1 to 9
Unit V	Chapter 12 sections 16 to 18

Books for Reference:

1. Discrete Mathematical Structure with Applications to Computer Science – J.P.Trembly&R.Manohar, Tata McGraw Hill Publishing Company, New Delhil 2003.
2. Discrete Mathematics by Prof. V.Sundaresan, K.S.GanapathySubramaniyan&K.Ganesan, Tata McGraw Hill Publishing Company, New Delhi, 2000.

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III YEAR - VI SEMESTER
COURSE CODE: 7BMAE3B

ELECTIVE COURSE - III (B) – FUZZY ALGEBRA

Unit – I

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

Unit – II

Operations on Fuzzy sets – Types of operations – Fuzzy complements – Fuzzy intersections : t-norms – Fuzzy Unions : t-conorms.

Unit – III

Combinations of operations – Fuzzy Arithmetic – Fuzzy numbers

Unit – IV

Arithmetic operations on intervals – Arithmetic operations on Fuzzy numbers – Fuzzy relations – Binary fuzzy relations – Fuzzy equivalence relations – Fuzzy compatibility relations.

Unit – V

Fuzzy ordering relations – fuzzy morphisms.

Text Book:

1. George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, Theory and Applications, Prentice Hall Inc., New Jersey. 1995.

Unit I	Chapter 1 sections 1.3, 1.4 Chapter 2 sections 2.1, 2.3
Unit II	Chapter 3 sections 3.1 to 3.4
Unit III	Chapter 3 section 3.5 Chapter 4 section 4.1
Unit IV	Chapter 4 sections 4.3& 4.4 Chapter 5 sections 5.3, 5.5, 5.6
Unit V	Chapter 5 sections 5.7 & 5.8

Books for Reference:

1. H.J.Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers Limited, New Delhi, 1991.

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