

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

(Established under section 3 of UGC Act, 1956)

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai-600119.



SYLLABUS

SCHOOL OF SCIENCE AND HUMANITIES

DEPARTMENT OF MATHEMATICS

2020

B.Sc. MATHEMATICS**CURRICULUM**

S. No.	Course Code	Course Title	L	T	P	C
SEMESTER I						
Theory						
1.	STA1101 SFR1101	Tamil - I French – I	3	0	0	3
2.	SHSA1104	General English-I	3	0	0	3
3.	SMTA1106	Calculus	3	1	0	4
4.	SPHA1105	Physics for Mathematics	3	0	0	3
5.	SBTA1001	Environmental Science	3	0	0	3
Practical						
6.	SPHA4101	Physics Lab	0	0	3	2
		Total				18
SEMESTER II						
Theory						
7.	STA1102 SFR1102	Tamil – II French – II	3	0	0	3
8.	SHSA1204	General English –II	3	0	0	3
9.	SMTA1203	Sequence and Series	3	1	0	4
10.	SMTA1204	Theory of Equations and Matrices	3	1	0	4
11.	SBS1104	Theory of Basic Computing	3	0	0	3
Practical						
12.	SBS4105	Basic Computing Lab	0	0	3	2
		Total				19

SEMESTER III						
Theory						
13	SMTA1305	Ordinary & Partial Differential Equations	3	1	0	4
14	SMTA1306	Trigonometry & 2D Analytical Geometry	3	1	0	4
15	SMTA1307	Discrete Mathematics	3	0	0	3
16	SMTA1308	Mathematical Statistics	3	0	0	3

17	SBA1302	Cost Accounting & Banking	3	0	0	3
18	S06APT1	Skill Enhancement Course I	2	0	0	2
Practical						
19	SMTA2301	SPSS for Statistics	0	0	2	2
		Total				21
SEMESTER IV						
Theory						
20.	SMTA1403	3D Analytical Geometry & Vector Calculus	3	1	0	4
21.	SMTA1404	Transform Techniques	3	1	0	4
22.	SMTA1405	Fourier Series & Application of Differential Equation	3	0	0	3
23.	SMTA1406	Formal language & Automata	3	0	0	3
24.	SMTA1407	Numerical Methods	3	0	0	3
25	S06APT2	Skill Enhancement Course II	2	0	0	2
26	SMTA2401	MATLAB for Numerical Methods	0	0	3	2
		Total				21
SEMESTER-V						
Theory						
27.	SMTA1501	Algebra I	3	1	0	4
28.	SMTA1502	Real Analysis	3	1	0	4
29.	SMTA1503	Mechanics I	3	1	0	4
30	SMTA1504	Data Analytics	3	0	0	3
31		Elective	3	0	0	3
Practical						
32	SMTA2501	Data Analytics Lab	0	0	3	2
		Total				20
SEMESTER-VI						
Theory						
33	SMTA1601	Algebra II	3	1	0	4
34	SMTA1602	Complex Analysis	3	1	0	4
35	SMTA1603	Mechanics II	3	1	0	4

36	SMTA1604	Operation Research	3	0	0	3
Practical						
37	SO6PROJ1	Dissertation	0	0	3	6
		Total				21
		TOTAL CREDITS	120			

LIST OF ELECTIVES						
Theory						
1.	SMTA3505	Combinatorics	3	0	0	3
2.	SMTA3506	Astronomy	3	0	0	3
3.	SMTA3507	Financial Mathematics	3	0	0	3
4.	SMTA3508	Number Theory	3	0	0	3
5.	SMTA3509	Graph Theory	3	0	0	3
6.	SMTA3510	Cryptography	3	0	0	3
7.	SMTA3511	Mathematical Modeling	3	0	0	3
8.	SMTA3512	Professional Communication	3	0	0	3
9.	SMTA3513	Actuarial Mathematics	3	0	0	3
10.	SMTA3514	LATEX Theory	3	0	0	3

SMTA1204	THEORY OF EQUATIONS & MATRICES	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	4	100

Course Objective: This course enables the student to learn to solve systems of linear equations and application problems requiring them. Helps to find and use eigen values and eigen vectors of a matrix and to work with matrices and determine if a given square matrix is invertible

UNIT I THEORY OF EQUATIONS

10 Hrs

Polynomial equations – Imaginary and Irrational roots – relation between roots and coefficients of equations – Symmetric functions of roots in terms of coefficients of third degree equation - problems.

UNIT II RECIPROCAL EQUATIONS

10 Hrs

Sum of the powers of the roots of an equation – Newton's Theorem on the sum of the powers of the roots – Transformation of equations – Roots with sign changed – Roots multiplied by a given number – Reciprocal equations – problems.

UNIT III TRANSFORMATION OF EQUATIONS

10 Hrs

Increase or decrease the roots of a given equation by a given quantity. Removal of terms - Square of the roots – Transformations in general – Descartes' rule of signs – problems.

UNIT IV ELEMENTARY CONCEPTS

10 Hrs

Symmetric and skew-symmetric matrices, Hermitian and skew-Hermitian matrices, Orthogonal and unitary matrices, Triangular and diagonal matrices, Rank of a matrix, Elementary transformations, Echelon and normal forms, Inverse of a matrix by elementary transformations.

UNIT V MATRICES

10 Hrs

Characteristic equation, Eigen values and Eigen vectors of a matrix, Cayley-Hamilton's theorem and its use in finding inverse of a matrix, Application of matrices to solve a system of linear (both homogeneous and non-homogeneous) equations, Consistency and general solution, Diagonalization of square matrices with distinct Eigen values, Quadratic forms.

TEXT / REFERENCE BOOKS

1. T. K. Manickavasagam Pillai, Natarajan and Ganapathy, Algebra, Volume II, S. Viswanathan Pvt. Ltd., 2004.
2. T. K. Manickavasagam Pillai, Matrices, S. Viswanathan Printers & Publishers, 2012.
3. S. Sudha, Algebra, Analytical Geometry (2D) and Trigonometry, Emerald publishers, 1998.
4. A. Singaravelu, Algebra & Trigonometry, Vol. I & II, Meenakshi Agency, 2003.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the imaginary and irrational roots of polynomial equations. Identify the nature of roots by Descartes' rules and quadratic forms. Recall types of matrices.
CO2	Understand the relations between roots and coefficients of equations. Sum the powers of roots of an equation by different methods.
CO3	Choose appropriate method and solve the reciprocal equations. Apply the concept of diminishing and produce the new equation. Solve by removing terms of polynomial equations. Uses of Cayley-Hamilton theorem.
CO4	Distinguish Echelon and normal forms in matrices.
CO5	Evaluate rank and inverse of matrices by elementary transformations.
CO6	Construct the diagonal matrix by transformations.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1305	ORDINARY & PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	4	100

Course Objective: This course enables to evaluate first order differential equations including separable, homogeneous, exact, and linear, existence and uniqueness of solutions. Solving second order and higher order linear differential equations. Introducing partial differential equations and to solve second and higher order Partial Differential with different methods.

UNIT I DIFFERENTIAL EQUATIONS OF FIRST ORDER

10 Hrs

Elementary Methods in Ordinary Differential Equations. Formation of differential equation. Solutions: General, particular, and singular. First order exact equations and integrating factors. Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variable are separable. Homogeneous equations. First order higher degree equations solvable for x , y , p . Clairaut's form and singular solutions. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

UNIT II DIFFERENTIAL EQUATIONS OF SECOND ORDER

10 Hrs

Linear differential equations of second order. Second order equation with constant coefficient with particular integrals for e^{ax} , x^m , $e^{ax}\sin mx$, $e^{ax}\cos mx$. Method of variation of parameters. Ordinary simultaneous differential equations.

UNIT III PARTIAL DIFFERENTIAL EQUATION

10 Hrs

Partial differential equations. Formation of partial differential equations. Types of solutions. PDEs of the first order. Lagrange's solution.

UNIT IV PARTIAL DIFFERENTIAL EQUATION (CONTD...)

10 Hrs

Some special types of equations which can be solved easily by methods other than the general methods. Charpit's and Jacobi's general method of solution.

UNIT V SECOND AND HIGHER ORDER PARTIAL DIFFERENTIAL EQUATION

10 Hrs

Partial differential equations of second and higher order. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients.

TEXT / REFERENCE BOOKS

1. P. Kandasamy, K. Thilagavathy, Mathematics for B. Sc Branch – I, Volume 3, 1st Edition, S. Chand and Co. Ltd., New Delhi, 2004.
2. M. K. Venkataraman and S. Krishnan, Engineering Mathematics, The National Publishing Co., 2010.
3. Dipak Chatterjee, Integral Calculus and differential equations, TATA McGraw S Hill Publishing Company Ltd., 2000.
4. Narayanan, T.K. Manichavasagam Pillai, Calculus, Vol. I, S. Viswanathan Printers Pvt. Limited, 2007.
5. Dr. S. Sudha, Differential Equations & Integral Transforms, Emerald Publishers, 2002.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Define Order, degree of ODE and PDE. Identify the methods to solve homogeneous and non homogeneous ODE and PDE.
CO2	Classify ODE and PDE. Illustrate various methods to solve second order Differential equation and Partial differential equations.
CO3	Solve some special types of partial differential equations by Charpit's and Jacobi's method.
CO4	Analyze the solution of first order differential equations by various methods.
CO5	Evaluate higher order differential equations by method of variation of parameters.
CO6	Formation of ODE & PDE for the given function.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1307	DISCRETE MATHEMATICS	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objective: This course enables the ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgments. Improves logical thinking of the students and apply in different areas.

UNIT I **LOGIC**

9 Hrs

Statements and Notations, Connectives ,Negation, Conjunction, Disjunction, statement, Formulae and Truth Tables, Conditional and Bi-conditional, Well-formed Formulae, Tautologies, Equivalence of Formulae, Duality Law Tautological Implications.

UNIT II **INFERENCE THEORY**

9 Hrs

Normal Forms, Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms, Rules of Inference, The Predicate Calculus, Predicates, Variables and Quantifiers, Predicate Formula, Free and Bound Variables.

UNIT III **SEMIGROUP AND MONOID**

9 Hrs

Semi groups, Monoids, Homomorphism of Semi groups and Monoids, Sub semi groups and Sub monoid.

UNIT IV **LATTICES**

9 Hrs

Lattices as Partially Ordered Set, Properties of Lattices, Lattices as Algebraic Systems, Sublattices, Direct Product and Homomorphism.

UNIT V **BOOLEAN ALGEBRA**

9 Hrs

Boolean Algebra, Basic properties, Sub algebra, Direct Product, and Homomorphism, Boolean Functions.

TEXT / REFERENCE BOOKS

1. J.P.Trembley,R.Manohar,Discrete Mathematical Structures with applications to Computerscience, McGrawHill BookCo.,second edition 2001.
2. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, Prentice Hall of India, e-Book, 2013.
3. R.LidlandG.Pilz,Applied Abstract Algebra, SpringerVerla,1984.
4. RalphP.Grimaldi , Discrete and combinatorial Mathematics:An Applied Introduction,Fourth edition,Pearson Education Asia,Delhi2002.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Define truth table; list equivalent Propositions, List basic properties of Lattices and Boolean algebra. Identify semigroup and Monoid.
CO2	Understand Equivalence Relation, Lagrange's theorem on Cyclic group.
CO3	Solve problems on Inference theory for Propositional Calculus and Predicate Calculus. Distinguish PCNF and PDNF. Analyze properties of groups.
CO4	Evaluate problems on implication and Equivalence laws, Analyse Lattices as Algebraic system
CO5	Develop supremum and infimum in Boolean function, . Construct truth table of the compound statements
CO6	Constructing proofs for semigroup, monoid, homomorphism and lattices

ENDSEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1308	MATHEMATICAL STATISTICS	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objectives

To present the general theory of statistical distributions as well as the standard distributions found in statistical practice. To train students with essential tools for statistical analyses by fostering understanding through real-world statistical applications.

UNIT I CONCEPT OF SAMPLE SPACE**9 Hrs**

Events, Definition of Probability (Classical, Statistical & Axiomatic) - Addition and Multiplication laws of probability - Independence - Conditional Probability - Bayes' theorem - Simple problems.

UNIT II RANDOM VARIABLES**9 Hrs**

(Discrete and Continuous) Distribution function - Expected values & moments - Moment generation function - probability generation functions - Examples.

UNIT III CONCEPTS OF BIVARIATE DISTRIBUTION**9 Hrs**

Correlation and regression - Linear prediction - Rank correlation coefficient - Concepts of Partial and Multiple Correlation coefficients - Simple problems.

UNIT IV STANDARD DISTRIBUTIONS**9 Hr**

Binomial, Poisson, Normal and Uniform distributions - Geometric, Exponential, Gamma and Beta distributions. Inter relationship between distributions.

UNIT V SAMPLING THEORY**9 Hrs**

Introduction-large sample test based on normal distribution - Sampling distribution of the mean – Confidence limits Test for single mean difference between means, proportion, difference between proportion - small sample test based on t, F distributions - Test for single mean, difference between means, standard deviation, difference between standard deviations - Chi square test for goodness of fit, independence of attributes.

TEXT / REFERENCE BOOKS

1. S. C. Gupta & V. K. Kapoor, Fundamental of Mathematical Statistics, 9th Edition, Sultan Chand & Sons, New Delhi, 1994.
2. P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2002.
3. Treatment and Content as in Mathematical Statistics, J. N. Kapur and H. C. Saxena, 20th Edition, S. Chand & Co. Ltd., New Delhi, 2010.
4. Hogg, R.V. & Craig, A. T. (1998): Introduction to Mathematical Statistics, Macmillan
5. T.Veerarajan, Probability, Statistics and Random process, Tata McGraw Hill, 1st reprint, 2004.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events. Translate real-world problems into probability models.
CO2	Derive the probability density function of transformation of random variables. Calculate probabilities, and derive the marginal and conditional distributions of bivariate random variables. Derive the mean and variance of the distributions.
CO3	Calculate and interpret the correlation between two variables. Calculate the simple linear regression equation for a set of data. Utilise the principles of linear regression and correlation, including least square method in predicting a particular value of Y for a given value of X and significance of the correlation coefficient. Analyse the association between the attributes.
CO4	Define binomial outcomes and compute probability of getting X successes in n trials. Identify the characteristics of different discrete and continuous distributions. Identify the type of statistical situation to which different distributions can be applied. Use Poisson, exponential, Normal distributions to solve statistical problems.
CO5	Use the normal probability distribution including standard normal curve calculations of appropriate areas. Use different distributions to solve simple practical problems. Understand the interdependence between the distributions.
CO6	Formulate null and alternative hypotheses and apply t-tests, F tests and Chisquare tests in real life problems. Compare the hypothetical values in small and large samples.

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SBA1302	COST ACCOUNTING AND BANKING	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

UNIT 1 INTRODUCTION TO COST ACCOUNTING**9 Hrs**

Cost Accounting – Meaning, Scope, Objectives - Advantages and Limitations – Difference between Cost Accounting and Financial Accounting – Elements of Cost – preparation of Cost Sheet.

UNIT 2 MATERIAL COST**9 Hrs**

Material cost – Purchase Procedure – Material controlling techniques – Economic Order Quantity – Stores Ledger – Pricing of Issues – FIFO, LIFO, Simple Average and Weighted Average Methods.

UNIT 3 LABOUR COST**9 Hrs**

Labour Cost – Importance – Various Methods of Labour Cost Control – Methods of Wage Payment – Various Incentive Schemes – Labour Turnover.

UNIT 4 OVERHEADS**9 Hrs**

Overheads – Classification – Apportionment Of Overheads – Redistribution Of Overheads – Absorption Of Overheads – Calculation of Machine Hour Rate

UNIT 5 INTRODUCTION TO BANKING**9 Hrs**

Banking – Meaning, objectives - **Role of banking**, Classification of Banks - functions of Commercial Banks- functions of RBI - E-Banking and Internet Banking - Meanings, scope, advantages and disadvantages.

Max. 45 Hrs**TEXT/ REFERENCE BOOKS**

1. Jain & Narang, Cost Accounting, Kalyani Publishers Ludhiana, 2006.
2. Reddy & Hari Prasad Reddy, Cost Accounting, Margham Publications, Chennai- 17.
3. Maheswari, Cost Accounting, Sultan chand & sons, New Delhi, 2002.
4. Pillai & Bagavathi, Cost Accounting, Sultan Chand & sons, New Delhi.
5. Jawaharlal, Cost Accounting, The McGrawHill Companies, UP, 2007.
6. B.Santhanam, 2005, Banking theory Law & Practice, 4th Ed., Margham Publications, Chennai.
7. Dr.S.N.Maheswari, 2004, banking Theory Law & Practice, 10th Ed., Sultan Chand & Sons, New Delhi.
8. Sundharam & Varshney, 2005, Banking Theory & Practice, 17th Ed., Sultan Chand & Sons, New Delhi.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Discuss the concepts in cost accounting
CO2	Classify various costs and overheads in an organisation
CO3	Estimate the total cost incurred for making a product
CO4	Prepare cost sheet and Describe the material controlling techniques
CO5	Compute labour remuneration and incentives
CO6	Know about the Banking types, and services.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A :** 10 Questions of 2 Marks each – No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

S06APT1	SKILL ENHANCEMENT COURSE I	L	T	P	CREDITS	TOTAL MARKS
		2	0	0	2	100

Course Objective: This module would train the students on the quick ways to solve quantitative aptitude problems and questions applying logical reasoning, within a short time span given during the placement drives.

QUANTITATIVE APTITUDE

Partnership, Simple Interest, Compound Interest, Profit and Loss, Problems on Clock, Calendar and Cubes, Permutation and Combination, Allegation and mixtures

LOGICAL REASONING

Letter and Symbol series, Number series, analyzing arguments, making judgments

SMTA2301	SPSS for STATISTICS	L	T	P	CREDITS	TOTAL MARKS
		0	0	2	2	100

Course Objectives

1. To reinforce the basic skills to organize, manage and present data using SPSS.
2. To impart to the students the knowledge of doing statistical data analysis and to demonstrate graphically using frequency distributions and cumulative frequency distributions.

S.No.	Exp. No	Name of experiments	Duration
1.	1	Creation of SPSS data file	2
2.	2	Frequency Analysis- preparation of charts and diagrams	2
3.	3	Descriptive Statistics	2
4.		Extended experiment – 1	2
5.	4	Parametric Test – One sample t-test	2
6.	5	Parametric Test – Independent t-test	2
7.	6	Parametric Test – Paired t-test	2
8.		Extended experiment -2	2
9.	7	Non-parametric Test- Chi-square test	2
10.	8	Non-parametric Test - Mann Whitney test	2
11.	9	Non-parametric Test - Kruskal Wallis test	2
12.		Extended experiment – 3	2
13.	10	Correlation-Bivariate	2
14.	11	Rank Correlation	2
15.	12	Regression	2
16.		Extended experiment -4	2

TEXT BOOKS

1. David M. Levine et al, Statistics for Managers using MS Excel,(6thEdition) Pearson, 2010
2. David R. Anderson, et al, An Introduction to Management Sciences, Quantitative approaches to Decision Making, (13th edition), South-Western College Pub, 2011.
3. William J. Stevenson, Ceyhun Ozgur, Introduction to Management Science with Spreadsheet, Tata McGraw Hill, 2009.
4. Wayne L. Winston, Microsoft Excel 2010, Data Analysis & Business Modeling, 3rdedition, Microsoft Press, 2011.
5. Vikas Gupta, Comdex Business Accounting with Ms Excel, 2010 and Tally ERP 9.0 Course Kit, Wiley India, 2012

6. Kiran Pandya and Smriti Bulsari, SPSS in simple steps, Dreamtech, 2011.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Discuss the concepts in Data Analysis and create data files using SPSS. Compute measures of association and structural models for discrete data
CO2	Preparation of Charts and Tables for frequency distributions using SPSS. Visualize categorical data and conduct explorative data analysis.
CO3	Compute the parametric tests for real world problems. Conduct inference for model parameters.
CO4	Compute the Non-parametric tests for real world problems Check model assumptions and analyze residuals and goodness-of-fit.
CO5	Evaluate Bivariate Correlation Coefficient using Karl Pearson and Spearman.
CO6	Apply Multiple Regression analysis technique for real life problems and predict the future values

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs

CAE Evaluation of Regular Lab class 25 Marks

50 Marks

Model practical exam 25 Marks

ESE University Practical exam

50 Marks

SMTA1403	3D ANALYTICAL GEOMETRY & VECTOR CALCULUS	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	4	100

Course Objective: To understand the concepts of 3 dimensional analytical geometry and finding shortest distance between skew line and orthogonal spheres. To analyze the differentiation and integration with vectors.

UNIT I RECTANGULAR CARTESIAN CO-ORDINATES

10 Hrs

Direction cosines of a line – Direction ratios of the join of two points - Projection on a line – Angle between the lines -Equation of a plane in different forms - Intercept form- normal form - Angle between two planes - Planes bisecting the angle between two planes, bisector planes.

UNIT II PLANE AND STRAIGHT LINE

10 Hrs

Equation of a line in different forms - reduction to symmetric form of a given line - angle between the lines - image of a point and a line with respect to a plane- plane and a line- Angle between a line and a Plane - Co-Planarity of two lines – Skew lines-Shortest distance between two skew lines.

UNIT III SPHERE

10 Hrs

Equation of the sphere - general form – plane section of a sphere- tangent line and tangent plane – orthogonal spheres.

UNIT IV VECTOR DIFFERENTIATION

10 Hrs

Limit of a vector function – Continuity of vector functions – Derivative of a vector function — Scalar and vector point functions – Gradient of a scalar point function – Directional derivative of a scalar point function – Divergence and curl of a vector point function – Solenoidal vector – Irrotational vector – Vector identities.

UNIT V VECTOR INTEGRATION

10 Hrs

Vector integration – Line integral – Application of line integral. Surface and Volume integrals – Applications - Gauss Divergence theorem. Stoke's theorem – Green's theorem.

TEXT / REFERENCE BOOKS

1. P. R. Vittal and V. Malini, Vector Analysis, Margham Publications, Chennai, 2006.
2. T. K. Manickavasagam Pillay and others, Vector Calculus, S. Viswanathan Publications.
3. S. Shanti Narayan, A Text Book of Vector Calculus, S. Chand and Co., New Delhi, 1966.
4. K. Viswanatham & S. Selvaraj, Vector Analysis, Emerald Publishers, Chennai, Reprint 1999.
5. P. Duraipandian, Laxmi Duraipandian, Vector Analysis, Emerald Publishers, Chennai, Reprint 2003.
6. Shanthi Narayanan and Mittal P.K: Analytical Solid Geometry 16th Edition S.Chand & Co., New Delhi, 2006.
7. Analytical Geometry – 3D by T.K. Manickavasagam Pillay and others S. Viswanathan (Printers & publishers), Chennai, 2001.
8. N. Saran and R. S. Gupta, Analytical Geometry of 3D, Pothishala Pvt. Ltd., Allahabad.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Describe equation of a plane in different forms, define direction cosines and direction ratios of a line and find angle between two planes, Bisector planes.
CO2	Identify the angle between lines, angle between line and plane Intersection of two lines. Estimate shortest distance between two skew lines
CO3	Sketch the general form of sphere, Orthogonal sphere and plane section of a sphere.
CO4	Apply gradient to solve problems involving normal vectors to level surfaces.
CO5	Evaluate line integral, surface and volume integral.
CO6	Integrate surface and volume integrals using Gauss Divergence, Stokes and Greens theorem.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1404	TRANSFORM TECHNIQUES	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	4	100

Course Objective: This course gives opportunity to students to know the principles and concepts of Laplace Transforms, Fourier Transforms and Z-Transforms. Apply Laplace Transform to solve differential equations. Evaluate integrals using Laplace Transform and Fourier Transform. Formation of difference equations and make use of the concepts of Z-Transforms to solve the difference equations.

UNIT I LAPLACE TRANSFORM

10 Hrs

Laplace transform – Transforms of standard functions – properties– Transforms of derivatives and integrals – Transforms of the type $e^{at}f(t)$, $tf(t)$, $f(t)/t$ - Transform of periodic functions – Transform of unit step function and impulse function - Initial and final value theorems

UNIT II INVERSE LAPLACE TRANSFORM

10 Hrs

Inverse Laplace transform –Transforms of standard functions – properties - Convolution theorem – Heaviside expansion theorem and its application.

UNIT III APPLICATIONS OF LAPLACE TRANSFORM

8 Hrs

Linear ordinary differential equation with constant co-efficients – Integral equations - Integral equations of convolution type -simultaneous linear differential equations with constant co-efficients

UNIT IV FOURIER TRANSFORM

11 Hrs

The infinite Fourier transform – Sine and Cosine transform – Properties – Inversion theorem – Convolution theorem – Parseval's identity – Finite Fourier sine and cosine transform.

UNIT IV Z-TRANSFORM

11 Hrs

Z-transform and inverse Z-transform of elementary functions, Shifting theorems, Convolution theorem, Initial and final value theorem, Application of Z-transforms to solve difference equations.

TEXT/ REFERENCE BOOKS

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2011.
2. R.K. Jain and S.R.K. Iyenger, Advanced Engineering Mathematics, Narosa Publishing House, 2009.
3. F. B. Hildebrand, Methods of Applied Mathematics, Courier Dover Publications, 1992.
4. L. Debanth and D. Bhatta, Integral Transforms and Their Applications, 2nd Ed., Taylor and Francis Group, 2007

Course Outcomes: At the end of the course, the student will be able to:

CO1	Applying the concept of Laplace Transforms to various type of functions.
CO2	Illustrate the solution for the functions using inverse Laplace transforms.
CO3	Produce the solution for integral and differential equations using Laplace and inverse Laplace Transforms.
CO4	Evaluate the functions by using finite and infinite fourier transforms.
CO5	Implement the solution for various functions using z transforms and Inverse Z transforms.
CO6	Determine the solution of difference equations using z transforms and Inverse Z transforms.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1405	FOURIER SERIES & APPLICATION OF DIFFERENTIAL EQUATION	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objective: This course provides students to get exposed to the concepts of Fourier series. Know the Application of Differential Equations. Apply Fourier series in solving Partial Differential Equations.

UNIT I FOURIER SERIES 9 Hrs

Definition- Dirichlets conditions- coefficients- Fourier series for the function defined in $[c, c+2\pi], [c, c+2l]$ – odd and even functions in fourier series- Parseval's identity (without proof).

UNIT II FOURIER SINE AND COSINE SERIES 9 Hrs

Half range cosine series and sine series of $f(x)$ defined in $[0, \pi], [0, l]$ - Parseval's Identity (without proof) - simple problems – Complex form of Fourier series-Harmonic Analysis.

UNIT III APPLICATION OF ODE 9 Hrs

Particle dynamics: Simple Harmonic motion – Projectiles: – horizontal plane - trajectory – velocity of projection – angle of projection – Range - time of flight – greatest height - projectiles on inclined plane. Central orbit and Central forces: – differential equation of a path – pedal equation of a differential equation – velocity at any point of a central orbit – areal velocity – Kepler's laws of planetary motion.

UNIT IV APPLICATION OF PDE 9 Hrs

One dimensional wave equation – Transverse vibration of finite elastic string with fixed ends – boundary and initial value problems – Fourier series solution – one dimensional heat equation – steady and unsteady state – boundary and initial value problems – Fourier series solution.

UNIT V APPLICATION OF PDE 9 Hrs

Two dimensional heat equation - steady state heat flow in two dimensions- Laplace equation in Cartesian and polar co-ordinates (excluding annulus) – Fourier series solution .

TEXT /REFERENCESBOOK

1. George F Simmons, Differential equation with Applications and historical notes, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.
2. S Narayanan & T K Manicavachogam Pillay, Differential Equations.: S V Publishers Private Ltd., 1981.
3. G K Ranganath, Text book of B.Sc, Mathematics, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.
4. Frank Ayres, Schaum's outline of theory and problems of Differential Equations, 1st ed. USA: McGraw-Hill, 1972.
5. S Narayanan, Dynamics, 16th ed. New Delhi: S Chand and Company Ltd., 1986.
6. N.P. Bali, Dynamics (Golden Series), Latest ed. New Delhi, India: Lakshmi Publications (p) Limited, 2004.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the periods for trigonometric functions. Identify even and odd functions. Recall integration formulas.
CO2	Understand and classify half range cosine and sine series
CO3	Apply methods to solve kepler's law of planetary motion, pedal equation of a differential equation
CO4	Distinguish ordinary differential equation and partial differential equation
CO5	Evaluate one dimensional heat equation with boundary and initial value condition. Discriminate between steady and unsteady state problems
CO6	Formulate two dimensional heat equation for Cartesian and polar coordinates.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1406	FORMAL LANGUAGE & AUTOMATA	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objective: To Acquiring adequate knowledge in Automata, Regular sets, Context-free language, Finding the Recent Trends and application in the theory of computation.

UNIT I FORMAL LANGUAGES AND FINITE STATE AUTOMATA

9 Hrs

Introduction to Formal Languages-Strings and Languages-Finite State Machines-Deterministic Finite State Automata- Non-deterministic Finite State Automata- Designing Finite State Automata-Languages accepted by Finite State Automata.

UNIT II REGULAR EXPRESSIONS AND REGULAR SETS

9 Hrs

Non-Deterministic Finite Automata with ϵ -moves - Equivalence of Deterministic and Non-deterministic Finite State Automata-Regular Expression-Applications of Regular expressions- Manipulating and Simplifying Regular Expressions-Regular Sets-Decision Algorithm for Regular Languages .

UNIT III GRAMMARS AND PROPERTIES OF REGULAR SETS

9 Hrs

Classification of Grammars: Chomsky Hierarchy-Context Sensitive Grammar-Regular Grammar- Context-Free Grammar-Closure Operations-Closure Properties of Regular Languages-Substitution-Homomorphism-Inverse homomorphism-Pumping Lemma for regular set.

UNIT IV CONTEXT-FREE LANGUAGES AND CLOSURE PROPERTIES

9 Hrs

Context-free languages-Derivation of a string-Parsing-Leftmost derivation and right most derivation- Ambiguity of a Grammar-Closure Properties of Context-free languages.

UNIT V NORMAL FORMS

9 Hrs

Simplification of Context-Free Grammars - Normal Forms- Chomsky Normal Form - Greibach Normal form and problems on normal forms- Decision Algorithms for Context-Free Languages -Pumping Lemma for Context-free Grammar.

TEXT / REFERENCE BOOKS

1. Dr. M. Venkatraman, Dr. N. Sridharan, N. Chandrasekaran, "Discrete Mathematics", Chapter 12, Sections 1 to 12.
2. Rani Siromoney, Formal Languages and Automata, The Christian Literature Society, Chennai. Chapter 2, Sections 2.1 to 2.4, Chapter 3, Sections 3.1 to 3.2, Chapter 4, Sections 4.1 to 4.5.
3. John E Hopcroft, Jeffery D, Ullman, Introduction to Automata Theory and Computations, Narosa Publishing House.
4. Ragade B.R, "Automata and Theoretical Computer Science", Pearson Education
5. Bernard M. Moret, "The Theory of Computation", Pearson Education
6. Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett Publishers

Course Outcomes: At the end of the course, the student will be able to:

CO1	Identify the fundamental knowledge of the core concepts in automata theory and distinguish the finite state machines.
CO2	Describe the regular expressions and regular sets.
CO3	Applying Grammars and Automata (recognizers) for different language classes (Regular, Context-Free).
CO4	Examine the languages and the ambiguity of a grammar.
CO5	Evaluate the problems on Chomsky Normal Forms.
CO6	Formulate the normal forms to an equivalent grammar.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1407	NUMERICAL METHODS	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objective: To acquire knowledge in the field of numerical analysis and also design and analyze the techniques to give approximate and accurate solutions to numerical problems

UNIT I DIRECT AND ITERATIVE METHODS

9 Hrs

Direct Method: Gauss elimination method – Error Analysis– Iterative methods: Gauss- Jacobi and Gauss-Seidel – Convergence considerations – Eigen value Problem: Power method.

UNIT II NUMERICAL DIFFERENTIATION AND INTEGRATION

9 Hrs

Interpolation: Lagrange's and Newton's interpolation -- Errors in interpolation – Optimal points for interpolation - Numerical differentiation by finite differences – Numerical Integration: Trapezoidal, Simpson's and Gaussian quadratures – Error in quadratures.

UNIT III POLYNOMIAL APPROXIMATION

9 Hrs

Norms of functions – Best Approximations: Least squares polynomial approximation – Approximation with Chebyshev polynomials – Piecewise Linear & Cubic Spline approximation.

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

9 Hrs

Single-Step methods: Euler's method –Taylor series method – Runge-Kutta method of fourth order – Multistep methods: Adams-Bashforth and Milne's methods – Stability considerations – Linear Two point BVPs: Finite Difference method.

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATION

9 Hrs

Elliptic equations: Five point finite difference formula in rectangular region – truncation error; One-dimensional Parabolic equation: Explicit and Crank-Nicholson schemes; Stability of the above schemes - One-dimensional Hyperbolic equation: Explicit scheme.

TEXT / REFERENCE BOOKS

1. Kandasamy P, Thilagavathy. K and G. Gunawathy, Numerical Methods, S.Chand & Sons, 3rd Revised Edition, 2013.
2. Balagurusamy. E, Numerical Methods, Tata McGraw Hill Publishing Company, 3rd Edition, 2000.
3. Isaacson E. and Keller, H.B., "Analysis of Numerical Methods" Dover Publication, 1994.
4. Philips G.M and Taylor P.J., "Theory and Applications of Numerical Analysis", Academic Press, 1996.
5. Jain M.K, "Numerical Methods for Scientific and Engineering computation", 3rd Edition, New Age International, 1999.
6. Conte S.D. and Carl de Boor, "Elementary Numerical Analysis", 3rd Edition, Tata McGraw-Hill Publishing Company, 2004.
7. Atkinson K.E., "An Introduction to Numerical Analysis", Wiley & Sons, 2nd Edition, 1989.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the types of direct method and iterative methods. State the difference between the Gauss–Seidel and Jacobi methods.
CO2	Classify the concepts of numerical differentiation and numerical integration.
CO3	Solve the polynomials using chebyshev method.
CO4	Discriminate between single step methods and multistep methods.
CO5	Determine the temperature for parabolic equations for various x values
CO6	Develop the temperature table for parabolic equation for suitable formulas

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

S06APT2	SKILL ENHANCEMENT COURSE II	L	T	P	CREDITS	TOTAL MARKS
		2	0	0	2	100

COURSE OBJECTIVE: This module is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning.

QUANTITATIVE APTITUDE

Time and Distance, Height and Distance, Problems on Ages, Trains, Pipes and Cistern Boats and Streams, Probability.

LOGICAL REASONING

Direction sense test, Venn diagrams, Seating arrangements, Cause and effect Blood relation test, Dice, Logical verbal puzzles.

SMTA2401	MAT LAB for NUMERICAL METHODS	L	T	P	CREDITS	TOTAL MARKS
		0	0	3	2	100

List of Experiments

1. Introduction to MATLAB
2. Study of Vector and Matrix Operations
3. Solution of System of equations
 - Gauss Elimination method
 - Gauss Seidal method
4. Numerical Differentiation
5. Numerical Integration
 - Trapezoidal
 - Simpsons rule
6. Least square polynomial approximation
7. Solution of ODE
 - Taylor's series method
 - Euler's method
 - Runge kutta method of fourth order

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs

CAE	Evaluation of Regular Lab class 25 Marks	50 Marks
	Model practical exam 25 Marks	
ESE	University Practical exam	50 Marks

SMTA1503	MECHANICS I	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	4	100

Course Objectives: To understand the procedures for analysis of static objects and also analyses and design the construction of force and moments in two and three dimension.

UNIT I STATICS 10 Hrs

Forces acting on a Particle – Concurrent forces – Equilibrium of forces acting at a point – Parallelogram Law of forces – Triangle Law of forces - Lami's theorem – Polygon of forces

UNIT II PRINCIPLES OF MOMENTUM 10 Hrs

Moment of a force about a point and a line – Theorems on moments- resultant of like and unlike parallel forces – couples- reduction of a force and couple in a plane to a single force – laws of friction-Equilibrium of a particle on a rough inclined plane.

UNIT III KINEMATICS 10 Hrs

Kinematics – motion of a point – Velocity and acceleration – Composition of velocities – Relative velocity – Motion in a straight line under uniform acceleration and variable acceleration – Vertical motion under gravity

UNIT IV NEWTON'S LAW OF MOTION 10 Hrs

Newton's laws of motion – conservation of linear momentum – motion of a particle on a rough horizontal and inclined plane under the action of a constant force – Motion in a resisting medium with resistance varying as velocity and velocity².

UNIT V PROJECTILES 10 Hrs

Projectiles – Trajectory – ranges on horizontal and inclined planes – enveloping parabola - impact of elastic bodies – impact of two smooth spheres (direct and oblique) – loss of kinetic energy.

TEXT / REFERENCE BOOKS

1. Naik, K.V. and Kasi, M.S., Statics and dynamics, Emerald publishers, 1992.
2. Narayanan, S., Statics and Dynamics Rochouse & Sons Pvt., Ltd
3. Venkataraman, M.K., Statics and Dynamics, 1982.
4. P.Duraipandian and Laxmi Duraipandian, Mechanics, S.Chand and Company Ltd. 1985.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Identify Parallelogram law of force, Triangle law of force and Concurrent forces.
CO2	Discuss moment of force about a point and a line. Summarize law of friction.
CO3	Calculate velocity and acceleration, Motion in a straight line under uniform and variable acceleration.
CO4	Categorize the motion of a particle on a rough horizontal and inclined plane by Newton's law of motion.
CO5	Estimate the impact of elastic bodies and two smooth spheres.
CO6	Create envelope of Projectile Trajectories

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1504	DATA ANALYTICS	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	4	100

Course Objectives: To educate and motivate the students in the field of data analysis. To allow the students to have a deep knowledge in fundamentals of statistics

Unit I: Introduction to Data Analysis

10 Hrs

Introduction – collection, classification and tabulation of data – Concept of primary and secondary data – Data - quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio – Data visualization - Bar diagram, pie chart, histogram, frequency curve and frequency polygon – Ogives- Introduction to statistical learning and R-Programming

Unit II: Descriptive Statistics

10 Hrs

Measures of central tendency - Measures of location of dispersions - Practice and analysis with R.

Unit III: Bivariate data

10 Hrs

Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), Simple linear regression, principle of least squares and fitting of polynomials and exponential curves –Practice and analysis with R.

Unit IV: Analysis of Time Series

10 Hrs

Introduction to times series data - Components of a time series- Decomposition of time series - Trend - Measure of trend – Graphical method, Semi Average method, Moving Average method and Least Square method – Measurement of Seasonal Variation – Simple Average method, Ratio Trend method and Ratio Moving Average method.

Unit IV Multivariate Analysis

10 Hrs

Multivariate Techniques - Multiple Regression Analysis - Factor Analysis – Discriminant Analysis – Cluster Methods - Artificial Neural Networks.

TEXT / REFERENCE BOOKS

1. D.C. Montgomery & E. Peck- Introduction to Linear Regression Analysis
2. A.M. Mood, F.A. Graybill & D.C. Boes. Introduction to the Theory of Statistics
3. N. Draper & H. Smith- Applied Regression Analysis
4. S. M. Ross, "A first course in Probability", Prentice Hall.
5. J. I. R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers". Fourth Edition, PHI.
6. A. M. Mood, F.A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", McGraw Hill Education.
7. Jared P. Lander- R for Everyone: Advanced Analytics and Graphics

Course Outcomes: At the end of the course, the student will be able to:

CO1	Recall the basics of statistics and Identify the level of measurement.
CO2	Estimate the measures of central tendency and location of dispersions using R
CO3	To conduct the Analysis of variance for randomized block design and latin squares using R.
CO4	Distinguish the different types of analysis, also explain about artificial neural networks, fuzzy logic and genetic algorithm.
CO5	Evaluate Type I and Type II errors in significance test using R.
CO6	Compose likelihood ratio property and create critical values using R.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA2501	DATA ANALYTICS LAB	L	T	P	CREDITS	TOTAL MARKS
		0	0	3	2	100

Course Objectives: To acquire basic knowledge of R laboratory techniques. To educate the students the basics of data acquisition, data analysis and interpretation of results.

LIST OF EXPERIMENTS

1. Programming Method
2. Implementation using R & R-studio
3. Debugging
4. Library Function, file
5. R statistical programming language
6. Introduction to R, Functions
7. Control flow and Loops
8. Working with Vectors and Matrices
9. Reading in Data, Writing Data
10. Working with Data
11. Manipulating Data
12. Simulation
13. Linear model
14. Data Frame
15. Graphics in R

Course Outcomes: At the end of the course, the student will be able to:

CO1	Able to download R software and R studio software.
CO2	Get familiar with R software and learn basics of R with descriptive statistics. Access online resources for R and import new function packages into the R workspace. Import, review, manipulate and summarize data-sets in R.
CO3	To educate the basics of data acquisition ,data analysis and interpretation of results.
CO4	Perform correlation, regression analysis and appropriate statistical tests for real life situations using R
CO5	Fit the distributions to a real life data using R-software.
CO6	Compute probabilities and fitting of probability distribution with R environment.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs

CAE **Evaluation of Regular Lab class 25 Marks**

50 Marks

Model practical exam 25 Marks

ESE **University Practical exam**

50 Marks

SMTA1603	MECHANICS II	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	4	100

Course Objective: This Course makes students to have a deep knowledge in mechanics and improves the imagination. To acquire a good knowledge in dynamics of a particle and learn about motion of a particle

UNIT I CENTRE OF GRAVITY

10 Hrs

Center of Gravity of areas – surfaces and volumes of solids of revolution – conditions of equilibrium.

UNIT II VIRTUAL WORK

10 Hrs

Virtual work – simple problems – equilibrium of strings and chains – common catenary – Suspension Bridge

UNIT III SIMPLE HARMONIC MOTION

10 Hrs

Simple harmonic motion and its application – particle attached to an elastic string – composition of two simple harmonic motions – Simple pendulum – tangential and Normal velocity and acceleration of a particle along a curve.

UNIT IV DYNAMICS OF A PARTICLE

10 Hrs

Velocity and acceleration of a particle in polar coordinates – circular, elliptic, parabolic and hyperbolic orbits -Problems in finding law of force – Equation to the orbit – Inverse square law

UNIT V RIGID BODY DYNAMICS

10 Hrs

M.I. of standard regular bodies – Theorems of parallel and perpendicular axes – Motion of rigid body about a fixed axis- D'Alemberts principle – Kinetic energy and angular Momentum of a rigid body rotating about horizontal axis – Compound Pendulum – Length of S.E.P. – Sphere rolling down the inclined plane

TEXT / REFERENCE BOOKS

1. Naik, K.V. and Kasi, M.S., Statics and dynamics, Emerald publishers, 1992.
2. Narayanan, S., Statics and Dynamics Rochouse & Sons Pvt., Ltd
3. Venkataraman, M.K., Statics and Dynamics, Agasthiar Publications, 1982.
4. P.Duraipandian and Laxmi Duraipandian, Mechanics, S.Chand and Company Ltd. 1985.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Identify the center of gravity, volumes of solids of revolution.
CO2	Understand the equilibrium of strings and chains and discuss problems on Suspension Bridge.
CO3	Use Simple harmonic motion and its application to illustrate the tangential and Normal velocity and acceleration of a particle along a curve.
CO4	Classify Velocity and acceleration in polar coordinates and examine the law of force by solving problems.
CO5	Estimate the Moment of Inertial of standard regular bodies, motion of rigid body about a fixed axis.
CO6	Analyze the forces that acts on link of mechanism using D Alemberts Principle.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA1604	OPERATION RESEARCH	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objective: This course gives students to understand the importance of Operation Research. Develop and Create Problem solving skills for any complex problems..Solve Linear Programming Problems, Transportation and Assignment Problems, Sequencing and Scheduling Problem, Inventory Control Replacement Model.

UNIT II INTRODUCTION TO OR

9 Hrs

Operations Research(OR)-Nature-Characteristics-Phases.-Role of OR in Decision making- Outline of OR Models Linear Programming - definition - mathematical formulation - graphical method.

UNIT II LINEAR PROGRAMMING PROBLEM

9 Hrs

General linear programming problems – canonical and standard forms – simplex method -Two Phase Method - Big M methods. Dual Simplex method - Duality - properties - fundamental theorems of duality(statements only) -principle of duality - dual simplex method.

UNIT III TRANSPORTATION AND ASSIGNMENT PROBLEM

9 Hrs

Transportation problem – Initial Basic feasible solution- Northwest corner method - Least Cost method - Vogel's approximation method –Optimum solution using MODI method - Assignment problems - Travelling salesman problems.

UNIT IV SEQUENCING AND SCHEDULING PROBLEM

9 Hrs

Sequencing Problem with N jobs and 2 machines N Jobs 3 machines N Jobs and m machines and 2 Jobs m machines (Graphical method) - Project Management -Basic concepts–Network construction - Scheduling Critical Path Method (CPM) & Program evaluation review technique (PERT) – simple applications.

UNITV INVENTORY CONTROL REPLACEMENT MODEL

9 Hrs

Inventory Control - Various Types of inventory models - deterministic inventory models - Production model, Purchase model -with and without shortage - Economic Order Quantity (EOQ) - Buffer stock -Shortage quantity - Probabilistic inventory models – Quantity Discount and Price Breaks.Replacement policy for items whose maintenance cost increases with time- Consideration of time value of money - Replacement policy- Individual, Group replacement of items that fail completely and suddenly.

TEXT / REFERENCE BOOKS

1. Kanthi Swarup, Gupta P.K., Man Mohan, "Operations Research, 12th Edition", Sultan Chand Sons, Educational Publishers, New Delhi, 2004
2. S.D Sharma,"operation research Theory, Methods and Application", 17th Edn., Kedar Nath Ram Nath Publication, 2010.
3. Panner Selvam R., "Operations Research", Prentice Hall of India Private Limited, New Delhi, 2006
4. Kalavathy S., "Operations research", 2nd Edition, Vikas Publishing House Private Limited, New Delhi, 2002.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the characteristics of operation research. Identify the decision variables and formulation of linear program. Recall to solve two variable problems.
CO2	Understand the slack and surplus variables to find the optimal solution of an optimization problem. Identify the artificial variable and form a new objective function.
CO3	Apply north west corner, least cost and vogel approximation method on transportation problem. Solve assignment problem using Hungarian method
CO4	Explain how to determine an optimal sequence in which the jobs should be performed on the machines so that the total elapsed time is minimum
CO5	Evaluate the various types of inventory models. Discriminate deterministic and probabilistic models in inventory.
CO6	Formulate the problem involves determining whether to replace them as a group or to replace individuals as they fail.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 questions of 2 Marks each – No choice

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

Exam Duration: 3 Hrs.

20 Marks

80 Marks

SMTA3510	CRYPTOGRAPHY	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objectives: This course facilitate the students to improve knowledge and skills of standard concepts in cryptography and exhibits how cryptography plays an significant role in the present digital world by knowing encryption and decryption techniques and secure data in transit across data networks.

Unit I Introduction to Number Theory

9 Hrs

Finite Fields and Number Theory: Modular arithmetic, Euclidian Algorithm, Primality Testing: Fermats and Eulers theorem, Chinese Remainder theorem, Discrete Logarithms

Unit II Cryptography and its Techniques

9 Hrs

Overview of Cryptography, Computer security concepts, Security attacks, Symmetric cipher model, Cryptanalysis and brute-force attack, Substitution techniques, Caesar cipher, Mono alphabetic ciphers, Play fair cipher, Hill cipher, Poly alphabetic ciphers, One-time pad, Transposition techniques, Binary and ASCII.

Unit III Data Encryption Standard (DES) and Advanced Encryption Standard (AES)

9 Hrs

Pseudo-random bit generation, Stream ciphers and Block ciphers and the Feistel cipher. The data encryption standard (DES), DES example, advanced encryption standard (AES), AES transformation functions, AES key expansion, AES example.

Unit IV Public-key Cryptography

9 Hrs

Principles of public-key cryptosystems, The RSA algorithm and security of RSA, Elliptic curve arithmetic, Elliptic curve cryptography, Cryptographic Hash functions, Secure Hash algorithm, Message Authentication, Message Authentication Code (MAC).

Unit V Digital Signatures and Network Security

9 Hrs

Digital signatures, Elgamal and Schnorr digital signature schemes, Digital signature algorithm. Wireless network and mobile device security, Email architecture, formats, threats and security, Secure/Multipurpose Internet Mail Extension (S/MIME) and Pretty Good Privacy (PGP).

References

1. Stallings, William (2017). *Cryptography and Network Security, Principles and Practice* (7th ed.). Pearson Education Limited. England.
2. Trappe, Wade & Washington, Lawrence C. (2006). *Introduction to Cryptography with Coding Theory* (2nd ed.). Pearson Education International.
3. Stinson, Douglas R. (2005). *Cryptography Theory and Practice* (3rd ed.). CRC Press.
4. William Stallings (2006), *Cryptography and Network Security: Principles and Practice*, 4th edition, Pearson Education, India.
5. Atul Kahate (2008), *Cryptography and Network Security*, 2nd edition, Tata Mc Grawhill, India.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Understand the fundamentals of Cryptography including data and advanced encryption standard (DES & AES), RSA and elliptic curve cryptography.
CO2	Classify Encryption and decryption messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms.
CO3	Identifying Authentication functions, the manner in which Message Authentication Codes and Hash Functions works.
CO4	Analyze Key Management techniques and importance of number Theory.
CO5	Developing knowledge of standard algorithms that can be used to provide confidentiality, integrity and authentication of data.
CO6	Design a security solution for a given application.

END SEMESTER EXAM PATTERN

Max. Marks: 100

PART A: 10 questions of 2 marks each – No choice -

PART B : 2 questions from each unit of internal choice, each carrying 16 marks -

Exam Duration: 3 Hrs

20 Marks

80 Marks

SMTA3511	MATHEMATICAL MODELING	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objective: Identify the significance of Mathematical Modeling and the various types of Mathematical models applied in different fields.

Unit-I: INTRODUCTION

9 Hrs

Basic Steps of Mathematical Modeling, its needs, types of models, limitations, Elementary ideas of dynamical systems, Equilibrium point, node, saddle point, focus, centre and limit-cycle idea with simple illustrations and figures

Unit-II: POPULATION MODELS

9 Hrs

Basic concepts, Exponential growth model, formulation, solution, interpretation and limitations. Compensation and depensation, Logistic growth model, formulation, solution, interpretation and limitations.

Unit-III: EPIDEMIC MODELS

9 Hrs

Basic concepts, SI model, SIS model with constant coefficient, SIS model with coefficient as a function of time t , SIS model with constant number of carriers, SIS model when the carriers is a function of time t , SIR model, Epidemics with vaccination.

Unit-IV: ECONOMIC MODELS

9 Hrs

Production and supply functions, price-elasticity, utility of consumption and consumer surplus, theory of production, production function.

Unit-V: BIOLOGICAL MODELS

9 Hrs

Blood flow and oxygen transfer, Modeling blood flow, viscosity, Poiseuille law, mathematical formulation of the problem, solution and interpretation.

TEXT / REFERENCE BOOKS

1. Mark M. Meerschaert, Mathematical Modeling, Academic Press, New York, 1993
2. W. Meyer, Concepts of Mathematical Modeling, McGraw Hill, New York, 1994
3. Beltrami, Mathematics for Dynamic Modeling, Academic Press, Orlando, Florida, 1987
4. N. Bailey, The Mathematical Theory of Infectious Diseases, Hafner press, New York, 1975

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the origin of Mathematical Modeling, needs and limitations
CO2	Discuss the components and facts of various Population models.
CO3	Sketch the models used to explore the epidemics
CO4	Analyze the nature of the Economic models
CO5	Summarize the science of blood flow and oxygen transfer
CO6	Organize how the Poiseuille law is applied for modeling biological flows

EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA3512	PROFESSIONAL COMMUNICATION	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course objectives: To enable students to acquire a specialized knowledge of the essential professional skills. To train them to make effective presentations on a variety of topics. To help them participate in group discussions displaying teamwork skills. To build their confidence and help them attend interviews winningly. To groom them to become successful professionals

UNIT I Exposure to Professional Skills

9 Hrs

Introduction to Skills: hard skills and soft skills – communication skills – interpersonal skills – employability and career skills – **planning and prioritizing work** – **time management** – stress management – emotional intelligence – SWOT analysis.

UNIT II Preparing and Presenting Inspiring Talks

9 Hrs

Key elements of effective presentation – nonverbal communication – impressive self-introduction and short individual presentation – preparing outline – structuring and organizing content – presenting – introducing topic – developing points – concluding – answering questions.

UNIT III Measures to Crack Group Discussion

9 Hrs

Group discussion skills – team building – using key strategies – etiquette – content preparation – brainstorming – out of box thinking – mind mapping – turn taking and turn giving – speaking persuasively questioning and clarifying.

UNIT IV Interview Skills to Get Hired

9 Hrs

Interview skills – etiquette – body language – confidence – preparedness – types of interviews – Frequently Asked Questions (FAQs) – mock interview – job application and resume writing.

UNIT V Language Skills and Career Mapping

9 Hrs

Listening skills – understanding different accents – reading skills – verbal ability – email writing – **professional grooming** – **leadership qualities** – fundamentals of entrepreneurship – career planning – goal setting – future challenges

Course Outcomes: At the end of the course, the student will be able to:

CO1	Have sufficient knowledge of the skills required for professional development
CO2	Give formal and effective presentations
CO3	Participate actively in group discussions
CO4	Attend job interviews and answer questions confidently and effortlessly
CO5	Emerge as professionals ready for placement
CO6	Create goal setting and future challenges

commended Software:

1. Globearena
2. Win English

Textbook:

Interact English Lab Manual for Undergraduate Students, 2016, Hyderabad: Orient BlackSwan.

Reference Books:

1. Alex, K, 2019, Soft Skills: Know Yourself and Know the World, New Delhi: S. Chand & Company Limited.
2. Butterfield, Jeff, 2015, Soft Skills for Everyone. New Delhi: Cengage Learning.
3. Kumar, Suresh E et al, 2015, Communication for Professional Success, Hyderabad: Orient BlackSwan.
4. Mitra, Barun K, 2016, Personality Development and Soft Skills, New Delhi: Oxford University Press.
5. Raman, Meenakshi and Sangeeta Sharma, 2014, Professional Communication, Oxford: Oxford University Press.
6. Rizvi, Ashraf, M, 2018, Effective Technical Communication, Chennai: McGraw-Hill Education.

Web References:

1. <https://www.britishcouncil.in/english/online/resources-websites/moocs>
2. <https://alison.com/courses/communications>
3. <https://in.topresume.com/career-advice/15-free-resources-to-improve-your-presentation-and-speaking-skills>
4. http://www.washington.edu/doi/TeamN/present_tips.html

5. <https://www.softwaretestinghelp.com/how-to-crack-the-gd/>
6. <http://www.oxforddictionaries.com/words/writing-job-applications>
7. http://www.mindtools.com/pages/article/newCDV_34.htm
8. <https://myinterviewpractice.com/>

EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A :** 10 questions of 2 Marks each – No choice**20 Marks****PART B :** 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SMTA3513	ACTUARIAL MATHEMATICS	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objective: To learn and gain the knowledge about the impact of economic and social conditions in the financial sector. Create awareness about the financial terminology and calculations in the policy designing.

UNIT I LIFE INSURANCE

9 Hrs

Introduction to life insurance - Insurance Payable at the Moment of Death - Insurance Payable at the End of Year of Death - Relationship between Insurance Payable at the Moment of Death and End of the Year of Death.

UNIT II LIFE ANNUITIES

9 Hrs

Introduction to Life Annuities - Continuous Life Annuities - Discrete Life Annuities - Life Annuities with monthly Payments - Complete Annuities-Immediate and Apportion able Annuities-Due.

UNIT III GENERAL INSURANCE FOR BUSINESS

9 Hrs

Describe the general insurance business environment Current business environment - Main provider of general insurance - Main types of general insurance Purposes - Benefits and perils- Exposure to which premiums are related - Claim characteristics - Risk factors and risk rating

UNIT IV OCCUPATIONAL PENSION PROVISION

9 Hrs

Occupational pensions scheme – main features, advantages and disadvantages, occupational pension scheme and personal pension - Defined benefit occupational pension schemes (state provisions, advantages and disadvantages)

UNIT V BONDS AND OTHER SECURITIES

9 Hrs

Premium and Discount - Valuation between Coupon Payment DGEates - Determination of Yield Rates - Callable and Puttable Bonds - Serial Bonds.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Demonstrate an appropriate mastery of theory and techniques
CO2	Identify appropriate techniques based on theory and practice in Annuities.
CO3	Apply general insurance policy in business environment and exposure main types of general insurance
CO4	Analyse the benefits of occupational pension
CO5	Evaluate the quantitative data in premium and securities and performing calculations
CO6	Create a data sheet for bonds and securities

TEXT BOOKS/REFERENCES:

1. Neelam C Gulati "Principles of Insurance Management", Excel Books, New Delhi.
2. Harriett E Jones "Principles of Insurance" FLMI Insurance Education Program. Life Management Institute LOMA, (Dec 1995).
3. Micheal M Parmenter, 'theory of Interest and Life contingencies with Pension', 3rd Edition.
4. Gerber, Hans U. – "Life insurance mathematics" 3rd Edition – Springer. Swiss Association of Actuaries, 1997.
5. Chandra, P., Investment Analysis and Portfolio Management, 4th Edition, Tata McGraw-Hill Education, New Delhi, 2012.
6. Ranganathan, M. and Madhumathi, R., Security Analysis and Portfolio Management, 2nd Edition, Pearson, New Delhi, 2012.
7. Gupta P. K., Insurance and risk management, HPH, 2nd edition, 2018.

EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMTA3514	LATEX THEORY	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

Course Objectives: To prepare a LaTeX document , To understand the fundamentals of LaTeX and utilization, Development of typesetting skills, Able to write article, project report, include figures and tables in a Latex document.

UNIT – I Basic LaTeX 9 Hrs

Sample document and Key Concepts – Type style – Environments - Vertical and Horizontal spacing.

UNIT – II Typesetting Mathematics 9 Hrs

Examples – Equation environments – Fonts, Hats and underlining – Braces – Arrays and Matrices – Customized commands – Theorems-like Environments - Math Miscellany.

UNIT – III Further essential LaTeX 9 Hrs

Document classes and the overall structure – Titles for documents – Sectioning Commands

UNIT – IV Pictures and Colors 9 Hrs

The picture Environment- Picture Objects-Curves.

UNIT – V Errors 9 Hrs

Finding the Error – LATEX's Error Messages – TEX's Error Messages- LATEX Warnings- TEX Warnings.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Demonstrate the appropriate type of style, Math miscellany and Commands
CO2	Identify the appropriate fonts, braces and customized commands.
CO3	Apply the commands in documents
CO4	Analyze the LATEX's error message and Picture environment
CO5	Evaluate the equation environments and overall structures
CO6	Create the documents using LATEX commands

TEXT / REFERENCE BOOKS

1. David F Griffiths and Desmond J. Higham, Learning LaTeX, SIAM (Society for Industrial and Applied Mathematics) Publishers, Phidel Phia, 1996.
2. Leslie . Lamport. LATEX: A Document Preparation System, User's Guide and Reference Manual. Addison-Wesley Publishing Company, New York, second edition, 1994
3. Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.

EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

PROGRAMME: B.Sc. MATHEMATICS

CURRICULUM

SEMESTER 1										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	STA1101	Tamil - I	3	0	0	3	50	50	1
		SFR 1101	French - I	3	0	0	3	50	50	4
2	Theory	SHS 1109	General English-I	3	0	0	3	50	50	6
3	Theory	SMT1104	Calculus	4	*	0	4	50	50	8
4	Theory	SPH 1105	Physics for Mathematics	4	0	0	4	50	50	10
5	Theory	SBT 1001	Environmental Science	3	0	0	3	50	50	11
6	Practical	SPH 4101	Physics Lab	0	0	4	2	50	50	13
Total Credits for Semester 1 – 19										
Total Marks for Semester 1 –600										

SEMESTER 2										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	STA 1102	Tamil – II	3	0	0	3	50	50	14
		SFR 1102	French - II	3	0	0	3	50	50	16
2	Theory	SHS 1110	General English -II	3	0	0	3	50	50	17
3	Theory	SMT1210	Trigonometry & 2D Analytical Geometry	4	*	0	4	50	50	19
4	Theory	SMT1211	Mathematical Statistics	3	*	0	3	50	50	21
5	Theory	SBS1104	Theory of Basic Computing	3	0	0	3	50	50	23
6	Practical	SBS4105	Basic Computing Lab	0	0	3	2	50	50	24
Total Credits for Semester 2 – 18										
Total Marks for Semester 2 – 600										

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

SEMESTER 3										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMT1302	Theory of Equations and Matrices	4	*	0	4	50	50	29
2	Theory	SMT1303	3D Analytical Geometry & Vector Calculus	4	*	0	4	50	50	31
3	Theory	SMT1304	Discrete Mathematics	3	*	0	3	50	50	32
4	Theory	SMT1305	Ordinary & Partial Differential Equations	4	*	0	4	50	50	33
5	Theory	SBA1302	Cost Accounting & Banking	3	0	0	3	50	50	34
6	Professional Training	SO6PT1	Quantitative Aptitude & Logical Reasoning I	2	0	0	2	100	-	36
Total Credits for Semester 3 – 20										
Total Marks for Semester 3 – 600										

SEMESTER 4										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMT1401	Transform Techniques	4	*	0	4	50	50	37
2	Theory	SMT1402	Sequence and Series	4	*	0	4	50	50	38
3	Theory	SMT1403	Fourier Series & Application of Differential Equation	4	*	0	4	50	50	39
4	Theory	SMT1404	Formal language & Automata	3	0	0	3	50	50	40
5	Theory	SMT1405	Numerical Methods	3	*	0	3	50	50	41
6	Professional Training	SO6PT2	Quantitative Aptitude & Logical Reasoning II	2	0	0	2	100		42
Total Credits for Semester 4 – 20										
Total Marks for Semester 4 – 600										

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION,

SEMESTER 5										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMT1501	Algebra I	4	*	0	4	50	50	43
2	Theory	SMT1502	Real Analysis	4	*	0	4	50	50	44
3	Theory	SMT1503	Mechanics I	4	*	0	4	50	50	45
4	Theory	SMT1504	Operation Research I	4	*	0	4	50	50	46
5	Theory	SMT1505	Graph Theory	3	*	0	3	50	50	47
6	Theory		Elective	4	*	0	4	50	50	
Total Credits for Semester 5 – 23										
Total Marks for Semester 5 – 600										

SEMESTER 6										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMT1601	Algebra II	4	*	0	4	50	50	52
2	Theory	SMT1602	Complex Analysis	4	*	0	4	50	50	53
3	Theory	SMT1603	Mechanics II	4	*	0	4	50	50	54
4	Theory	SMT1604	Operation Research II	4	*	0	4	50	50	55
5	Project	SO6PROJ	Project	0	0	10	8	50	50	
Total Credits for Semester 6 – 24										
Total Marks for Semester 6 – 500										

List of electives										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMT1551	Combinatorics	4	*	0	4	50	50	48
2	Theory	SMT1552	Astronomy	4	*	0	4	50	50	49
3	Theory	SMT1553	Financial Mathematics	4	*	0	4	50	50	50
4	Theory	SMT1554	Number Theory	4	*	0	4	50	50	51

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
CAE – CONTINUOUS ASSESSMENT EXAMINATION,

SMT1211	MATHEMATICAL STATISTICS	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	3	100

COURSE OBJECTIVE

To be familiar with basic concepts sample space; To be familiar with discrete and continuous Random variables; To be familiar with correlation and regression analysis; To understand the standard distribution; To expose the testing of hypotheses.

UNIT I CONCEPT OF SAMPLE SPACE 12 Hrs

Events, Definition of Probability (Classical, Statistical & Axiomatic) - Addition and Multiplication laws of probability - Independence - Conditional Probability - Bayes' theorem - Simple problems.

UNIT II RANDOM VARIABLES 12 Hrs

(Discrete and Continuous) Distribution function - Expected values & moments - Moment generation function - probability generation functions - Examples.

UNIT III CONCEPTS OF BIVARIATE DISTRIBUTION 12 Hrs

Correlation and regression - Linear prediction - Rank correlation coefficient - Concepts of Partial and Multiple Correlation coefficients - Simple problems.

UNIT IV STANDARD DISTRIBUTIONS 12Hrs

Binomial, Poisson, Normal and Uniform distributions - Geometric, Exponential, Gamma and Beta distributions. Inter relationship between distributions.

UNIT V SAMPLING THEORY 12 Hrs

Introduction-large sample test based on normal distribution - Sampling distribution of the mean – Confidence limits Test for single mean difference between means, proportion, difference between proportion - small sample test based on t, F distributions - Test for single mean, difference between means, standard deviation, difference between standard deviations - Chi square test for goodness of fit, independence of attributes.

TEXT / REFERENCE BOOKS

1. S. C. Gupta & V. K. Kapoor, Fundamental of Mathematical Statistics, 9th Edition, Sultan Chand & Sons, New Delhi, 1994.
2. P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2002.
3. Treatment and Content as in Mathematical Statistics, J. N. Kapur and H. C. Saxena, 20th Edition, S. Chand & Co. Ltd., New Delhi, 2010.
4. Hogg, R.V. & Craig. A. T. (1998): Introduction to Mathematical Statistics, Macmillan
5. T.Veerarajan, Probability, Statistics and Random process, Tata McGraw Hill, 1st reprint, 2004.

CO1	Define basic probabilities. List the additive and multiplicative laws on probability, types of correlations. Identify the sample tests, mean and confidence limits.
CO2	Explain functions of random variables, their probability distributions and probability generating functions. Explain and derive the mean and variance of the distributions.
CO3	Choose appropriate probability theorem and solve the problems. Prepare the cumulative distribution for random variables. Applications of parameters of standard distributions.
CO4	Distinguish correlation and regression, moments and moments generating functions.

	Categorize the regression coefficients. Differentiate correlation and rank correlation.
CO5	Evaluate the correlation coefficients and expected values of random variables.
CO6	Compare the hypothetical values in small and large samplings.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT1302	THEORY OF EQUATIONS & MATRICES	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

UNIT I THEORY OF EQUATIONS**12 Hrs**

Polynomial equations – Imaginary and Irrational roots – relation between roots and coefficients of equations – Symmetric functions of roots in terms of coefficients of third degree equation -problems.

UNIT II RECIPROCAL EQUATIONS**12 Hrs**

Sum of the powers of the roots of an equation – Newton's Theorem on the sum of the powers of the roots – Transformation of equations – Roots with sign changed – Roots multiplied by a given number – Reciprocal equations – problems.

UNIT III TRANSFORMATION OF EQUATIONS**12 Hrs**

Increase or decrease the roots of a given equation by a given quantity. Removal of terms - Square of the roots – Transformations in general – Descartes's rule of signs – problems.

UNIT IV ELEMENTARY CONCEPTS**12 Hrs**

Symmetric and skew-symmetric matrices, Hermitian and skew-Hermitian matrices, Orthogonal and unitary matrices, Triangular and diagonal matrices, Rank of a matrix, Elementary transformations, Echelon and normal forms, Inverse of a matrix by elementary transformations.

UNIT V MATRICES**12 Hrs**

Characteristic equation, Eigen values and Eigen vectors of a matrix, Cayley-Hamilton's theorem and its use in finding inverse of a matrix, Application of matrices to solve a system of linear (both homogeneous and non-homogeneous) equations, Consistency and general solution, Diagonalization of square matrices with distinct Eigen values, Quadratic forms.

TEXT / REFERENCE BOOKS

1. T. K. Manickavasagam Pillai, Natarajan and Ganapathy, Algebra, Volume II, S.Viswanathan Pvt. Ltd., 2004.
2. T.K. Manickavasagam Pillai, Matrices, S.Viswanathan Printers & Publishers, 2012.
3. S. Sudha, Algebra, Analytical Geometry (2D) and Trigonometry, Emerald publishers, 1998.
4. A. Singaravelu, Algebra & Trigonometry, Vol. I & II, Meenakshi Agency, 2003.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the imaginary and irrational roots of polynomial equations. Identify the nature of roots by Descartes's rules and quadratic forms. Recall types of matrices.
CO2	Understand the relations between roots and coefficients of equations. Sum the powers of roots of an equation by different methods.
CO3	Choose appropriate method and solve the reciprocal equations. Apply the concept of diminishing and produce the new equation. Solve by removing terms of polynomial equations. Uses of Cayley-Hamilton theorem.
CO4	Distinguish Echelon and normal forms in matrices.
CO5	Evaluate rank and inverse of matrices by elementary transformations.
CO6	Construct the diagonal matrix by transformations.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT1303	3D ANALYTICAL GEOMETRY & VECTOR CALCULUS	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT I RECTANGULAR CARTESIAN CO-ORDINATES**12 Hrs**

Direction cosines of a line – Direction ratios of the join of two points - Projection on a line – Angle between the lines -Equation of a plane in different forms - Intercept form- normal form - Angle between two planes - Planes bisecting the angle between two planes, bisector planes.

UNIT II PLANE AND STRAIGHT LINE**12 Hrs**

Equation of a line in different forms - reduction to symmetric form of a given line - angle between the lines - image of a point and a line with respect to a plane- plane and a line- Angle between a line and a Plane - Co-Planarity of two lines –Skew lines-Shortest distance between two skew lines.

UNIT III SPHERE**12 Hrs**

Equation of the sphere - general form – plane section of a sphere- tangent line and tangent plane – orthogonal spheres.

UNIT IV VECTOR DIFFERENTIATION**12 Hrs**

Limit of a vector function – Continuity of vector functions – Derivative of a vector function – Scalar and vector point functions – Gradient of a scalar point function – Directional derivative of a scalar point function – Divergence and curl of a vector point function – Solenoidal vector – Irrotational vector – Vector identities.

UNIT V VECTOR INTEGRATION**12 Hrs**

Vector integration – Line integral – Application of line integral. Surface and Volume integrals – Applications - Gauss Divergence theorem. Stoke's theorem – Green's theorem.

TEXT / REFERENCE BOOKS

- P. R. Vittal and V. Malini, Vector Analysis, Margham Publications, Chennai, 2006.
- T. K. Manickavasagam Pillay and others, Vector Calculus, S. Viswanathan Publications.
- S. Shanti Narayan, A Text Book of Vector Calculus, S. Chand and Co., New Delhi, 1966.
- K. Viswanatham & S. Selvaraj, Vector Analysis, Emerald Publishers, Chennai, Reprint 1999.
- P. Duraipandian, Laxmi Duraipandian, Vector Analysis, Emerald Publishers, Chennai, Reprint 2003.
- Shanthi Narayanan and Mittal P.K: Analytical Solid Geometry 16th Edition S.Chand & Co., New Delhi, 2006.
- Analytical Geometry – 3D by T.K. Manickavasagam Pillay and others S. Viswanathan (Printers & publishers), Chennai, 2001.
- N. Saran and R. S. Gupta, Analytical Geometry of 3D, Pothishala Pvt. Ltd., Allahabad.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Describe equation of a plane in different forms, define direction cosines and direction ratios of a line and find angle between two planes, Bisector planes.
CO2	Identify the angle between lines, angle between line and plane Intersection of two lines. Estimate shortest distance between two skew lines.
CO3	Sketch the general form of sphere, Orthogonal sphere and plane section of a sphere.
CO4	Apply gradient to solve problems involving normal vectors to level surfaces.

C05	Evaluate line integral, surface and volume integral.
C06	Integrate surface and volume integrals using Gauss Divergence, Stokes and Greens theorem.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT1304	DISCRETE MATHEMATICS	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	3	100

COURSE OBJECTIVE

1. To equip the students with mathematical tools that has applications in various fields.
2. To enable students to develop construction and verification of mathematical logic.
3. To gain fundamental knowledge about lattices and Boolean algebra.

UNIT I LOGIC 12 Hrs

Statements and Notations, Connectives, Negation, Conjunction, Disjunction, statement, Formulae and Truth Tables, Conditional and Bi-conditional, Well-formed Formulae, Tautologies, Equivalence of Formulae, Duality Law, Tautological Implications.

UNIT II INFERENCE THEORY 12 Hrs

Normal Forms, Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms, Rules of Inference, The Predicate Calculus, Predicates, Variables and Quantifiers, Predicate Formula, Free and Bound Variables.

UNIT III SEMIGROUP AND MONOID 12 Hrs

Semigroups, Monoids, Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoid.

UNIT IV LATTICES 12 Hrs

Lattices as Partially Ordered Set, Properties of Lattices, Lattices as Algebraic Systems, Sublattices, Direct Product and Homomorphism.

UNIT V BOOLEAN ALGEBRA 12 Hrs

Boolean Algebra, Basic properties, Sub algebra, Direct Product, and Homomorphism, Boolean Functions.

TEXT / REFERENCE BOOKS

1. J.P.Trembley, R.Manohar, Discrete Mathematical Structures with application to Computer science, McGrawHill Book Co., second edition 2001.
2. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, Prentice Hall of India, e-Book, 2013.
3. R.Lidl and G.Pilz, Applied Abstract Algebra, Springer Verlag, 1984.
4. Ralph P. Grimaldi, Discrete and combinatorial Mathematics: An Applied Introduction, Fourth edition, Pearson Education Asia, Delhi 2002.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Define truth table; list equivalent Propositions, List basic properties of Lattices and Boolean algebra. Identify semigroup and Monoid.
CO2	Understand Equivalence Relation, Lagrange's theorem on Cyclic group.
CO3	Solve problems on Inference theory for Propositional Calculus and Predicate Calculus. Distinguish PCNF and PDNF. Analyze properties of groups.
CO4	Evaluate problems on implication and Equivalence laws, Analyse Lattices as Algebraic system

C05	Develop supremum and infimum in Boolean function, . Construct truth table of the compound statements
C06	Constructing proofs for semigroup, monoid, homomorphism and lattices

ENDSEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3****Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT1305	ORDINARY & PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT I DIFFERENTIAL EQUATIONS OF FIRST ORDER**12 Hrs**

Elementary Methods in Ordinary Differential Equations. Formation of differential equation. Solutions: General, particular, and singular. First order exact equations and integrating factors. Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variable are separable. Homogeneous equations. Linear equations and equations reducible to linear form. First order higher degree equations solvable for x , y , p . Clairaut's form and singular solutions. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

UNIT II DIFFERENTIAL EQUATIONS OF SECOND ORDER**12 Hrs**

Linear differential equations of second order. Second order equation with constant coefficient with particular integrals for e^{ax} , x^m , $e^{ax}\sin mx$, $e^{ax}\cos mx$. Transformation of the equation by changing — the dependent variable and the independent variable. Method of variation of parameters. Ordinary simultaneous differential equations.

UNIT III PARTIAL DIFFERENTIAL EQUATION**12 Hrs**

Partial differential equations. Formation of partial differential equations. Types of solutions. PDEs of the first order. Lagrange's solution.

UNIT IV PARTIAL DIFFERENTIAL EQUATION (CONTD...)**12 Hrs**

Some special types of equations which can be solved easily by methods other than the general methods. Charpit's and Jacobi's general method of solution.

UNIT V SECOND AND HIGHER ORDER PARTIAL DIFFERENTIAL EQUATION**12 Hrs**

Partial differential equations of second and higher order. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's methods.

TEXT / REFERENCE BOOKS

- P. Kandasamy, K. Thilagavathy, Mathematics for B. Sc Branch – I, Volume 3, 1st Edition, S. Chand and Co.Ltd., New Delhi, 2004.
- M. K. Venkataraman and S. Krishnan, Engineering Mathematics, The National Publishing Co., 2010.
- Dipak Chatterjee, Integral Calculus and differential equations, TATA McGraw S Hill Publishing Company Ltd., 2000.
- Narayanan, T.K. Manichavasagam Pillai, Calculus, Vol. I, S. Viswanathan Printers Pvt. Limited, 2007.
- Dr. S. Sudha, Differential Equations & Integral Transforms, Emerald Publishers, 2002.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Define Order , degree of ODE and PDE. Identify the methods to solve homogeneous and non homogeneous ODE and PDE.
CO2	Classify ODE and PDE. Illustrate various methods to solve second order Differential equation

	and Partial differential equations.
CO3	Solve some special types of partial differential equations by Charpit's and Jacobi's method.
CO4	Analyze the solution of first order differential equations by various methods.
CO5	Evaluate higher order differential equations by method of variation of parameters.
CO6	Formation of ODE & PDE for the given function.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SBA1302	COST ACCOUNTING AND BANKING	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	3	100

COURSE OBJECTIVES

- To understand the basic principles of costing.
- To Impart knowledge of preparing cost sheet.
- To familiarize with Cost controlling techniques
- To know well about banking services.

UNIT 1 INTRODUCTION TO COST ACCOUNTING**9****Hrs.**

Cost Accounting – Meaning, Scope, Objectives - Advantages and Limitations – Difference between Cost Accounting and Financial Accounting – Elements of Cost – preparation of Cost Sheet.

UNIT 2 MATERIAL COST**9 Hrs.**

Material cost – Purchase Procedure – Material controlling techniques – Economic Order Quantity – Stores Ledger – Pricing of Issues – FIFO, LIFO, Simple Average and Weighted Average Methods.

UNIT 3 LABOUR COST**9 Hrs.**

Labour Cost – Importance – Various Methods of Labour Cost Control – Methods of Wage Payment – Various Incentive Schemes – Labour Turnover.

UNIT 4 OVERHEADS**9 Hrs**

Overheads – Classification – Apportionment Of Overheads – Redistribution Of Overheads – Absorption Of Overheads – Calculation of Machine Hour Rate

UNIT 5 INTRODUCTION TO BANKING**9****Hrs**

Banking – Meaning, objectives - **Role of banking**. Classification of Banks - functions of Commercial Banks- functions of RBI - E-Banking and Internet Banking - Meanings, scope, advantages and disadvantages.

Max. 45 Hrs**COURSE OUTCOMES**

On completion of the course, student will be able to

1. Discuss the concepts in cost accounting
2. Classify various costs and overheads in an organisation
3. Estimate the total cost incurred for making a product
4. Prepare cost sheet and Describe the material controlling techniques
5. Compute labour remuneration and incentives
6. Know about the Banking types, and services.

TEXT/ REFERENCE BOOKS

1. Jain & Narang, Cost Accounting, Kalyani Publishers Ludhiana, 2006.
2. Reddy & Hari Prasad Reddy, Cost Accounting, Margham Publications, Chennai- 17.
3. Maheswari, Cost Accounting, Sultan chand & sons, New Delhi, 2002.
4. Pillai & Bagavathi, Cost Accounting, Sultan Chand & sons, New Delhi.
5. Jawaharlal, Cost Accounting, The McGraw Hill Companies, UP, 2007.

6. B.Santhanam, 2005, Banking theory Law & Practice, 4th Ed., Margham Publications, Chennai.
7. Dr.S.N.Maheswari, 2004, banking Theory Law & Practice, 10th Ed., Sultan Chand & Sons, New Delhi.
8. Sundharam & Varshney, 2005, Banking Theory & Practice, 17th Ed., Sultan Chand & Sons, New Delhi.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 Questions of 2 Marks each – No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

S06PT1	QUANTITATIVE APTITUDE & LOGICAL REASONING I	L	T	P	CREDITS	TOTAL MARKS
		2	0	0	2	100

COURSE OBJECTIVE

This module would train the students on the quick ways to solve quantitative aptitude problems and questions applying logical reasoning, within a short time span given during the placement drives.

QUANTITATIVE APTITUDE

Partnership, Simple Interest, Compound Interest, Profit and Loss, Problems on Clock, Calendar and Cubes, Permutation and Combination, Allegation and mixtures

LOGICAL REASONING

Letter and Symbol series, Number series, analyzing arguments, making judgments

SMT1401	TRANSFORM TECHNIQUES	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

UNIT I **LAPLACE TRANSFORM** 12 Hrs

Laplace transform – Transforms of standard functions – properties– Transforms of derivatives and integrals – Transforms of the type $e^{at}f(t)$, $tf(t)$, $f(t)/t$ - Transform of periodic functions – Transform of unit step function and impulse function - Initial and final value theorems

UNIT II **INVERSE LAPLACE TRANSFORM** 12 Hrs

Inverse Laplace transform – Transforms of standard functions – properties - Convolution theorem – Heaviside expansion theorem and its application.

UNIT III **APPLICATIONS OF LAPLACE TRANSFORM** 10 Hrs

Linear ordinary differential equation with constant co-efficients – Integral equations - Integral equations of convolution type - simultaneous linear differential equations with constant co-efficients

UNIT IV **FOURIER TRANSFORM** 13 Hrs

The infinite Fourier transform – Sine and Cosine transform – Properties – Inversion theorem – Convolution theorem – Parseval's identity – Finite Fourier sine and cosine transform.

UNIT IV **Z-TRANSFORM** 13 Hrs

Z-transform and inverse Z-transform of elementary functions, Shifting theorems, Convolution theorem, Initial and final value theorem, Application of Z-transforms to solve difference equations.

TEXT/ REFERENCE BOOKS

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2011.
2. R.K. Jain and S.R.K. Iyenger, Advanced Engineering Mathematics, Narosa Publishing House, 2009.
3. F. B. Hildebrand, Methods of Applied Mathematics, Courier Dover Publications, 1992.
4. L. Debanth and D. Bhatta, Integral Transforms and Their Applications, 2nd Ed., Taylor and Francis Group, 2007

Course Outcomes: At the end of the course, the student will be able to:

CO1	Applying the concept of Laplace Transforms to various type of functions.
CO2	Illustrate the solution for the functions using inverse Laplace transforms.
CO3	Produce the solution for integral and differential equations using Laplace and inverse Laplace Transforms.
CO4	Evaluate the functions by using finite and infinite fourier transforms.
CO5	Implement the solution for various functions using z transforms and Inverse Z transforms.
CO6	Determine the solution of difference equations using z transforms and Inverse Z transforms.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMT 1403	FOURIER SERIES & APPLICATION OF DIFFERENTIAL EQUATION	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT I FOURIER SERIES**12 Hrs**

Definition- Dirichlets conditions- coefficients- Fourier series for the function defined in $[c, c+2\pi]$, $[c, c+2l]$ – odd and even functions in fourier series- Parseval's identity (without proof).

UNIT II FOURIER SINE AND COSINE SERIES**11 Hrs**

Half range cosine series and sine series of $f(x)$ defined in $[0, \pi]$, $[0, l]$ - Parseval's Identity (without proof) - simple problems – Complex form of Fourier series-Harmonic Analysis.

UNIT III APPLICATION OF ODE**12 Hrs**

Particle dynamics: Simple Harmonic motion – Projectiles: – horizontal plane - trajectory – velocity of projection – angle of projection – Range - time of flight – greatest height - projectiles on inclined plane. Central orbit and Central forces: – differential equation of a path – pedal equation of a differential equation – velocity at any point of a central orbit – areal velocity – Kepler's laws of planetary motion.

UNIT IV APPLICATION OF PDE**12 Hrs**

One dimensional wave equation – Transverse vibration of finite elastic string with fixed ends – boundary and initial value problems – Fourier series solution – one dimensional heat equation – steady and unsteady state – boundary and initial value problems – Fourier series solution.

UNIT V APPLICATION OF PDE**12 Hrs**

Two dimensional heat equation - steady state heat flow in two dimensions- Laplace equation in Cartesian and polar co-ordinates (excluding annulus) – Fourier series solution .

TEXT /REFERENCESBOOK

- George F Simmons, Differential equation with Applications and historical notes, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.
- S Narayanan & T K Manicavachogam Pillay, Differential Equations.: S V Publishers Private Ltd., 1981.
- G K Ranganath, Text book of B.Sc, Mathematics, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.
- Frank Ayres, Schaum's outline of theory and problems of Differential Equations, 1st ed. USA: McGraw-Hill, 1972.
- S Narayanan, Dynamics, 16th ed. New Delhi: S Chand and Company Ltd., 1986.
- N.P. Bali, Dynamics (Golden Series), Latest ed. New Delhi, India: Lakshmi Publications (p) Limited, 2004.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the periods for trigonometric functions. Identify even and odd functions. Recall integration formulas.
CO2	Understand and classify half range cosine and sine series
CO3	Apply methods to solve kepler's law of planetary motion, pedal equation of a differential equation

CO4	Distinguish ordinary differential equation and partial differential equation
CO5	Evaluate one dimensional heat equation with boundary and initial value condition. Discriminate between steady and unsteady state problems
CO6	Formulate two dimensional heat equation for Cartesian and polar coordinates.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT 1404	FORMAL LANGUAGE & AUTOMATA	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

COURSE OBJECTIVE

To study formal languages and Automata and establish some of the properties of such systems. To familiarize the students with some theories of Mathematics in Computer Science

UNIT I FORMAL LANGUAGES 12 Hrs

Finite Automaton-Definition of finite automaton - Representation of finite automaton- Acceptability of a string by a finite automaton- Languages accepted by a finite automaton.

UNIT II FINITE AUTOMATA 12 Hrs

Non-deterministic finite automaton- Acceptability of a string by NFA- Equivalence of FA and NFA- Procedure for finding an FA equivalent to a given NFA- Properties of regular sets –Decision algorithm for regular sets.

UNIT III GRAMMARS 12 Hrs

Phrase – Structure Grammar derivations - Phrase–Structure languages – Context-sensitive languages(CSL)- Context-free languages(CFL)- Chomskian Hierarchy.

UNIT IV PROPERTIES OF REGULAR LANGUAGE 12 Hrs

Closure Operation- Kleene Closure- Substitutions- Homomorphism-Inverse Homomorphism- Context free language, Derivation trees- Ambiguity leftmost, rightmost derivations.

UNIT V MORE PROPERTIES OF REGULAR LANGUAGE 12 Hrs

Normal forms- Chomsky's normal forms- Problems based on Chomsky's normal forms – uvwxy theorem- Problems based on uvwxy theorem.

TEXT / REFERENCE BOOKS

1. Dr. M. Venkatraman, Dr. N. Sridharan, N. Chandrasekaran, "Discrete Mathematics", Chapter 12, Sections 1 to 12.
2. Rani Siromoney, Formal Languages and Automata, The Christian Literature Society, Chennai. Chapter 2, Sections 2.1 to 2.4, Chapter 3, Sections 3.1 to 3.2, Chapter 4, Sections 4.1 to 4.5.
3. John E Hopcroft, Jeffery D, Ullman, Introduction to Automata Theory and Computations, Narosa Publishing House.
4. Ragade B.R, "Automata and Theoretical Computer Science", Pearson Education
5. Bernard M. Moret, "The Theory of Computation", Pearson Education
6. Peter Linz, "An Introduction to Formal Languages and Automata", Jones & Bartlett Publishers

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the languages and strings. Define finite automata.
CO2	Explain the concepts of finite automation and Non-deterministic finite automaton.
CO3	Illustrate the process of phrase- structure grammar. Apply methods of context sensitivity languages.
CO4	Examine the decision algorithms for context free languages. Discriminate between kleene closure and positive closure

C05	Evaluate the problems based on Chomsky's normal forms
C06	Formulate uvwxy theorem and problems based on uvwxy theorem

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A :** 10 questions of 2 Marks each – No choice**20 Marks****PART B :** 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SMT 1405	NUMERICAL METHODS	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

COURSE OBJECTIVE

Solve equations numerically by direct and iterative methods- Be familiar with interpolation and numerical differentiation & integration - Be exposed to best approximations and spline approximations- Solve equations using predictor – corrector methods- Be thorough with elliptic, parabolic and hyperbolic equations

UNIT I DIRECT AND ITERATIVE METHODS 12 Hrs

Direct Method: Gauss elimination method – Error Analysis– Iterative methods: Gauss- Jacobi and Gauss-Seidel – Convergence considerations – Eigen value Problem: Power method.

UNIT II NUMERICAL DIFFERENTIATION AND INTEGRATION 12 Hrs

Interpolation: Lagrange's and Newton's interpolation -- Errors in interpolation – Optimal points for interpolation - Numerical differentiation by finite differences – Numerical Integration: Trapezoidal, Simpson's and Gaussian quadratures – Error in quadratures.

UNIT III POLYNOMIAL APPROXIMATION 12 Hrs

Norms of functions – Best Approximations: Least squares polynomial approximation – Approximation with Chebyshev polynomials – Piecewise Linear & Cubic Spline approximation.

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 12 Hrs

Single-Step methods: Euler's method –Taylor series method – Runge-Kutta method of fourth order – Multistep methods: Adams-Bashforth and Milne's methods – Stability considerations – Linear Two point BVPs: Finite Difference method.

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL METHODS 12 Hrs

Elliptic equations: Five point finite difference formula in rectangular region – truncation error; One-dimensional Parabolic equation: Explicit and Crank-Nicholson schemes; Stability of the above schemes - One-dimensional Hyperbolic equation: Explicit scheme.

TEXT / REFERENCE BOOKS

1. Kandasamy P, Thilagavathy. K and G. Gunawathy, Numerical Methods, S.Chand & Sons, 3rd Revised Edition, 2013.
2. Balagurusamy. E, Numerical Methods, Tata Mcgraw Hill Publishing Company, 3rd Edition, 2000.
3. Isaacson E. and Keller, H.B., "Analysis of Numerical Methods" Dover Publication, 1994.
4. Philips G.M and Taylor P.J., "Theory and Applications of Numerical Analysis", Academic Press, 1996.
5. Jain M.K, "Numerical Methods for Scientific and Engineering computation", 3rd Edition, New Age International, 1999.
6. Conte S.D. and Carl de Boor, "Elementary Numerical Analysis", 3rd Edition, Tata McGraw-Hill Publishing Company. 2004.
7. Atkinson K.E., "An Introduction to Numerical Analysis", Wiley & Sons, 2nd Edition, 1989.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the types of direct method and iterative methods. State the difference between the Gauss–Seidel and Jacobi methods.
CO2	Classify the concepts of numerical differentiation and numerical integration.
CO3	Solve the polynomials using chebyshev method.
CO4	Discriminate between single step methods and multistep methods.

C05	Determine the temperature for parabolic equations for various x values
C06	Develop the temperature table for parabolic equation for suitable formulas

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A** : 10 questions of 2 Marks each – No choice**20 Marks****PART B** : 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

S06PT2	QUANTITATIVE APTITUDE & LOGICAL REASONING II	L	T	P	CREDITS	TOTAL MARKS
		2	0	0		

COURSE OBJECTIVE:

This module is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning.

QUANTITATIVE APTITUDE

Time and Distance, Height and Distance, Problems on Ages, Trains, Pipes and Cistern Boats and Streams, Probability.

LOGICAL REASONING

Direction sense test, Venn diagrams, Seating arrangements, Cause and effect Blood relation test, Dice, Logical verbal puzzles.

SMT 1503	MECHANICS I	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT I STATICS 12 Hrs

Forces acting on a Particle – Concurrent forces – Equilibrium of forces acting at a point – Parallelogram Law of forces – Triangle Law of forces - Lami's theorem – Polygon of forces

UNIT II PRINCIPLES OF MOMENTUM 12 Hrs

Moment of a force about a point and a line – Theorems on moments- resultant of like and unlike parallel forces – couples- reduction of a force and couple in a plane to a single force – laws of friction-Equilibrium of a particle on a rough inclined plane.

UNIT III KINEMATICS 12 Hrs

Kinematics – motion of a point – Velocity and acceleration – Composition of velocities – Relative velocity – Motion in a straight line under uniform acceleration and variable acceleration – Vertical motion under gravity

UNIT IV NEWTON'S LAW OF MOTION 12 Hrs

Newton's laws of motion – conservation of linear momentum – motion of a particle on a rough horizontal and inclined plane under the action of a constant force – Motion in a resisting medium with resistance varying as Velocity and velocity².

UNIT V PROJECTILES 12 Hrs

Projectiles – Trajectory – ranges on horizontal and inclined planes – enveloping parabola - impact of elastic bodies – impact of two smooth spheres (direct and oblique) – loss of kinetic energy.

TEXT / REFERENCE BOOKS

- Naik, K.V. and Kasi, M.S., Statics and dynamics, Emerald publishers, 1992.
- Narayanan, S., Statics and Dynamics Rochouse & Sons Pvt., Ltd
- Venkataraman, M.K., Statics and Dynamics, 1982.
- . P.Duraipandian and Laxmi Duraipandian, Mechanics, S.Chand and Company Ltd. 1985.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Identify Parallelogram law of force, Triangle law of force and Concurrent forces.
CO2	Discuss moment of force about a point and a line. Summarize law of friction.
CO3	Calculate velocity and acceleration , Motion in a straight line under uniform and variable acceleration.
CO4	Categorize the motion of a particle on a rough horizontal and inclined plane by Newton's law of motion.
CO5	Estimate the impact of elastic bodies and two smooth spheres.

CO6	Create envelope of Projectile Trajectories
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END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A :** 10 questions of 2 Marks each – No choice**20 Marks****PART B :** 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SMT1504	OPERATION RESEARCH I	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT I INTRODUCTION TO OR**12 Hrs**

Operations Research(OR)-Nature-Characteristics-Phases.-Role of OR in Decision making- Outline of **OR Models** Linear Programming - definition - mathematical formulation - graphical method.

UNIT II LINEAR PROGRAMMING PROBLEM**12 Hrs**

General **linear programming problems** – canonical and standard forms – simplex method -Two Phase Method - Big M methods.

UNIT III DUAL SIMPLEX METHOD**12 Hrs**

Dual Simplex method - Duality - properties - fundamental theorems of duality(statements only) - principle of duality - dual simplex method.

UNIT IV TRANSPORTATION AND ASSIGNMENT PROBLEM**12 Hrs**

Transportation problem – Initial Basic feasible solution- Northwest corner method - Least Cost method - Vogel's approximation method –Optimum solution using MODI method - Assignment problems - Travelling salesman problem.

UNIT V SEQUENCING AND SCHEDULING PROBLEM**12 Hrs**

Sequencing Problem with N jobs and 2 machines N Jobs 3 machines N Jobs and m machines and 2 Jobs m machines (Graphical method) - Project Management -Basic concepts–Network construction - Scheduling Critical Path Method (CPM) & Program evaluation review technique (PERT) – simple applications.

TEXT / REFERENCE BOOKS

- Kanthi Swarup, Gupta P.K., Man Mohan, "Operations Research, 12th Edition", Sultan Chand Sons, Educational Publishers, New Delhi, 2004
- S.D Sharma,"operation research Theory, Methods and Application", 17th Edn., Kedar Nath Ram Nath Publication, 2010.
- Panner Selvam R., "Operations Research", Prentice Hall of India Private Limited, New Delhi, 2006
- Kalavathy S., "Operations research", 2nd Edition, Vikas Publishing House Private Limited, New Delhi, 2002..

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the characteristics of operation research. Identify the decision variables and formulation of linear program. Recall to solve two variable problems.
CO2	Understand the slack and surplus variables to find the optimal solution of an optimization problem. Identify the artificial variable and form a new objective function.

C03	Apply dual simplex method and fundamental theorem on duality
C04	Explain north west corner, least cost and vogel approximation method on transportation problem.
C05	Evaluate the sequencing problems.
C06	Formulate the problem involves scheduling and PERT.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT 1505	GRAPH THEORY	L	T	P	CREDITS	TOTAL MARKS
		3	1	0	3	100

COURSE OBJECTIVE

To translate real life situations to diagrammatic representations and develop problem solving skills and thereby solve real life problems.

UNIT I INTRODUCTION TO GRAPH THEORY 12 Hrs

Graphs – Applications of graphs – finite and infinite graphs – Incidence and degree – Isomorphism
Subgraphs – Walks, paths and circuits – connected graphs, disconnected graphs and components -
Directed graph – some types of digraphs.

UNIT II EULERIAN AND HAMILTONIAN GRAPH 12 Hrs

Euler Graphs – Operations on Graphs – More on Euler Graphs – Hamiltonian paths and circuits.

UNIT III TREES 12 Hrs

Trees – some properties of Trees – Pendant vertices in a Tree – Distance and centers in a Tree – Spanning Trees – Spanning Trees in a weighted Graph.

UNIT IV OPTIMIZATION AND MATCHING 12 Hrs

Cut-sets – some properties of cut-sets – All cut-sets in a Graph – Fundamental circuits and cut-sets – connectivity and separability - Matching theory – Hall's Marriage theorem.

UNIT V PLANAR GRAPH 12 Hrs

Planar Graphs – Kuratowski's Graphs – Different representations of a planar Graph – Chromatic Number and chromatic polynomials.

TEXT / REFERENCE BOOKS

1. NarsinghDeo, Graph Theory with applications to Engineering and Computer Science, Prentice Hall of India, Publications 2004.
2. AmitSinha, [Suneet Gupta](#), Graph Theory, Acme Learning Private Limited, First Edition, e-book, 2012.
3. S. Arumugam and S. Ramachandran, Invitation to Graph theory, SciTech publications, 2015.
4. R. Balakrishnan, K. Ranganathan, A Textbook of Graph Theory, Springer, Second Edition, 2012.
5. [G. Suresh Singh](#), Graph Theory, PHI Learning, e-book, 2010.
6. UditAgarwal, Umesh Pal Singh, Graph Theory, University Science Press, 2009.
7. **Course Outcomes: At the end of the course, the student will be able to:**

CO1	List precise and accurate mathematical definition of objects in graph theory and to know some important classes of graph theoretical problems.
CO2	Interpret whether graphs are Hamiltonian and / or Eulerian.
CO3	Apply basic algorithm to find spanning trees in a weighted graph
CO4	Analyze problems involving vertex and edge connectivity, cut sets and matching.
CO5	Evaluate chromatic number and chromatic polynomial

CO6	Create different planar graph and apply some basic algorithms for graphs to use graph theory as a modeling graph
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END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT 1551	COMBINATORICS	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

To introduce the branch of Discrete Mathematics that deals with enumeration and existence problems. To enable the students to attempt questions related to enumeration in various competitive examinations

UNIT I BASICS**12 Hrs**

Basic combinatorial numbers – Stirling numbers of the second kind

UNIT II FUNCTION AND RELATION**12 Hrs**

Generating functions and Recurrence relations- Symmetric functions

UNIT III PRINCIPLE OF INCLUSION AND EXCLUSION**12 Hrs**

Multinomial - multinomial theorem - Inclusion and Exclusion principle.

UNIT IV PERMUTATION AND COMBINATION**12 Hrs**

Euler function-Permutations with forbidden positions-The 'Menage' problem-Problem of Fibonacci

UNIT V POLYA THEORY OF COUNTING**12 Hrs**

Polya Theory-Necklace problem and Burnside's Lemma- Cycle index of a permutation group- Polya's theorem and their immediate applications.

TEXT / REFERENCE BOOKS

1. V. Krishnamoorthy, "Combinatorics theory and applications", East-west Press:
2. V.K. Balakrishnan, "Theory and problems of combinatorics" Schaum's outline series- McGraw Hill.
3. Inn Anderson, "Combinatorics of finite sets", Oxford Science Publications
4. Kenneth P Boggart, "Introductory Combinatorics"- Pitmann Books Ltd.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Recall the basic concepts of Combinatorics
CO2	Classify the function and relation, also illustrate problems using recurrence relation.
CO3	Sketch multinomial theorem and prepare inclusion and exclusion principle. to solve problems of counting derangements of a finite set.
CO4	Analyze the problems of permutation and combination and to explain the concepts of arrangements with forbidden
CO5	Determine the number of distinct items using Polya's theorem on counting.
CO6	Create number of necklace with n clear and solid beads.

EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT 1552	ASTRONOMY	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVES: This course aims to provide working knowledge about the universe.

UNIT I SPHERICAL TRIGONOMETRY

12 Hrs

Sphere – Great circles and small circles – axis and poles of a circle – Distance between two points on a sphere – angle between two circles – Secondaries – angular radius – length of an arc of a small circle – spherical triangle – cosine formula, sine formula, cotangent formula (without proof).

UNIT II CELESTIAL SPHERE

12 Hrs

Celestial sphere – diurnal motion, celestial axis and equator – celestial horizon – Zenith and Nadir – Celestial Meridian – Cardinal points – Declination circles – Verticals – Parallactic angle – Rising and setting – Transit or culmination – due east, west, north, south – annual motion of sun – First point of Aries and First point of Libra – Equinoxes and Solstices – Celestial coordinates – Horizontal, Equatorial, Meridian, ecliptic systems – Hour Angle and azimuth at rising and setting – latitude of a place – Circumpolar Star – Twilight.

UNIT III REFRACTION

12 Hrs

Laws of refraction – Astronomical refraction – Tangent formula – General effects – Effects on rising or setting – Effect on R.A, declination – effect on small horizontal arc, vertical arc, any small arc – Cassini's Formula – Horizontal refraction. Concepts of geocentric, heliocentric parallax, aberration, Precession and Nutation (definitions only) Overview of the universe – The solar system in general – the other planets – comets – galaxies. **Time:** Equation of time – Seasons – Calendar – Conversion of time.

UNIT IV KEPLER'S LAWS AND PLANETARY PHENOMENA

12 Hrs

Kepler's Laws of **planetary motion** – Longitude of Perigee – Forward motion of the apse line – eccentricity of earth's orbit – To fix the position of a planet in its elliptical orbit – To express v as a series of u – mean anomaly – Kepler's equation – To express u as a series in m . Phases of the planets – Relation between sidereal and synodic period of a planet, brightness of the planets.

UNIT V MOON AND ECLIPSES

12 Hrs

Relation between sidereal and synodic month – elongation – **Phases of moon**. Umbra and Penumbra – Lunar eclipse – **Solar eclipse** – Condition for occurrence of a solar eclipse – angular radius of the cross section of the shadow cone where moon enters – length of earth's shadow – condition for the occurrence of a solar eclipse – ecliptic limits – maximum and minimum number of eclipses near a node – in a year – Saros of Chaldeans.

TEXT / REFERENCE BOOKS

1. S. Kumaravelu and Susheela Kumaravelu, Astronomy. SKV Publishers, Nagarkoil, 2004.
2. V.Thiruvengkatacharya, A text book of Astronomy, SChand & Co. Pvt. Ltd., 1972.
3. H.Kartunen, Fundamental Astronomy, Content Technologies Publications, 2013.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the origin of the universe, the big bang theory and the present general structure of the universe.
CO2	Discuss the components and facts of the solar system, including planets, satellites, asteroids, comets and theories of the origin of the solar system.
CO3	Sketch the methods use to explore the natural phenomena of the universe, including the

	scientific methods, the nature of mathematical energy, radiation and historical development of astronomical ideas.
CO4	Analyze the nature of planets including planets formation and evaluation, stellar energy sources and how this is related to our sun.
CO5	Summarize the science of cosmology and its relation to the other fields of science.
CO6	Organize how the scientific method and quantitative arguments are used in cosmology.

EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT1553	FINANCIAL MATHEMATICS	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE:

To have knowledge about probability. To learn about Brownian motion. To be familiar with Arbitrage theorem. To have knowledge in pricing, estimating and expected utility

UNIT I PROBABILITY 12 Hrs

Probability – Probabilities and Events – Conditional probability – Random Variables and Expected Values – Convergence and correlation – Continuous Random variables – Normal Random Variables – Properties of Normal Random Variables – The central limit Theorem – Simple Problems.

UNIT II GEOMETRIC BROWNIAN MOTION 12 Hrs

Geometric Brownian Motion – G.B.M. as a limit of simple models – Brownian Motion – Simple problems - **Interest rates** – **Present value analysis** – Rate of return – Continuation of varying interest rates – An example of option pricing – other examples of pricing via arbitrage.

UNIT III THE ARBITRAGE THEOREM AND BLACK SCHOLES FORMULA 12 Hrs

The **Arbitrage theorem** – The multi period Binomial model – proof of the Arbitrage theorem - Black Scholes formula – properties of the Black Scholes option cost – Derivation of Black Scholes formula – simple problems.

UNIT IV ADDITIONAL RESULTS ON OPTIONS 12 Hrs

Additional results on options – Call options on Dividend paying Securities – Pricing American put options – Adding Jumps to Geometric Brownian Motion – Estimating the Volatility Parameter – Simple problems.

UNIT V VALUING BY EXPECTED UTILITY 12 Hrs

Valuing by Expected Utility – **Limitation** of Arbitrage pricing – valuing Investments by Expected utility – The portfolio selection problem – Value at risk and conditional value at risk The capital assets pricing model – Mean variance analysis of risk – Neutral priced Call options – **Rates of return** – Single period and Geometric Brownian Motion – simple problems.

TEXT / REFERENCE BOOKS

1. Sheldon .M.Ross, An Elementary Introduction to Mathematical Finance, 2nd Edition, Cambridge University press, 2005.
2. S.M.Ross, A first course in probability, Englewood cliffs Prentice Hall-NJ, 2002.
3. J.Cox and M.Rubinstein, Options Market, Englewood cliffs Prentice Hall-NJ, 2012.
4. J.E.Ingersill, Theory of financial decision making, Lanjarn, MD Rowman of Little fields, 1987.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Identify and approximate probability distribution for a given discrete or continuous random variable and use its properties to calculate probabilities.
CO2	Relate the continuous time stochastic process using geometric Brownian motion.
CO3	Apply black scholes formula in financial market, which contains derivative investment instruments. Construct Arbitrage theorem to help the investors and financial analyst in price securities

C04	Analyze the stock prices, prices of other assets caused by unpredictable events using jumps to geometric Brownian motion.
C05	Evaluate the expected utility by taking the weighted average of all possible outcomes under certain circumstances.
C06	Compose the invariance principle that a decision maker should not be affected by the way alternates are presented.

EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**

SMT1554	NUMBER THEORY	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

To learn about division algorithm. To have knowledge about fundamental theorem of arithmetic. To be familiar with linear congruences. To have knowledge in Mobius inversion formula and Euler's theorem

UNIT I EUCLIDEAN ALGORITHM AND DIOPHANTINE EQUATION 12 Hrs

The Division Algorithm – The g.c.d. – The Euclidean Algorithm – The Diophantine Equation $ax + y = c$.

UNIT II THE SIEVE OF ERATOSTHENES 12 Hrs

The Fundamental theorem of arithmetic, The sieve of Eratosthenes – The Goldbach conjecture – basic properties of congruence.

UNIT III FERMAT'S THEOREM 12 Hrs

Special Divisibility tests – Linear congruences – The Little Fermat's theorem – Wilson's theorem.

UNIT IV NUMBER THEORETIC FUNCTIONS 12 Hrs

The random functions – The Mobius inversion formula – The greatest integer function.

UNIT V EULER'S GENERALIZATION OF FERMAT'S THEOREM 12 Hrs

Euler's Phi – function – Euler's theorem – Some properties of the Phi – function.

TEXT / REFERENCE BOOKS

1. David M. Burton, Elementary Number Theory, Universal Book Stall, 2001
2. T.M.Apostol, Introduction to Analytic Number Theory, Springer Valley, 1976.
3. Kumaravelu and Suseela Kumaravelu, Number Theory, SKV Publications, 2002.
4. Kenneth & Rosen, Elementary number theory & its applications, Addison Wesley Publishing Co. Ltd., 1968.
5. George E, Andrea, Number Theory, Hindustan Publishing, 1989.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Identify Euclid's algorithm to find the gcd. Illustrate the solution of Diophantine equations using Euclidean algorithm.
CO2	Explain Sieve of Eratosthenes to find all prime numbers upto any given limit.
CO3	Apply Fermat's little theorem to compute powers of integers modulo prime numbers.
CO4	Analyze Mobius inversion formula for counting the number of reduced fractions in terms of their prime decomposition.
CO5	Appraise Euler's theorem in powers of integers modulo positive integers using applications of elementary number theory.
CO6	Investigate the number of non-negative integers less than n using Euler's Phi function

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 Marks each – No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 16 Marks

80 Marks

SMT 1603	MECHANICS II	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT I CENTRE OF GRAVITY**12 Hrs**

Center of Gravity of areas – surfaces and volumes of solids of revolution – conditions of equilibrium.

UNIT II VIRTUAL WORK**12 Hrs**

Virtual work – simple problems – equilibrium of strings and chains – common catenary – Suspension Bridge

UNIT III SIMPLE HARMONIC MOTION**12 Hrs**

Simple harmonic motion and its application – particle attached to an elastic string – composition of two simple harmonic motions – Simple pendulum – tangential and Normal velocity and acceleration of a particle along a curve.

UNIT IV DYNAMICS OF A PARTICLE**12 Hrs**

Velocity and acceleration of a particle in polar coordinates – circular, elliptic, parabolic and hyperbolic orbits -Problems in finding law of force – Equation to the orbit – Inverse square law

UNIT V RIGID BODY DYNAMICS**12Hrs**

M.I. of standard regular bodies – Theorems of parallel and perpendicular axes – Motion of rigid body about a fixed axis- D'Alemberts principle – Kinetic energy and angular Momentum of a rigid body rotating about horizontal axis – Compound Pendulum – Length of S.E.P. – Sphere rolling down the inclined plane

TEXT / REFERENCE BOOKS

1. Naik, K.V. and Kasi, M.S., Statics and dynamics, Emerald publishers, 1992.
2. Narayanan, S., Statics and Dynamics Rochouse & Sons Pvt., Ltd
3. Venkataraman, M.K., Statics and Dynamics, Agasthiar Publications, 1982.
4. P.Duraipandian and Laxmi Duraipandian, Mechanics, S.Chand and Company Ltd. 1985.

Course Outcomes: At the end of the course, the student will be able to:

CO1	Identify the center of gravity, volumes of solids of revolution.
CO2	Understand the equilibrium of strings and chains and discuss problems on Suspension Bridge.
CO3	Use Simple harmonic motion and its application to illustrate the tangential and Normal velocity and acceleration of a particle along a curve.
CO4	Classify Velocity and acceleration in polar coordinates and examine the law of force by solving problems.
CO5	Estimate the Moment of Inertial of standard regular bodies, motion of rigid body about a fixed axis.

CO6	Analyze the forces that acts on link of mechanism using D Alemberts Principle.
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END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A :** 10 questions of 2 Marks each – No choice**20 Marks****PART B :** 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SMT 1604	OPERATION RESEARCH II	L	T	P	CREDITS	TOTAL MARKS
		4	1	0	4	100

COURSE OBJECTIVE

- The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

UNIT I INTRODUCTION TO OPERATIONS RESEARCH**12 Hrs**

Over view of Operations Research - **games and strategies** - two person zero sum games - maximin minimax principle - games without saddle points - mixed strategies - graphical solution - dominance property – solution using L.P.P.

UNIT II REPLACEMENT MODEL**12 Hrs**

Replacement policy for items whose maintenance cost increases with time- Consideration of time value of money - Replacement policy- Individual, Group replacement of items that fail completely and suddenly.

UNIT III INVENTORY CONTROL**12 Hrs**

Inventory Control - Various Types of inventory models - deterministic inventory models - Production model, Purchase model -with and without shortage - Economic Order Quantity (EOQ) - Buffer stock - Shortage quantity - Probabilistic inventory models – Quantity Discount and Price Breaks.

UNIT IV DECISION THEORY**12 Hrs**

Introduction to Decision Making process - Decision making under uncertainty - Maximin and Maximax criteria - Hurwicz criterion – Laplace criterion – Minimax Regret criterion – Decision tree analysis - Simulation - Nature and need for simulation - Monte Carlo method.

UNIT V QUEUING THEORY**12 Hrs**

Queuing theory – characteristics – Poisson and Exponential distributions – transient and steady state – Poisson process – finite and infinite queues – M/M/I and M/M/C models.

TEXT / REFERENCE BOOKS

- Kanthi Swarup, Gupta P.K., Man Mohan, "Operations Research, 12th Edition", Sultan Chand Sons, Educational Publishers, New Delhi, 2004
- S.D Sharma, "operation research Theory, Methods and Application", 17th Edn., Kedar Nath Ram Nath Publication, 2010.
- Panner Selvam R., "Operations Research", Prentice Hall of India Private Limited, New Delhi, 2006.
- Kalavathy S., "Operations research", 2nd Edition, Vikas Publishing House Private Limited, New Delhi, 2002.

Course Outcomes: At the end of the course, the student will be able to:

CO1	List the characteristics of operation research. Identify the decision variables and formulation of linear program. Recall to solve two variable problems.
CO2	Understand the slack and surplus variables to find the optimal solution of an optimization problem. Identify the artificial variable and form a new objective function.
CO3	Apply north west corner, least cost and vogel approximation method on transportation

	problem. Solve assignment problem using Hungarian method
C04	Explain how to determine an optimal sequence in which the jobs should be performed on the machines so that the total elapsed time is minimum
C05	Evaluate the various types of inventory models. Discriminate deterministic and probabilistic models in inventory.
C06	Formulate the problem involves determining whether to replace them as a group or to replace individuals as they fail.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration: 3 Hrs.****PART A : 10 questions of 2 Marks each – No choice****20 Marks****PART B : 2 questions from each unit of internal choice, each carrying 16 Marks****80 Marks**