FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A" Grade by NAAC (3rd Cycle)
74th Rank in India Ranking 2020 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT : MATHEMATICS (SF)

NAME OF THE PROGRAMME : B.Sc. MATHEMATICS

PROGRAMME CODE : USMA

ACADEMIC YEAR : 2020 - 2021

FATIMA COLLEGE (AUTONOMOUS) MADURAI

DEPARTMENT OF MATHEMATICS

Sem	Sub.Code	Title of the Paper	Hr	Cr	Int A	Ext B	Total A+B
I	**Major Core**						
	19M1CC1/19G1CC1	Calculus	6	4	40	60	100
	19M1CC2/ 19G1CC2	Classical Algebra	6	4	40	60	100
	Allied Core						
	19M1AC1/19G1AC1	Statistics	5	5	40	60	100
	19I1ACG1/19J1ACG1	Discrete Mathematics	5	5	40	60	100
	Non Major Elective						
	19M1NME/19G1NME	Quantitative Aptitude	2	2	40	60	100
II	**Major Core**						
	19M2CC3/19G2CC3	Differential Equations	6	4	40	60	100
	19M2CC4/19G2CC4	Numerical Methods	6	4	40	60	100
	Allied Core						
	19M2AC2/19G2AC2	Advanced Statistics	5	5	40	60	100
	19I2ACG2/19J1ACG1	Operations Research	5	5	40	60	100
	Non Major Elective						
	19M2NME/19G2NME	Quantitative Aptitude	2	2	40	60	100
III	**Major Core**						
	19M3CC5/19G3CC5	Modern Algebra	6	4	40	60	100
	19M3CC6/19G3CC6	VectorCalculus & Fourier Transforms	6	4	40	60	100
	Skill based - Mathematics Skill Development						
	19M3SB1/19G3SB1	Applications ofCalculus and Differential Equations	2	2	40	60	100
IV	**Major Core**						
	19M4CC7/19G4CC7	Sequences and Series	6	4	40	60	100
	19M4CC8/19G4CC8	Linear Algebra	6	4	40	60	100
	Skill based – Mathematics Skill Development						
	19M4SB2/19G4SB2	Foundations of Mathematics	2	2	40	60	100
V	**Major Core**						
	M5CC9/G5CC9	Real Analysis	6	5	40	60	100
	M5CC10/G5CC10	Mechanics	6	5	40	60	100
	M5CC11/G5CC11	Computer Programming in C	6	5	40	60	100

	M5CCP1/G5CCP1	C -Practicals	3	2	40	60	100
	Major Elective						
	M5ME1/G5ME1	Graph Theory	5	5	40	60	100
	M5ME2/G5ME2	Fuzzy Mathematics	5	5	40	60	100
	Skill Based - MathematicsSkill Development						
	M5SB3/G5SB3	Fourier Transforms	2	2	40	60	100
	M5SB4/G5SB4	Advanced Linear Programming	2	2	40	60	100
VI	**Major Core**						
	M6CC12/G6CC12	Complex Analysis	6	5	40	60	100
	M6CC13/G6CC13	Numerical Methods	5	4	40	60	100
	M6CC14/G6CC14	Operations Research	5	4	40	60	100
	Major Elective - I						
	M6ME3/G6ME3	Object Oriented Programming withC++	3	3	40	60	100
	M6MEP1/G6MEP1	C++ -Practicals	2	2	40	60	100
	M6ME4/G6ME4	Astronomy	5	3	40	60	100
	M6MEP2/G6MEP2	Astronomy-Project	-	2	40	60	100
	Major Elective - II						
	M6ME5/G6ME5	Lattices and BooleanAlgebra	5	5	40	60	100
	M6ME6/G6ME6	Automata Theory	5	5	40	60	100
	M6ME7/G6ME7	Theory of Numbers	5	5	40	60	100
	Skill Based - MathematicsSkill Development						
	M6SB5/G6SB5	MATLAB	2	2	40	60	100
	M6SB6/G6SB6	Applied Dynamics	2	2	40	60	100

I B.Sc. Mathematics

SEMESTER – I

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M1CC1 / 19G1CC1	CALCULUS	**Lecture**	6	4

COURSE DESCRIPTION

This course provides broad view on differential and integral calculus.

COURSE OBJECTIVE/S

To enable the students learn higher derivatives, Curvature, Singular points, Envelopes, Asymptotes, Reduction formula, Multiple integrals and Fourier series in Calculus.

SYLLABUS

UNIT – I HIGHER DERIVATIVES AND CURVATURE [20 HRS]

n th Derivative of some standard functions- Leibnitz theorem- p-r equations – Curvature , centre and radius of curvature - Evolutes.

UNIT –II SINGULAR POINTS, ENVELOPES AND ASYMPTOTES [25 HRS]

Envelopes - Multiple points – classification of double points – cusps – nodes –conjugate points- Asymptotes-Curve Tracing.

UNIT –III REDUCTION FORMULA [10 HRS]

Reduction formula for $\sin^n x$, $\cos^n x$, $\tan^n x$, $\cot^n x$, $\operatorname{cosec}^n x$, $\sec^n x$, and

$\sin^m x \cos^n x$.

UNIT –IV MULTIPLE INTEGRALS [20 HRS]

Double and Triple integrals – Jacobian (self-study) - Change of variables in double and triple integral.

UNIT –V FOURIER SERIES [15 HRS]

Definition – Sine Series & Cosine Series.

SELF STUDY:

UNIT IV - Jacobian

TEXT BOOKS:

1. Dr. S. Arumugam and A. ThangapandiIssac - Calculus (Differential and Integral Calculus) - New Gamma Publishing House, June 2014. Unit I: (PART I Sections – 2.12, 2.13, 3.3, 3.4, 3.5)
   Unit II: (PART I Sections – 3.6, 3.10, 3.11(excluding Asymptotes of polar curves),3.12.
   Unit III: (PART II Section 2.8)
   Unit IV: (PARTI Section 3.9, PART II Sections 3.2, 3.3, 3.4)
   Unit V: (PART II Chapter 5)

REFERENCES:

1. Narayanan &Manickavasagam Pillai – Calculus - S. Viswanathan (Printers & Publishers) Pvt Ltd, 2008.
2. AnitM.Agarwal -Differential Calculus- MeerutArihantPrakashan -2008.
3. Shanthi Narayanan- Differential Calculus - Shyam Lal Chairtable Trust, 1994.
4. Shanthi Narayanan -Integral Calculus - S.Chand and Company Ltd, 1994.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Explain higher derivatives and apply Leibnitz theorem to find the nth derivative of functions.
CO 2	Solve problems on curvature, envelopes, asymptotes and curve tracing.
CO 3	Construct reduction formula for trigonometric functions.
CO 4	Define Jacobian, double & triple integrals and apply the knowledge of change of variables to solve the problems in double and triple integrals.
CO 5	Construct Fourier series by recalling integration.

I B.Sc. Mathematics

SEMESTER –I

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M1CC2 / 19G1CC2	CLASSICAL ALGEBRA	**Lecture**	6	4

COURSE DESCRIPTION

This course is designed to understand the concepts of algebra which are useful for solving various real word problems.

COURSE OBJECTIVE/S

To enable the students learn Set theory, Binomial, Exponential, Logarithmic series, Theory of equations and to apply them to solve problems.

SYLLABUS

UNIT –I THEORY OF SETS, RELATIONS AND FUNCTIONS [18 HRS]

Set inclusion-Union f sets-Intersection of sets-difference of sets- complement of a set Symmetric difference of sets-Cartesian product of sets-Relations- Equivalence relations Partial order-Functions

UNIT –II BINOMIAL SERIES [18 HRS]

Summation and approximation using Binomial Series.

UNIT –III EXPONENTIAL AND LOGARITHMIC SERIES [18 HRS]

Exponential & Logarithmic series (Proof not expected). Summation and approximation using Exponential and Logarithmic series.

UNIT –IV THEORY OF EQUATIONS [18 HRS]

An equation of nth degree has exactly n roots, Relation between the roots and coefficients irrational roots – imaginary roots – Symmetric functions of the roots in terms of the coefficients. Sum of the powers of the roots (Newton's theorem)

UNIT –V TRANSFORMATION OF EQUATIONS [18 HRS]

Transformation of equations –Reciprocal equations – To increase or decrease the roots of a given equation by a given quantity-Form of the quotient and remainder when a polynomial is divided by a polynomial-Removal of terms-To form an equation whose roots are any power of the roots of a given equation – Descartes Rule of signs – multiple roots – Roll's theorem and applications– Descartes Rule of signs – Newton's method and Honer's method to solve algebraic equations.

Self Study:

Unit V - Hyperbolic functions.

TEXT BOOKS:

1. Modern Algebra – Arumugam and Isaac , New Gamma Publishing House 2002. Unit I – Chapter 1(section 1.2 -1.8) & chapter 2(section 2.1-2.4)

2. S. Natarajan, T. K. Manicavachagam Pillai and K. S. Ganapathy - Algebra Vol I - S. Viswanathan (Printers and Publishers), Pvt. Ltd, 2008. Unit II - Chapter 3: Sections 10, 12& 14

Unit III - Chapter 4: Sections 1-9, 11-12

Unit IV - Chapter 6: Sections 1-14

Unit V - Chapter 6: Sections 15 - 26

REFERENCES:

1. P.R.Vittal and V.Malini - Algebra & Trigonometry, Margham Publications, 2008.

2. Sudhir K Pundirsingh- Algebra & Trigonometry, MeeratPragathi prakashan, 2003.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Explain sets, relations and functions.
CO 2	Define binomial series, logarithmic and exponential series and solve problems.
CO 3	Identify Relations between the roots and coefficients of equations.
CO 4	Explain the transformations of equations.
CO 5	Recognize the important Methods in finding roots.

I B.Sc. Mathematics

SEMESTER –I

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M1AC1 / 19G1AC1	STATISTICS	**Lecture**	5	5

COURSE DESCRIPTION

This course is designed to make the students understand the importance of statistical literacy in today's data rich world.

COURSE OBJECTIVE/S

To enable the students learn moments, correlation, regression, curve fitting, random variables, analysis of time series and index numbers which will be used in various social sciences, business management, public administration, etc.

SYLLABUS

UNIT –I MOMENTS AND CORRELATION [15 HRS]

Moments – Measures of skewness, Kurtosis, Correlation- rank correlation and product moment correlation coefficient.

UNIT –II REGRESSION AND CURVE FITTING [15 HRS]

Regression- Regression lines - curve fitting.

UNIT –III RANDOM VARIABLES AND DENSITY FUNCTION [15 HRS]

Random variables- distribution functions- probability density functions – Various measure of central tendency – dispersion - skewness and kurtosis for continuous probability distribution Joint probability mass function and properties –Transformation of one dimensional and two dimensional random variables.

UNIT –IV MATHEMATICAL EXPECTATION [15 HRS]

Mathematical expectation – Addition theorem of expectation, multiplication theorem of expectation- Expectation of a linear combination random variables – covariance- Correlation coefficient –linear combination of random variables – conditional expectation and conditional variance – Moment generating function – cumulants – Characteristic function.

UNIT –V ANALYSIS OF TIME SERIES AND INDEX NUMBERS [15 HRS]

Components of a time series- measurements of trends. Index numbers (Self Study).

Self Study:

Unit V- Index numbers**.**

TEXT BOOKS:

1. S.C. Gupta and V.K. Kapoor ,Fundamentals of Mathematical statistics- Sultan Chand & Sons, Revised edition - June 2002 for Unit III and IV.

UNIT III: Chapter: 5- Sections: 5.1 to 5.7

UNIT IV: Chapter: 6- Sections: 6.1 to 6.6, 6.8

2. S. Arumugam and Thangapandi Isaac, Statistics–New Gamma publishing house, January 2006 for Unit I, II and V.

UNIT I: Chapter: 4- Sections: 4.0 to 4.2.

Chapter: 6- Sections: 6.0 to 6.2

UNIT II: Chapter: 6- Sections: 6.3.

Chapter: 5

UNIT V: Chapter: 9 and 10

REFERENCES:

1. Kapoor, Mathematical statistics, second edition, Delhi PusthkSadan, 1961.

2. H.C.Saxena, Elementary statistics, AbhirorPrakashan, New Delhi, 2008. .

3. S.C. Gupta and V.K Kapoor, Fundamental of Applied Statistics, third edition, Sultan Chand & Sons, New Delhi.

4. T. Veerarajan, Fundamentals of Mathematical Statistics, Yesdee Publishing Private Limited, Chennai, 2017.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Solve problems on moments, skewness, kurtosis and correlation.
CO 2	Construct regression line and curve equation.
CO 3	Explain random variables and probability density function
CO 4	Solve problems on expectation.
CO 5	Define and explain analysis of time series and index numbers

I B.Sc. IT / BCA

SEMESTER –I

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
USMA	19I1ACG1 / 19J1ACG1	DISCRETE MATHEMATICS	**Lecture**	5	5

COURSE DESCRIPTION

This course strengthens and increases the understanding of some concepts in Discrete Mathematics.

COURSE OBJECTIVE

To enable the students learn Tautology, Recursion, Logical premises and Some basics ofBoolean Algebra.

COURSE OUTCOMES

CO1: Understand the basic principles of sets and operations in sets.

CO2: Describe any statement formula in normal forms.

CO3: Understand the basics of matrices and able to solve system of equation using matrix

CO4: Demonstrate an understanding of relations and functions and be able to determine their properties

CO5: Understand Boolean algebra and basic properties of Boolean algebra; able to simplify simple Boolean functions by using the basic Boolean properties.

UNIT I: Sets, Relations [15 HRS]

Sets – Definition- Venn Diagram- Operations on sets Properties of Relations- Inverse relation- Equivalence classes- Partition of a set- Fundamental theorem on equivalence relations- Graphs of relations and Hasse Diagram.

UNIT II: Logic [15 HRS]

Connectives- Equivalence Formulas- Tautological Implication- Normal Forms- Inference Theory- Predicate Calculus-Inference theory for Predicate Calculus.

UNIT III: Theory of Matrices **[15 HRS]**

Matrix Inversion- System of equations- Consistency of systems of linear equations- Eigen Values- Eigen Vectors- Digitalization Process- Induction Principle- Peano's Postulates.

UNIT IV: Recurrence Relations and Generating Functions **[15 HRS]**

Polynomial expression- Sequences- Recurrence relations- Generating Functions- Properties of Generating Functions- Solution of Recurrence Relations using Generating Functions.

UNIT V: Boolean Algebra **[15 HRS]**

Boolean Algebra- Simplification of Boolean Functions by the map method -Introduction to the Applications of Boolean Algebra to Switching Theory-Turing Machine Problem.

Text Book:

Discrete Mathematics - Prof. V. Sunderesan, K.S. Ganapathy Subramanian,K. Ganesan, A.R. Publications, 2002. Chapters : 1(excluding Functions),2,3,6(excluding 6.1,6.2).

Reference Books :

1) Applied Discrete Structures for Computer Science - Alan Doerr & Kenneth Levasseur, Galgotia Publications, New Delhi.

2) J P Tremblay and R Manohar, Discrete Mathematical Structures with Applications to Computer Science, Publication : Tata McGraw-Hill Publishing Company Limited.

I B.A & B.Sc.

SEMESTER –I

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M1NME/19M2NME/19G1NME/19G2NME	QUANTITATIVE APTITUDE	**Lecture**	2	2

COURSE DESCRIPTION

This course is designed to help the students to appear in competitive examinations.

COURSE OBJECTIVE/S

To enable the students do the problems using short cut methods on the topics – Profit & Loss, Partnership, Time & Work and Time & Distance.

SYLLABUS

UNIT –I PROBLEMS ON AGES **[6 HRS]**

Problems related with ages.

UNIT –II PROFIT AND LOSS **[6 HRS]**

Profit and Loss: Cost Price – Selling Price – Profit or Gain – Loss – Gain percentage - Loss percentage.

UNIT –III PARTNERSHIP **[6 HRS]**

Partnership – Ratio of Division of Gains – Working and Sleeping Partners.

UNIT –IV TIME & WORK **[6 HRS]**

Time and Work: Important facts and formulae on time and work -Problems.

UNIT –V TIME & DISTANCE **[6 HRS]**

Time and Distance: Important facts and formulae on speed, time and distance – Problems.

TEXT BOOKS:

1. R.S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand & Company Ltd, Revised Edition 2008.

UNIT I: Chapter 17

UNIT II: Chapter 11

UNIT III: Chapter 13

UNIT IV: Chapter 15

UNIT V: Chapter 17

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Solve problems on ages .
CO 2	Illustrate profit and loss with examples.
CO 3	Explain partnership and related problems.
CO 4	Discuss problems on time and work.
CO 5	Solve problems on time and distance.

I B.Sc. Mathematics

SEMESTER –II

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M2CC3 / 19G2CC3	DIFFERENTIAL EQUATIONS	**Lecture**	6	4

COURSE DESCRIPTION

This course will provide the knowledge for solving ordinary and partial differential equations.

COURSE OBJECTIVE/S

To enable the students get thorough knowledge of solving Differential Equations of first order, second order, Laplace transforms Partial differential equations.

SYLLABUS

UNIT –I DIFFERENTIAL EQUATIONS OF FIRST ORDER [18 HRS]

Homogeneous equations – Non homogeneous equations of the first degree in x and y (Self Study) – Linear equations – Bernoulli's equation – Exact differential equation – Equations solvable for p – solvable for x – solvable for y – Clairauts equation.

UNIT –II DIFFERENTIAL EQUATIONS OF SECOND ORDER [18 HRS]

Linear equations with constant coefficients with terms of the form e^{ax} V on RHS – Linear equations with variable coefficients – Equations reducible to the linear homogeneous equations – methods of variation of parameters – Simultaneous linear differential equations.

UNIT –III LAPLACE TRANSFORMS [18 HRS]

Laplace transforms – Laplace transforms of periodic functions – Some general theorems – The Inverse Laplace transforms – Solution of Differential equations using Laplace transforms.

UNIT –IV PARTIAL DIFFERENTIAL EQUATIONS [18 HRS]

Formation of Partial Differential equations – First order Partial Differential Equations – Some standard forms – Lagrange's method – Charpit's method.

UNIT –V APPLICATIONS **[18 HRS]**

Applications of first order equations: Growth, decay and chemical reactions.

SELF STUDY:

Unit I - Homogeneous equations – Non homogeneous equations of the first degree in x and y.

TEXT BOOKS:

1. S. Narayanan, T.K. Manickavachagam Pillay - Differential Equation and its Applications – S. Viswanathan (Printers and Publishers) Pvt. Ltd.2006.

UNIT I: Chapter: 2- Sections: 1 – 6.4 & Chapter: 4 - Sections 1 – 4.

UNIT II: Chapter: 5 - Sections: 1 – 6, Chapter: 6 - Sections: 1 – 6.

UNIT III: Chapter: 9 -Sections: 1 – 10.

UNIT V: Chapter: 3 - Section: 1.

2. Dr. S. Arumugam and Issac - Differential Equation and Applications – New Gamma Publishing House Nov- 2011. Chapters 2, 4

UNIT II: Chapter: 2 - Sections: 2.5 Type D

UNIT IV: Chapter: 4 - Sections: 4.0 – 4.5.

REFERENCES:

1. N.Ch.S.N.Iyengar – Differential Equations – Anmol publications pvt.ltd – 2000

2. Rasinghania - Differential Equations – S.Chand & Company limited – 1997.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Solve problems in differential equations of first order.
CO 2	Classify homogeneous and Non homogeneous differential equations of second order and solve problems.
CO 3	Solve differential equation problems using Laplace transform.
CO 4	Define Partial differential equations and solve problems.
CO 5	Solve problems on Growth, decay and chemical reactions

I B.Sc. Mathematics

SEMESTER –II

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M2CC4 / 19G2CC4	NUMERICAL METHODS	**Lecture**	6	4

COURSE DESCRIPTION

This course enables the students to solve equations using various Numerical Methods.

COURSE OBJECTIVE/S

To enable the students to solve Algebraic, Transcendental, Differential Equations using various Numerical methods like Bisection, Runge - Kutta, Euler and Taylor.

SYLLABUS

UNIT –I ALGEBRAIC AND TRANSCENDENTAL EQUATION [15 HRS]

Introduction - Bisection method - Iteration method – Regula-falsi method – Newton Raphson method. (No derivations).

UNIT II: SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS [15 HRS]

Introduction- – Gauss Elimination method – Gauss Jordan method – Calculation of inverse of a matrix – Gauss Jacobi Iteration method – Gauss-Seidel iteration method.(No derivations).

UNIT III: FINITE DIFFERENCES & INTERPOLATION [20 HRS]

Difference operators – Other difference operators- Relation between the operators - Newton's forward Interpolation formula- Newton's backward Interpolation formula – Gauss forward Interpolation formula - Gauss backward Interpolation formula – Stirling's formula - Lagrange's interpolation formula – Divided difference – Newton's Divided difference formula – Inverse interpolation. (No derivations).

UNIT IV: NUMERICAL DIFFERENTIATION AND INTEGRATION [20 HRS]

Derivatives using Newton's forward difference formula- Derivatives using Newton's backward difference formula- Derivatives using Central difference formula-Maxima and minima of the interpolating polynomial- Numerical Integration – Trapezoidal Rule – Simpson's one third rule. (No derivations).

UNIT V: NUMERICAL SOLUTION OF DIFFERENTIALEQUATION [20 HRS]

Taylor series method – Picard's method – Euler's method – Modified Euler's method Runge - Kutta methods –Second order Runge-Kutta method-Higher order Runge-Kutta method-Predictor-Corrector formulae-Milne's Predictor- Corrector formulae-Adam's Predictor-Corrector equations. (No derivations).

TEXT BOOKS:

1. Dr. M.K. Venkataraman, Numerical Methods in Science and Engineering, The National publishing company, fifth edition.

Unit I : Chapter III -Sections 1 to 5

Unit II: Chapter IV- Sections 1,2,3,6

Unit III: Chapter V-Sections 1 to 12, 14 to 18 Chapter VI - Sections 1 to 5. Chapter VII-Sections 1 to 5. Chapter VIII - Sections 1 to 5

Unit IV: Chapter IX- Sections 1 to 8, 10

Unit V : Chapter XI-Sections 6,9,10,12,13,14,16,19,20,21

REFERENCES:

1.S. Arumugam, S. Thangapandi Isaac and A. Soma Sundaram, Numerical Analysis, New Gamma Publishing House 2007.

2. S.S.Sastry, Introductory methods of Numerical analysis, Prentice Hall of India.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Solve algebraic and transcendental equations using various methods.
CO 2	Identify the various methods of solving simultaneous linear algebraic equations.
CO 3	Recognize difference operators and apply the concept of interpolation.
CO 4	Compute the values of the derivatives at some point using numerical differentiation and integration.
CO 5	Solve problems on higher order differential equations using Euler's, Runge- kutta and Predictor- Corrector methods

I B.Sc. Mathematics

SEMESTER –II

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M2AC2 / 19G2AC2	ADVANCED STATISTICS	**Lecture**	5	5

COURSE DESCRIPTION

This course provides a strong background in statistical tools which will be used in various physical and social sciences.

COURSE OBJECTIVE/S

To enable the students to know the concepts of discrete distributions, continuous distributions, Test of significance for large and small samples and analysis of variance.

SYLLABUS

UNIT –I DISCRETE DISTRIBUTIONS **[15 HRS]**

Binomial distribution and Poisson distribution

UNIT –II CONTINUOUS DISTRIBUTION **[15 HRS]**

Normal Distribution - Normal Distribution as a limiting form of binomial distribution – characteristics of Normal Distribution – Area property – Fitting of Normal Distribution.

UNIT –III TEST OF SIGNIFICANCE FOR LARGE SAMPLES **[15 HRS]**

Concept of sampling distribution - Test of significance for large samples using normal distribution.

UNIT –IV TEST OF SIGNIFICANCE FOR SMALL SAMPLES **[15 HRS]**

$\chi 2$, Student-t, $\chi 2$, F distributions (no derivation for t, $\chi 2$, F distributions), Test of significance $\chi 2$ for small samples using t, $\chi 2$, F distributions.

UNIT –V ANALYSIS OF VARIANCE **[15 HRS]**

Analysis of variance - One way and two way classification, Randomized block design - Latin square. Self Study: Unit I - Poisson distribution.

TEXT BOOKS:

1. S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical statistics- Sultan Chand & Sons, Revised edition - June 2002 for Unit I to IV.

UNIT I : Chapter : 8 - Sections : 8.1 – 8.5.

UNIT II : Chapter : 9 - Sections : 9.1, 9.2.

UNIT III : Chapter : 14 - Sections : 14.1 – 14.8.

UNIT IV : Chapter : 15 - Sections : 15.1 - 15.6, Chapter : 16 - Sections : 16.1 – 16.8

2. S.P.Gupta, Statistical Mehthods - Sultan Chand & Sons, (Rev.2000)

UNIT V: Chapter: 14

REFERENCES:

1. H.C.Saxena, Elementary Statistics,AbhirorPrakashan,New Delhi,2008.

2. S.C. Gupta and V.K Kapoor , Fundamentals of Applied Statistics, Sultan Chand & Sons,2004.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Classify discrete and continuous random variables and characteristics of Binomial distribution and Poisson distribution
CO 2	Explain and illustrate the properties of Normal distribution and solve variety of problems.
CO 3	Distinguish between a population and a sample and explain testing of hypothesis.
CO 4	Explain chi square distribution, t- distribution and describe their various applications is Statistics.
CO 5	Define F- distribution and apply it to solve problems in analysis of variance.

I B.Sc. IT/ BCA

SEMESTER –II

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
USMA	19I2ACG2 / 19J2ACG2	OPERATIONS RESEARCH	**Lecture**	5	5

COURSE DESCRIPTION

The course provides appropriate methods for the efficient computation of optimal solutions to problems which are modeled by objective function and linear constraints.

COURSE OBJECTIVE

To enable the students to convert real life problems into a Mathematical problem and to solve them using different techniques like graphical method, simplex method, Big – M method, Two - phase method and dual simplex method Also to solve problems in transportation, assignment and game theory.

COURSE OUTCOMES

CO 1: Formulate linear programming problems and solve by graphical method

CO 2: Classify simplex, two phase and Big - M method to solve linear programming problems

CO 3: Illustrate Duality in Linear programming

CO 4: Recognize and formulate transportation, assignment problems and find the optimal solution

UNIT I Linear Programming Problem [15 HRS]

Linear Programming Problem- Mathematical Foundation: Introduction - Linear Programming Problem - Mathematical Formulation of the Problem - Illustration on Mathematical Formulation of LPPs,

Linear Programming Problem- Graphical Solution: Introduction - Graphical Solution Method - General Linear Programming problem.

UNIT II Simplex Method **[15 HRS]**

Linear Programming - Simplex Method: Introduction - Fundamental Properties of Solutions - The Computational Procedure - Use of Artificial Variables - Degeneracy in Linear Programming - Solution of Simultaneous Linear Equations - Inverting a Matrix Using Simplex Method - Application of Simplex Method.

UNIT III Dual Problem **[15 HRS]**

Primal-Dual Pair in Matrix Form - Duality Theorems - Complementary Slackness Theorem - Duality and Simplex Method - Economic Interpretation of Duality - Dual Simplex Method.

UNIT IV Transportation Problem **[15 HRS]**

Introduction - LP Formulation of the Transportation Problem - Existence of Solution in T.P. - Duality in Transportation Problem - The Transportation Table - Loops in Transportation Tables - Triangular Basis in a T.P. - Solution of a Transportation Problem - Finding an Initial Basic Feasible Solution - Test for Optimality

UNIT V Assignment Problem **[15 HRS]**

Introduction - Mathematical Formulation of the Problem - Solution Methods of Assignment Problem - Special Cases in Assignment Problem - Dual of the Assignment Method – The Traveling Salesman Problem.

TEXT BOOK:

Operations research, Eighth edition, Kanti Swarup, Gupta P.K. and Manmohan,1997,sultan Chand and sons.

Unit I: Chapter: 2, 3 Unit II: Chapter: 4 Unit III: Chapter: 5 Unit IV: Chapter: 10Unit V: Chapter: 11

REFERENCE BOOK:

1. V. Sunderesan, K.S. Subramanian, K. Ganesan, Operations Research, New revisededition, A.R. Publications, sirkali.
2. Hamdy A. Taha, Operations Research, Fifth edition, Prentice Hall of India, New Delhi, 1995.

II B.Sc. Mathematics

SEMESTER –III

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M3CC5/ 19G3CC5	MODERN ALGEBRA	**Lecture**	6	4

COURSE DESCRIPTION

This course introduces the abstract concepts of modern algebra.

COURSE OBJECTIVE/S

To enable the students to study Groups, Rings and Fields with various conditions imposed on sets, which finds application in different fields of science.

SYLLABUS

UNIT –I GROUPS **[18 HRS]**

Definitions and Examples – Elementary properties of a group – Equivalent Definitions – Permutation Groups - Subgroups - Cyclic Groups - Order of an Element.

UNIT –II NORMAL SUBGROUPS **[18 HRS]**

Cosets and Lagrange's Theorem - Normal Subgroups and Quotient Groups - Isomorphism – Homomorphisms

UNIT –III RINGS **[18 HRS]**

Definitions and examples – Elementary properties of rings – Isomorphism – Types of rings – Characteristic of a ring – Subrings.

UNIT –IV IDEALS **[18 HRS]**

Ideals – Quotient Rings – Maximal and Prime Ideals – Homomorphism of rings (self study) – Field of quotients of an integral domain – Ordered Integral domain –Unique Factorization domain.

UNIT –V POLYNOMIAL RINGS **[18 HRS]**

Euclidean domain – Every P.I.D is a U.F.D – Polynomial Rings – Polynomial Rings Over U.F.D – Polynomials Over Q.

SELF STUDY:

UNIT IV -Homomorphism of rings.

TEXT BOOKS:

1. Dr. S. Arumugam and A.ThangaPandi Isaac - Modern Algebra – Scitech Publications (India) Private Limited - 2003.

UNIT I: Chapter: 3- Sections: 3.1 – 3.7.

UNIT II: Chapter: 3- Sections: 3.8 – 3.11.

UNIT III: Chapter: 4 -Sections: 4.1 – 4.6.

UNIT IV: Chapter: 4 -Sections: 4.7-4.13

UNIT V: Chapter: 4 -Sections: 4.14- 4.18

REFERENCES

1. A.R.Vasishtha - Modern Algebra –Krishna Prakashan Media (P) Ltd.,Delhi- 2006.

2. Surgeet Singh - Modern Algebra –Vikas Publishing House-III Edition 2003.

3. N.S. Gopalakrishnan - University Algebra – New Age International Limited- II Edition – 2005.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Classify groups and explain their properties.
CO 2	Describe cosets and Lagrange's theorem.
CO 3	Explain the characteristics of different types of rings and their properties.
CO 4	Classify various types of ideals.
CO 5	Construct polynomial rings over UFD.

II B.Sc. Mathematics

SEMESTER –III

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M3CC6/ 19G3CC6	VECTOR CALCULUS AND FOURIER TRANSFORM	**Lecture**	6	4

COURSE DESCRIPTION

This course emphasizes the fundamental concepts of vector calculus and Fourier transforms.

COURSE OBJECTIVE/S

To enable the students to learn the concepts of differentiation of vectors, line and surface integrals, applications of Green, Gauss and Stokes theorems and Fourier transform.

SYLLABUS

UNIT –I DIFFERENTIATION OF VECTORS **[15 HRS]**

Differentiation of vectors – Gradient – geometrical interpretation of gradient Directional derivative.

UNIT II: DIVERGENCE AND CURL **[15 HRS]**

Divergence and Curl – solenoidal and irrotational vectors.

UNIT III: LINE AND SURFACE INTEGRALS **[20 HRS]**

Line integrals – Surface integrals – Theorems of Green, Gauss and Stokes.

UNIT IV: FOURIER TRANSFORMS - FINITE TRANSFORM **[20 HRS]**

Introduction - Fourier transforms - Fourier cosine transform - Fourier sine transform Alternative form of Fourier complex integral formula - Relationship between Fourier transform and Laplace transform. Finite Fourier transforms - Inversion formulas.

UNIT V: PROPERTIES OF FOURIER AND FINITE TRANSFORM [20 HRS]

Linear property - Shifting property - Modulation theorem - Conjugate symmetry property - Transform of derivatives – Derivatives of the transform-Convolution theorem - Parsevel's identity (without proof). - Finite Fourier transforms of derivatives. SELF STUDY: Differentiation of vectors.

TEXT BOOKS:

1. Arumugam & Issac - Analytical Geometry 3D, Vector calculus & Trigonometry – New Gamma Publishing House, January 2006.

UNIT I: Chapter 5: Sections – 5.0 - 5.3

UNIT II: Chapter 5: Section – 5.4

UNIT III: Chapter 7: Sections – 7.0 - 7.3 2. T. Veerarajan - Engineering Mathematics III Edition - Tata Mcgrew- Hill publishing Company Limited, New Delhi.

UNIT IV: Chapter 6: Sections - 6.1 - 6.5, 6.7(Example 1 – 7)

UNIT V: Chapter 6: Sections - 6.6, 6.7 (Finite Fourier Transforms of derivatives, Examples 8, 9, 10)

REFERENCES

1. S. Narayanan & T. k. Manicavachagam Pillay - Vector algebra & Analysis – South India Saiva Siddanta Works Publishing Society – Fourth Edition – 1986.

2. Goyal & Gupta - Integral Transforms - PragatiPrakashan, Meerut, 1987.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Explain the concept of differentiation of vectors.
CO 2	Compute divergence and curl of vectors.
CO 3	Solve problems on line and surface integrals.
CO 4	Compute fourier sine and cosine transforms.
CO 5	Describe the properties of fourier transforms.

II B.Sc. Mathematics

SEMESTER –III

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M3SB1/ 19G3SB1	APPLICATIONS OF CALCULUS AND DIFFERENTIAL EQUATIONS	**Lecture**	2	2

COURSE DESCRIPTION

This course deals with applications of calculus and differential equations.

COURSE OBJECTIVE/S

This course will enable students to develop a more profound understanding of Applications of calculus and differential equations and to solve related problems in Geometry, Physics, Chemistry, Mechanics etc.

SYLLABUS

UNIT –I BETA AND GAMMA FUNCTIONS [6 HRS]

Introduction – Definition of Beta and Gamma Functions – Properties and results involving Beta and Gamma functions.

UNIT –II MAXIMA MINIMA OF FUNCTIONS OF TWO VARIABLES [6 HRS]

The method of finding the Maxima Minima of functions of two variables.

UNIT –III TRAJECTORIES [6 HRS]

Trajectories Introduction – Cartesian coordinates – Polar Coordinates; Orthogonal trajectories.

UNIT –IV THE BRACHISTOCHRONE PROBLEM [6 HRS]

The Brachistochrone Problem – TautoChronous property of the Cycloid - Simple Electric Circuit.

UNIT –V FALLING BODIES AND DYNAMICAL PROBLEMS **[6 HRS]**

Falling Bodies and other rate problems – Dynamical Problems with Variable Mass. Falling Bodies – Dynamical Problem with Variable Mass.

TEXT BOOKS:

1. Dr S. Arumugam and A. ThangapandiIssac - Calculus, New Gamma Publishing House 2006.

UNIT I: Chapter 4(Part II)

UNIT II: Chapter 3(Part I) - Section – 3.7 2.

2. Dr S. Arumugam and A. ThangapandiIssac - Differential Equations and Applications, New Gamma Publishing House 2008.

UNIT III: Chapter 6 - Sections – 6.1

UNIT IV: Chapter 6 - Sections – 6.4 to 6.6

UNIT V: Chapter 6 - Sections – 6.7, 6.12

REFERENCES

1. T.K. Manickavasagam Pillai, S. Narayanan - Calculus-S. Viswanathan (Printers & Publishers) Pvt Ltd , 2008.

2. T.K. Manickavasagam Pillai, S. Narayanan - Differential Equations and Applications–S. Viswanathan (Printers and Publishers) Pvt. Ltd.2006.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Explain Beta and Gamma functions and their properties.
CO 2	Solve the problems in Maxima minima of functions of two variables.
CO 3	Describe trajectories and orthogonal trajectories.
CO 4	Solve Brachistrochone problems
CO 5	Discuss dynamical problems with variable mass

II B.Sc. Mathematics

SEMESTER –IV

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M4CC7 / 19G4CC7	SQUENCES AND SERIES	**Lecture**	6	4

COURSE DESCRIPTION

This course introduces the concept of sequence and series and to enable the students to understand the fundamental ideas in Real Analysis.

COURSE OBJECTIVE/S

To enable the students to learn theorem and problems in sequences and series which is essential for learning higher Mathematics.

SYLLABUS

UNIT –I SEQUENCES **[20 HRS]**

Sequences – Bounded Sequences – Monotonic Sequences – Convergent Sequences – Divergent and Oscillating Sequences – The Algebra of Limits – Behaviour of Monotonic Sequences.

UNIT –II LIMITS AND SUBSEQUENCES **[15 HRS]**

Some Theorems on Limits – Subsequences – Limit Points – Cauchy Sequences – The upper and Lower Limits of a Sequence.

UNIT –III SERIES OF POSITIVE TERMS **[20 HRS]**

Infinite Series - Comparison Test – Kummer's Test – Root test and Condensation Test – Integral Test.

UNIT –IV ALTERNATING SERIES **[20 HRS]**

Alternating Series – Absolute Convergence – Tests for Convergence of series of arbitrary terms.

UNIT –V REARRANGEMENT OF SERIES **[15 HRS]**

Rearrangement of series – Multiplication of series – Power Series**.**

TEXT BOOKS:

1. S. Arumugam and A. ThangapandiIssac, Sequences and Series, New Gamma Publishing House 2002.

Unit – I: Chapter 3 (Sec 3.1 – 3.7)

Unit – II: Chapter 3 (Sec 3.8 – 3.12)

Unit – III Chapter 4

Unit – IV Chapter 5 (Sec 5.1 – 5.3)

Unit – V Chapter 5 (Sec 5.4 – 5.6)

REFERENCES:

1. M.K.Venkatraman and Mrs. Manoramma Sridhar, Sequences and Series, The National Publishing Company 2002.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Define basic concepts of sequences.
CO 2	Explain subsequences and Cauchy sequences.
CO 3	Differentiate various convergence test for series and use them to solve problems.
CO 4	Recognize alternating, convergent, conditionally and absolutely convergent series.
CO 5	Distinguish the behaviour of series and power series.

II B.Sc. Mathematics

SEMESTER –IV

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M4CC8 / 19G4CC8	LINEAR ALGEBRA	**Lecture**	6	4

COURSE DESCRIPTION

This course will focus on matrix as linear transformations relative to a basis of a vector space.

COURSE OBJECTIVE/S

To enable the students to understand matrix and vector space concepts which can be applied in Graph Theory, Linear Programming, Physics and Chemistry etc .

SYLLABUS

UNIT –I VECTOR SPACES **[18 HRS]**

Definition and Examples of Vector spaces – Subspaces – Linear Transformation – Span of a set.

UNIT –II BASIS AND DIMENSION **[18 HRS]**

Linear Independence – Basis and Dimension – Rank and Nullity - Matrix of a Linear Transformation.

UNIT –III INNER PRODUCT SPACES **[18 HRS]**

Definition and Examples of inner product spaces – Orthogonality – Orthogonal Complement.

UNIT –IV THEORY OF MATRICES **[18 HRS]**

Algebra of Matrices – Types of Matrices – The Inverse of a Matrix – Elementary Transformations. Rank of a Matrix – Simultaneous Linear Equations – Characteristic Equation and Cayley Hamilton Theorem, Eigen Values and Eigen Vectors.

UNIT –V BILINEAR FORMS **[18 HRS]**

Bilinear forms – Quadratic forms.

TEXT BOOKS:

1. Dr. S. Arumugam and A.ThangaPandi Isaac - Modern Algebra – Scitech Publications (India) Private Limited - 2003.

UNIT I Chapter 5: 5.0-5.5

UNIT II Chapter 5: 5.6 – 5.8

UNIT III Chapter 6

UNIT IV Chapter 7

UNIT V Chapter 8

REFERENCES:

1. Surgeet Singh, Modern Algebra, Vikas Publishing House-III Edition 2003.

2. N.S. Gopalakrishnan ,University Algebra , New Age International Limited- II Edition - 2005.

3. Alan Doerr& Kenneth Levasseur – Applied Discrete Structures for Computer Science - Galgotia Publications Pvt. Ltd. - Edition 1989.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Define Vector Space and explain its various concepts.
CO 2	Illustrate Inner Product Spaces.
CO 3	Define basic concepts of matrices and solve linear equations.
CO 4	Appraise Eigen Value and Eigen Vectors of matrices.
CO 5	Describe bilinear forms and quadratic forms.

II B.Sc. Mathematics

SEMESTER –IV

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAMA/USMA	19M4SB2 / 19G4SB2	FOUNDATIONS OF MATHEMATICS	**Lecture**	2	2

COURSE DESCRIPTION

This course helps the students to develop their problem solving skills.

COURSE OBJECTIVE/S

To enable the students learn some basic concepts of Trigonometry, Number Theory and Algebra and to solve problems.

SYLLABUS

UNIT –I TRIGONOMETRY **[6 HRS]**

Hyperbolic functions, Inverse Hyperbolic functions.

UNIT –II COMPLEX QUANTITIES **[6 HRS]**

Logarithms of complex quantities.

UNIT –III PROPERTIES OF INTEGERS **[6 HRS]**

Euclid's First Theorem, Euclid's Second Theorem, Law of Trichotomy, Fundamental Theorem of Arithmetic, Division Algorithm, Calculation of LCM and GCD.

UNIT –IV CONGRUENCES **[6 HRS]**

Congurences and Chinese Remainder theorem (Only Statements & Problems).

UNIT –V INEQUALITIES **[6 HRS]**

Triangule inequalities, Relation between arithmetic, harmonic and geometric means, CauchySchwartz inequality.

TEXT BOOKS:

1. S. Narayanan and T. K. Manicavachagam Pillai - Trigonometry, S. Viswanathan (Printers and Publishers), Pvt. Ltd, 2008.

UNIT I Chapter 4 – Section 2.1, 2.2, 2.3

UNIT II Chapter 5 - Section 5

2. Dr. N. Vijayarangan - Foundations of Mathematics – Scitech Publications (India) Pvt. Ltd.

UNIT III Chapter 3 (Relevant topics)UNIT IV Chapter 3 (Relevant topics)

3. Dr. S Arumugam and A ThangapandiIssac – Sequences and series-New Gamma Publishing House-July 2010.

UNIT V Chapter 2 (Section 2.1 - 2.4)

REFERENCES:

1. P.R.Vittal &V.Malini - Algebra & Trigonometry, Margham Publications, 2008.

2. Sudhir K Pundirsingh - Algebra & Trigonometry, MeeratPragathi prakashan,2003.

3. Alan Doerr & Kenneth Levasseur – Applied Discrete Structures for Computer Science - Galgotia Publications Pvt. Ltd. - Edition 1989.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Recall some expansions of Trigonometric functions.
CO 2	Explain Logarithms of Complex quantities.
CO 3	Describe properties of integers.
CO 4	Solve puzzles using Chinese remainder Theorem.
CO 5	Analyse inequalities.

III B.Sc. MATHEMATICS

V SEMESTER

M5CC9/G5CC9 - REAL ANALYSIS

(For those who join in 2014 onwards)

HRS/WEEK: 6 **CREDITS: 5**

Objective: To introduce the basic concepts in Analysis and to enable the students to understand fundamental ideas and theorems on Metric spaces

UNIT I: METRIC SPACES **[25 HRS]**

Countable sets- Uncountable sets- Inequalities of Holder and Minkowski - Metric spaces, definition and examples - Bounded sets in a metric space – Open ball in a metric space-open sets- Subspaces.

UNIT II: COMPLETE METRIC SPACES **[15 HRS]**

Interior of a set – Closed sets – Closure - Limit point – Dense sets - Completeness – Baire's Category theorem

UNIT III: CONTINUITY **[20 HRS]**

Continuity-Definition and examples of a Continuous function – Homeomorphism – Isometry – Uniform Continuity – Discontinuous functions on R.

UNIT IV: CONNECTEDNESS **[10 HRS]**

Definition and Examples – Connected subsets of R – Connectedness and Continuity.

UNIT V: COMPACTNESS **[20 HRS]**

Definition and examples – Compact space- Compact subsets of R – Equivalent Characterization for Compactness – Compactness and Continuity.

TEXT BOOK:

Dr. S. Arumugam & A. Thangapandi Issac - Modern Analysis - New Gamma Publishing house – Edition 2010.

UNIT I : Chapters: 1, 2 (sec 2.1 – 2.5) UNIT II : Chapters: 2 (sec 2.6 – 2.10), 3

UNIT III : Chapter: 4 UNIT IV : Chapter: 5

UNIT V : Chapter: 6

REFERENCE BOOKS:

1. Copson - Metric spaces – Universal book stall, New delhi – 1989
2. Walter Rudin - Mathematical Analysis - MC-craw hill international – Third edition

III B.Sc. MATHEMATICS

V SEMESTER

M5CC10/G5CC10 - MECHANICS

(For those who join in 2014 onwards)

HRS/WEEK: 6 **CREDITS: 5**

Objective: Enable the students to apply the laws, principles, postulates, governing the Statics of the system and to apply the laws and principles Governing Dynamics of the system, in Physical reality.

UNIT I: INTRODUCTION AND FORCES ACTING AT A POINT [15 HRS]

Introduction – Resultant and components: Definition – Simple cases of finding the resultant – Parallelogram of Forces – Analytical expression for the resultant of two forces acting at a point – Triangle of forces – Lami's Theorem – Resultant of any number of coplanar forces acting at a point – Condition of equilibrium of any number of forces acting up on a particle.

UNIT II: PARALLEL FORCES AND MOMENTS, COUPLES [20 HRS]

Introduction – Condition of equilibrium of three coplanar parallel forces – Centre of two parallel forces – Moment of a force – Geometrical representation of a moment – Sign of the moment – Varigon's theorem – Generalized theorem of moments - Couples - Equilibrium of three forces acting on a rigid body.

UNIT III: FRICTION [20 HRS]

Introduction – Experimental results – Statical, dynamical and limiting friction – Laws of friction – Friction a passive force – Coefficient of friction – Angle of friction – Cone of friction – Numerical values – Equilibrium of a particle on a rough inclined plane – Equilibrium of body on a rough inclined plane under a force parallel to the plane –Equilibrium of a body on a rough inclined plane under any force – Problems on friction.

UNIT IV: PROJECTILE [20 HRS]

Definitions-Path of a Projectile-Characteristic of the motion of a Projectile – Velocity of the projectile in magnitude and direction- Range on an Inclined Plane– Motion on the surface of a smooth inclined plane - Enveloping parabola.

UNIT V: MOTION UNDER THE ACTION OF CENTRAL FORCES [15 HRS]

Velocity and acceleration in polar coordinates-Equations of motion in polar coordinates-Differential equation of the central orbit-Pedal Equation of some of the well known curves –

Velocities in a central orbit – Apses and apsidal distances – Law of the inverse square-Law of the inverse cube.

TEXT BOOKS:

1. Dr. M.K. Venkataraman - A Text book of Statics, Agasthiar Publications-2007.
   Unit I: Chapters I, II.
   Unit II: Chapters III, IV, V.
   Unit III: Chapter VII.
2. Dr.M.K. Venkataraman - A Text Book of Dynamics, Agasthiar Publications-2007.
   Unit IV: Chapter VI.
   Unit V: Chapter XI.

REFERENCE BOOKS:

1. P. Duraipandian & Lakshmi Duraipandian - Mechanics, S. Chand & Co., Fourth edition, Reprint 2003.
2. M.L. Khanna - Statics, Fourth edition, South Asian Books, 1900.
3. M.L. Khanna – Dynamics of a rigid body, Jai Prakash Nath & Co., Meerut, 1975.

III B.Sc. MATHEMATICS

V SEMESTER

M5CC11/G5CC11 - COMPUTER PROGRAMMING IN C

(For those who join in 2014 onwards)

HRS/WEEK: 6 **CREDITS: 4**

Objective: C language is one of the most popular computer languages today and the programs written in C are powerful, efficient, fast and compact. Realizing the need for educating our students in the various applications of mathematics, we have introduced this course.

UNIT I: C FUNDAMENTALS, OPERATORS AND EXPRESSIONS [15 HRS]

Character Set – C Tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of Variables – Assigning Values to Variables – Defining Symbolic Constants – Operators & Expressions : Introduction – Arithmetic of operators – Relational operators – Logical operators – Assignment operators – Increment and decrement operators – Conditional operator – Bitwise operators – Special operators – Arithmetic expressions – Evaluation of expressions – Precedence of arithmetic operators – Some computational problems – Type conversions in expressions – Operator precedence and associativity – Mathematical functions.

UNIT II: DATA INPUT, OUTPUT & CONTROL STATEMENTS [25 HRS]

Reading a character – Writing a character – Formatted input – Formatted output - Decision Making and Branching: IF Statement – the IF ELSE statement – Nesting of IF...ELSE statements – The ELSE IF ladder – The switch statement - The ?: Operator – the GOTO statement – Decision Making and Looping : The WHILE statement – the DO statement – the FOR statement – Jumps in loops.

UNIT III: ARRAYS & HANDLING OF STRINGS [20 HRS]

One Dimensional Arrays – Two Dimensional Arrays – Initializing Two Dimensional Arrays – Handling of Character Strings : Declaring and Initializing String Variables – Reading String from Terminal – Writing Strings to Screen – Arithmetic Operations on Characters – Putting Strings together – Comparison of two Strings – String Handling Functions – Table of Strings

UNIT IV: USER – DEFINED FUNCTIONS & POINTERS [15 HRS]

Need for User-Defined Functions – A Multi-function Program – Form of C Functions – Return Values and their Types – Calling a Function – Category of Functions – No Arguments and No Return Values – Arguments but No Return Values – Arguments with Return Values – Handling

of Non-Integer Functions – Nesting of Functions – Recursion – Functions with Arrays - the scope and lifetime of variables in functions. Pointer : Understanding Pointers – Accessing the Address of a Variable – Declaring and Initializing Pointers – Accessing a Variable through its Pointer – Pointer Expressions – Pointer Increment and Scale Factor – Pointers and Arrays.

UNIT V: STRUCTURES & FILES [15 HRS]

Structure definition – Giving values to members – Structure initialization – Comparison of structure variables – Arrays of structures – Arrays within structures – Structures within structures – Structures and functions –Unions – Size of structures – Bit fields. File Management in C: Defining and opening a file-closing a file-Input / Output operations on files-Error handling during I / O operations-Random access to files-Command line arguments.

TEXT BOOK:

E. Balagurusamy - Programming in ANSI C - Tata McGraw-Hill Publishing Company Ltd. – Fourth Edition - 2000

Chapters: 2 to 10 excluding section 7.5 (Multidimensional Arrays),

Chapters 11: sections 11.1-11.8 and Chapter 12.

REFERENCE BOOKS:

1) Byron S. Gotfried - Theory and problems of programming with C (Schaums Series) Tata – McGraw Hills Edition - 1991.
2) Kernighan & Brian.W - The C programming language, Prentice – Hall of India, Private Limited, New Delhi - 1999.

III B.Sc. MATHEMATICS

V SEMESTER

M5CCP1/G5CCP1 – C PRACTICALS

(For those who join in 2014 onwards)

HRS/WEEK: 3 **CREDITS: 2**

LIST OF PROGRAMS

1) Solving Quadratic equations
2) Checking primes
3) Arranging numbers in ascending / descending order
4) Fibonacci sequence
5) Reversing digits of a number
6) Finding the values of ncr, npr. using functions.
7) Palindrome
8) Matrix addition, multiplication
9) Transpose of a matrix, Trace of a matrix
10) Alphabetizing names
11) Mean and Standard deviation
12) Finding Correlation coefficient
13) Straight line fitting by the method of least squares
14) Recursion application – ncr – Fibonacci sequence
15) Eratosthenes sieving technique for finding prime using pointers
16) To find inner product of two vectors using pointers
17) To count the number of words in a text using pointers to strings.
18) Create structure of customer's bank data
19) To get the net salary of an employee and print the salary slip given the name, basic pay, DA, HRA, CCA, IT,PF using structures.
20) To read the berth no. (1 to 72) and print the bay no. and the position of the berth.

III B.Sc. MATHEMATICS

V SEMESTER

M5ME1/G5ME1 – GRAPH THEORY

(For those who join in 2014 onwards)

HRS/WEEK: 5 **CREDITS: 5**

Objective: Abstract concepts in Mathematics, in all branches of Science and Technology, even in Social and Natural sciences find representations in graph theory. There is hardly any field where graph theory does not find application. This paper is to enable the students to have better application of abstract concepts through graph theory.

UNIT I GRAPHS AND SUBGRAPHS **[15 HRS]**

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

UNIT II DEGREE SEQUENCES AND CONNECTEDNESS **[15 HRS]**

Degree Sequences – Graphic Sequences – Walks, Trails and Paths – Connectedness and Components – Blocks – Connectivity.

UNIT III EULERIAN AND HAMILTONIAN GRAPHS **[15 HRS]**

Eulerian Graphs – Hamiltonian Graphs.

UNIT IV TREES AND MATCHINGS **[15 HRS]**

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

UNIT V PLANARITY AND COLOURABILITY **[15 HRS]**

Definition and Properties – Characterization of Planar Graphs – Thickness, Crossing and Outer Planarity – Chromatic Number and Chromatic Index – The Five Colour Theorem.

TEXT BOOK:

S. Arumugam & S. Ramachandran, Invitation to Graph Theory –2012 - Scitech Publications (India) Pvt. Ltd. Chapters 2, 3, 4, 5, 6, 7, 8, 9.1 & 9.2

REFERENCE BOOKS:

1. Harary, Graph Theory, Narosa Publishing House, 2001.
2. S. Kumaravelu and Susheela Kumaravelu,Graph Theory , First Edition, 1999.
3. Chartrand & Pinzang , Introduction to graph Theory, Tata Mcgraw-Hill Publishing Company Limited , Edition 2006.
4. John Clark, A first look at Graph Theory, Affliated to East West Press, Pvt Ltd 1995

III B.Sc. MATHEMATICS

V SEMESTER

M5ME2/G5ME2 – FUZZY MATHEMATICS

(For those who join in 2014 onwards)

HRS/WEEK: 5 **CREDITS: 5**

Objective: The objective of this course is to introduce to the students the concepts of Fuzzy Sets, Fuzzy Logic, Fuzzy Operations and Fuzzy Relations.

UNIT I: FUZZY SETS AND FUZZY LOGIC **[10 HRS]**

Introduction - Crisp Sets - The Notion of Fuzzy Sets - Basic concepts of Fuzzy Sets - Classical Logic - Fuzzy Logic.

UNIT II: OPERATIONS ON FUZZY SETS **[15 HRS]**

Fuzzy Complement - Fuzzy Union - Fuzzy Intersection.

UNIT III: COMBINATIONS OF FUZZY OPERATIONS **[10 HRS]**

Combinations of Operations - General Aggregation Operations.

UNIT IV: FUZZY RELATIONS –I **[10 HRS]**

Crisp and Fuzzy Relations - Binary Relations - Binary Relations on a Single set - Equivalence and Similarity Relations.

UNIT V: FUZZY RELATIONS –II **[10 HRS]**

Compatibility or Tolerance Relations – Orderings – Morphisms – Fuzzy Relation Equations.

TEXT BOOK:

George J. Klir and Tina A. Folger – Fuzzy sets, Uncertainty and Information, Prentice Hall of India, 2005.

Unit I: Chapter: 1, **Unit II:** Chapter: 2(2.1 to 2.4)

Unit III: Chapter: 2(2.5, 2.6), **Unit IV:** Chapter: 3(3.1 to 3.4)

Unit V: Chapter: 3(3.5 to 3.8)

REFERENCE BOOK:

George J. Klir and Boyuan – Fuzzy Sets and Fuzzy Logic, Theory and Applications, Prentice Hall of India, 2002.

III B.Sc. MATHEMATICS

V SEMESTER

SKILL BASED - MATHEMATICS SKILL DEVELOPMENT

M5SB3/G5SB3 - FOURIER TRANSFORMS

(For those who join in 2014 onwards)

HRS/WEEK: 2 **CREDITS: 2**

Objective: Enable the students to apply Fourier transforms which plays an important role in the study of continuous time signals.

UNIT I: FOURIER TRANSFORMS **[6 HRS]**

Introduction - Fourier transforms - Fourier cosine transform - Fourier sine transform

UNIT II: ALTERNATIVE FORM OF FOURIER TRANSFORMS **[6 HRS]**

Alternative form of Fourier complex integral formula - Relationship between Fourier transform and Laplace transform.

UNIT III: PROPERTIES OF FOURIER TRANSFORM **[6 HRS]**

Linear property - Shifting property - Modulation theorem - Conjugate symmetry property -

UNIT IV: DERIVATIVES OF THE FOURIER TRANSFORM **[6 HRS]**

Transform of derivatives – Derivatives of the transform-Convolution theorem - Parsevel's identity (without proof).

UNIT V: FINITE FOURIER TRANSFORMS **[6 HRS]**

Finite Fourier transforms - Inversion formulas - Finite Fourier transforms of derivatives

TEXT BOOK:

T. Veerarajan - Engineering Mathematics III Edition - Tata Mcgrew- Hill publishing Company Limited, New Delhi.

REFERENCE BOOK:

Goyal & Gupta - Integral Transforms - Pragati Prakashan, Meerut, 1987.

III B.Sc. MATHEMATICS

V SEMESTER

SKILL BASED - MATHEMATICS SKILL DEVELOPMENT

M5SB4/G5SB4 - ADVANCED LINEAR PROGRAMMING

(For those who join in 2014 onwards)

HRS/WEEK: 2 **CREDITS: 2**

Objective: To enable the students to convert real problems into a Mathematical model and solve them using different techniques. That is through method of duality, Gomory's method, Branch and Bound Technique, Dynamic programming method.

UNIT I: DUALITY IN LINEAR PROGRAMMING **[6 HRS]**

Introduction – General Primal-Dual pair-Formulating a Dual Problem, Primal-Dual pair in matrix form, Duality theorems – Complementary Slackness theorems- Duality and Simplex method- Economic Interpretation of duality – Dual Simplex method .

UNIT II: INTEGER PROGRAMMING – GOMORY'S METHOD **[6 HRS]**

Introduction-Pure and Mixed Integer Programming Problem-Gomory's All-IPP Method Construction of Gomory's constraints-Fractional Cut Method - (All Integer & Mixed Integer LPP)

UNIT III: INTEGER PROGRAMMING – BRANCH & BOUND METHOD **[6 HRS]**

Branch and Bound Method-Applications of Integer Programming

UNIT IV: DYNAMIC PROGRAMMING -I **[6 HRS]**

Introduction – The Recursive Equation Approach – Characteristics of Dynamic Programming

UNIT V: DYNAMIC PROGRAMMING -II **[6 HRS]**

Solution of LPP by Dynamic Programming **(Only problems)**

TEXT BOOK:

Kanti Swarup , P K Gupta , Man Mohan - Operations Research – Sultan Chand and sons – Educational Publishers, New Delhi.14th Edition, 2008 . - Chapters **5, 7, 13 (13.1, 13.2, 13.3, 13.7)**

REFERENCE BOOKS :

1. Hamdy A. Taha – Operations Research- Prentice Hall of India Private Limited, New Delhi- 8th Edition – 2006.
2. R.K.Gupta - Operations Research- Theory and Applications- Macmillan India Limited- 3rd Edition – 2007.

III B.Sc. MATHEMATICS

VI SEMESTER

M6CC12/G6CC12 – COMPLEX ANALYSIS

(For those who join in 2014 onwards)

HRS/WEEK: 6 **CREDITS: 5**

Objective: To provide the student with an introduction to Complex Analysis of one variable since it has its application in almost every branch of Mathematics

UNIT I: COMPLEX NUMBERS & BILINEAR TRANSFORMATIONS [15 HRS]

Geometrical representation of complex numbers – n-th roots of complex number- Circles and straight line – Regions in the complex plane – The extended complex plane – Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of bilinear transformation – Some special bilinear transformations.

UNIT II: ANALYTIC FUNCTIONS [15 HRS]

Introduction - Functions of a complex variable – Limits – Theorems on limit – Continuous functions – Differentiability - The Cauchy – Riemann equations – Analytic functions – Harmonic functions – Conformal mapping.

UNIT III: COMPLEX INTEGRATION [20 HRS]

Definite integral – Cauchy's theorem – Cauchy's integral formula - Higher derivatives.

UNIT IV: SERIES EXPANSIONS [20 HRS]

Introduction - Taylor's series – Laurent's series – Zeros of an analytic function – singularities.

UNIT V: CALCULUS OF RESIDUES [20 HRS]

Introduction – Residues – Cauchy's residue theorem – Evaluation of definite integrals.

TEXT BOOK:

S.Arumugam, A.Thangapandi Isaac & A.Somasundaram - Complex Analysis - SciTech Publications (India) Pvt.Ltd-2009

Unit-I: Chapter 1-1.5 to 1.9 Chapter 3-3.1 to 3.5

Unit-II: Chapter 2-2.0 to 2.9 **Unit-III: Chapter 6-6.0 to 6.4**

Unit-IV: Chapter 7-7.0 to 7.4 **Unit-V: Chapter 8-8.0 to 8.3**

REFERENCE BOOKS:

1. T. K. Manicavachagam Pillay ,Dr. S. P.Rajagopalan and Dr .S. Sattanathan-S.Viswanathan (Printers & Publishers), Pvt.Ltd., 2007 - Complex Analysis
2. P. Duraipandian, Laxmi Duraipandian & D. Muhilan- Emerald Publishers, 1986-Complex Analysis
3. P.Duraipandian, Laxmi Duraipandian & D.Muhilan, - Emerald Publishers, 1986-Complex Analysis

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III B.Sc. MATHEMATICS

VI SEMESTER

M6CC13/G6CC13 – NUMERICAL METHODS

(For those who join in 2014 onwards)

HRS/WEEK: 5 **CREDITS: 4**

Objective: To give basic knowledge in Numerical methods and to solve problems purely mathematical in nature so that the students develop the confidence of solving research level problems.

UNIT I: ALGEBRAIC AND TRANSCENDENTAL EQUATIONS [10 HRS]

Introduction - Bisection method - Iteration method – Regula-falsi method – Newton-Raphson method. (No derivations).

UNIT II: SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS [15 HRS]

Introduction- – Gauss Elimination method – Gauss Jordan method – Calculation of inverse of a matrix – Gauss Jacobi Iteration method – Gauss-Seidel iteration method.(No derivations).

UNIT III: FINITE DIFFERENCES & INTERPOLATION [20 HRS]

Difference operators – Other difference operators- Relation between the operators -Newton's forward Interpolation formula- Newton's backward Interpolation formula – Gauss forward Interpolation formula - Gauss backward Interpolation formula –Stirling's formula - Lagrange's interpolation formula – Divided difference – Newton's Divided difference formula – Inverse interpolation. (No derivations).

UNIT IV: NUMERICAL DIFFERENTIATION AND INTEGRATION [15 HRS]

Derivatives using Newton's forward difference formula- Derivatives using Newton's backward difference formula- Derivatives using Central difference formula-Maxima and minima of the interpolating polynomial- Numerical Integration – Trapezoidal Rule – Simpson's one third rule. (No derivations).

UNIT V: NUMERICAL SOLUTION OF DIFFERENTIAL EQUATION [15 HRS]

Taylor series method – Picard's method – Euler's method – Modified Euler's method-Runge - Kutta methods –Second order Runge-Kutta method-Higher order Runge-Kutta method-Predictor-Corrector formulae-Milne's Predictor- Corrector formulae-Adam's Predictor-Corrector equations. (No derivations).

TEXT BOOK:

Dr. M.K. Venkataraman - Numerical Methods in Science and Engineering- The National publishing company – fifth edition.

Unit I- Chapter III -Sections 1 to 5.

Unit II- Chapter IV- Sections 1,2,3,6.

Unit III- Chapter V-Sections 1 to 12, 14 to 18. Chapter VI - Sections 1 to 5.

Chapter VII-Sections 1 to 5. Chapter VIII - Sections 1 to 5.

Unit IV - Chapter IX- Sections 1 to 8, 10.

Unit V - Chapter XI-Sections 6,9,10,12,13,14,16,19,20,21.

REFERENCE BOOKS:

1. S. Arumugam,S. Thangapandi Isaac & A. Soma Sundaram -Numerical Analysis , New Gamma Publishing House-2007.

2. S.S.Sastry - Introductory methods of Numerical analysis, Prentice Hall of India Private Limited 1991.

III B.Sc. MATHEMATICS

VI SEMESTER

M6CC14/G6CC14 – OPERATIONS RESEARCH

(For those who join in 2014 onwards)

HRS/WEEK: 5 **CREDITS: 4**

Objective: This course deals with sequencing problem, Game theory, Inventory Control, Queuing theory and Network scheduling by PERT/CPM and it emphasis the students to convert real problem into a mathematical model and solve them using these techniques.

UNIT I: SEQUENCING PROBLEM **[10 HRS]**

Introduction – problem of sequencing – Basic terms used in sequencing - Processing n jobs through two machines – Processing n jobs through k machines - Processing 2 jobs through k machines.

UNIT II: GAMES AND STRATEGIES **[15 HRS]**

Introduction – Two person zero sum games – Some basic terms - The maximin-minimax principle – Games without saddle points – mixed strategies – Graphical solution of 2 x n and m x 2 games – Dominance property – Arithmetic method for n x n game – General solution of m x n rectangular games.

UNIT III: INVENTORY CONTROL **[15 HRS]**

Introduction – The Inventory decisions – Cost associated with inventories – Factors affecting inventory control - Economic Order Quantity(EOQ) – Deterministic inventory problems with no shortages - Deterministic inventory problems with shortages – Probabilistic inventory problems. **(Only Problems, No derivation)**.

UNIT IV: QUEUING THEORY **[20 HRS]**

Introduction- Queuing system – Elements of Queuing system – Operating characteristics of queuing system – Probability distributions in queuing systems – Classification of queuing models – Definition of transient and steady states – Poisson queuing systems –Model I (M/M/1): (∞ / FIFO) – Model II (M/M/I): (∞/SIRO) - Model III (M/M/1): (N/FIFO).

UNIT V: NETWORK SCHEDULING BY PERT/CPM **[15 HRS]**

Introduction – Network and basic components – Logical sequencing – Rules of network construction – Critical path analysis – probability considerations in PERT

TEXT BOOK:

Kanti Swarup, P.K Gupta and Man Mohan - Operations Research - 2006 edition.

Unit I - Chapter 12: Sections 12.1 to 12.6

Unit II - Chapter 17: Sections 17.1 to 17.9

Unit III - Chapter 19: Sections 19.1 to 19.7, 19:12.1, 19:12.2

Unit IV - Chapter 20: Sections 20.1 to 20.8 (Upto model III)

Unit V - Chapter 21: Sections 21.1 to 21.6

REFERENCE BOOKS:

1. Prem Kumar Gupta and D.S Hira - Problems in Operations Research, Sultan Chand & Co. Ltd- Revised edition 2009.
2. P.K Gupta and Man Mohan - Problems in Operations Research, Sultan Chand & Sons - 2007

III B.Sc. MATHEMATICS

VI SEMESTER

M6ME3/G6ME3 – OBJECT ORIENTED PROGRAMMING WITH C++

(For those who join in 2014 onwards)

HRS/WEEK: 3 **CREDITS: 3**

Objective: In the expanding field of computer education, one of the fastest growing, versatile and much sought after languages is C++. This course enables the students to understand the fundamentals of the language, the concepts related to the syntax of the language.

UNIT I: BEGINNING WITH C++, TOKENS, EXPRESSIONS AND CONTROL STRUCTURES, FUNCTIONS IN C++ **[7 HRS]**

What is C++ - Applications of C++ - A simple C++ program – More C++ statements – Structure of C++ program – Tokens – Keywords – Identifiers – Variables – Operators – Manipulators – Expressions – Control structures. Introduction – The main function – Function prototyping – Call by reference – Return by reference – Return by reference – Inline function – Default arguments – Const arguments – Function overloading – Friend and virtual functions – Math library functions.

UNIT II: CLASSES AND OBJECTS **[10 HRS]**

Introduction – C structures revisited – Specifying a class – Defining member functions – A c++ program with class – Making an outside function inline – Nesting of member functions – Private member functions – Arrays within a class – Memory allocation for objects – Static data members – Static member functions – Arrays of objects – Objects as function arguments – Friendly functions – Returning objects – Const member functions – Pointers to members – Local classes.

UNIT III: CONSTRUCTORS AND DESTRUCTORS AND OPERATOR OVERLOADING **[10 HRS]**

Constructors and destructors Introduction – Defining operator overloading – Overloading unary operators - Overloading binary operators - Overloading binary operators using friends – Manipulation of strings using operators – Rules for overloading operators – Type conversions

UNIT IV: INHERITANCE **[10 HRS]**

Introduction – Defining derived classes – Single inheritance – Making a private member inheritable – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid

inheritance – Virtual base classes – Abstract classes – Constructors in derived classes – Member classes: Nesting of classes.

UNIT V: POINTERS, VIRTUAL FUNCTIONS AND POLYMORPHISM [8 HRS]

Introduction – Pointers – Pointers to objects –this pointer – Pointers to derived classes – Virtual functions – Pure virtual functions.

TEXT BOOK:

E. Balagurusamy - Object Oriented Programming with C++, Tata McGraw-Hill Publishing Company Limited – Fourth Edition - 2007.

Unit-I: Chapter 2- 2.1 to 2.4, 2.6, Chapter 3- 3.2 to 3.24 Chapter 4- 4.1 to 4.11

Unit-II: Chapter 5- 5.1 to 5.19,

Unit-III: Chapter 6-6.1 to 6.11 Chapter 7- 7.1 to 7.8,

Unit-IV Chapter 8-8.1 to 8.12

Unit-V: Chapter 9- 9.1 to 9.7

REFERENCE BOOKS:

1. Robert Lafore – Object-Oriented Programming in Microsoft C++ - Galgotia publication – Third Edition – 2004.
2. Stephen Prata - C++ primer plus - Galgotia publication pvt. Ltd. – 1997.

III B.Sc. MATHEMATICS

VI SEMESTER

M6MEP1/G6MEP1 – C++ PRACTICALS

(For those who join in 2014 onwards)

HRS/WEEK: 2 **CREDITS: 2**

List of Programs

1. Implement a person class, each object of their class will represent human being, include the person's name, DOB. Year of death, include member function for getting and printing information.
2. Create a Class called distance with feet and inches as member data. Include member function to get and print the same**.**
3. Implement a 'point' class for 3-dimensional points x, y, z - include a default construction, a copy construction, a "Negative ( )" function to transform the point into its negative. A "norm ( )" function to return the points distance from the origin (0, 0, 0) and a "print ( )" function.
4. Implement the 'student' class. The object consists of the data members, student's identification number, major code, marks in 3 subjects. Include a member function 'process' to print the 'class' of each student based on the total marks in three subjects.
5. Sorting employee record using array of objects.
6. Evaluating sine series using Inline functions.
7. Simple interest and compound interest using default argument.
8. a). Implement the vector operations using operator overloading.
   b). Implement the matrix operations using operator overloading.
9. Using function overloading, find the areas of squares, rectangle, triangle and circle.
10. The base class 'person' consists of the data members name and address. The two classes 'student' and 'staff' are derived from the 'person'. The 'student' class consists of the department, subjects handled by the staff. Using the inheritance concepts display all the information of the student and staff.

III B.Sc. MATHEMATICS

VI SEMESTER

M6ME4/G6ME4 – ASTRONOMY

(For those who join in 2014 onwards)

HRS/WEEK: 5 **CREDITS: 5**

Objective: To introduce the concepts about the celestial bodies such as Earth, Moon and Planets and to import the knowledge on duration of day and night, lunar and solar eclipses, maximum number of eclipses.

UNIT I: SPHERICAL TRIGONOMETRY **[15 HRS]**

Spherical trigonometry – formulae only – celestial sphere – diurnal motion – sidereal day – different systems of coordinates – equinoxes, solstices, apparent annual motion of the sun – ecliptic – latitude of a place – hour angle of a star at rising – circumpolar star.

UNIT II: EARTH **[15 HRS]**

Earth – dip – definition and effects – twilight – duration

UNIT III: REFRACTION **[15 HRS]**

Refraction – tangent and Cassini's formula – effects of refraction on right ascension, declination, small vertical and horizontal arcs and on dip

UNIT IV: MOON **[15 HRS]**

Moon – Introduction – phases of moon – sidereal and synodic month-lunar day and lunar time – the tides.

UNIT V: ECLIPSES **[15 HRS]**

Eclipses – solar and lunar – occurrences – conditions for the occurrences – ecliptic limits – maximum and minimum number of eclipses in a year.

TEXT BOOK:

Astronomy by S.Kumaravelu,and Susheela Kumaravelu, Reprinted, Sri Vishnu Arts, 2004.

Unit I : Chapter 2; **Unit II : Chapter 3;**

Unit III : Chapter 4; **Unit IV: Chapter 12;**

Unit V : Chapter 13

REFERENCE BOOK:

Introduction in Astronomy by Robert .H. Baker 6th Edition.

III B.Sc. MATHEMATICS

VI SEMESTER

M6ME5/G6ME5 – LATTICES AND BOOLEAN ALGEBRA

(For those who join in 2014 onwards)

HRS/WEEK: 5 **CREDITS: 5**

Objective: To enable the students to know more about lattices and Boolean Algebra and their usefulness in other areas of Mathematics.

UNIT I: POSETS AND LATTICES **[20 HRS]**

Diagrammatical representation of a poset – Isomorphisms – Duality – Product of two Posets – Semi Lattices – Complete Lattices – Sub Lattices.

UNIT II: IDEALS **[10 HRS]**

Dual Ideals – Principal Ideals – Principal Dual Ideals – Prime Ideals – Complements – Length and Covering Conditions.

UNIT III: MODULAR AND DISTRIBUTIVE LATTTICES **[20 HRS]**

Direct Products – Ideal lattice – Isomorphism Theorem – Distributive Lattices – Direct Product.

UNIT IV: BOOLEAN ALGEBRA **[15 HRS]**

Boolean Algebra – Boolean Rings – Boolean Functions – Conjunctive Normal Form – Disjunctive Normal Form.

UNIT V: SWITCHING CIRCUITS **[10 HRS]**

Switching Circuits – Representation of Circuits – Simplification of Circuits – Design of Circuits – Don't Care Conditions – Design of n-terminal Circuits – Non-Series-Parallel Circuits.

TEXT BOOK:

Vijay K. Khanna, Lattices and Boolean Algebras, Vicas Publishing house Pvt Ltd – Second Edition, 2008

Chapters: 2, 3(pages 38 – 57), 4, 5 (pages 96 – 99 and 107 – 125).

REFERENCE BOOKS:

1. Mendelson Elliott, Theory and problems of Boolean Algebra, Schaums Outline Series, New York McGraw Hill Publications, 1970
2. Whitesitt. J Eldon, Boolean Algebra and its Applications, Massachusetts: Adition Wesley, 1962

III B.Sc. MATHEMATICS

VI SEMESTER

M6ME6/G6ME6 – AUTOMATA THEORY

(For those who join in 2014 onwards)

HRS/WEEK: 5 **CREDITS: 5**

Objective: It provides techniques useful in a wide variety of applications and helps to develop a way of thinking that leads to understanding of the structure behavior and limitations and capabilities of logical machines.

UNIT I: FINITE AUTOMATA **[15 HRS]**

Deterministic Finite Accepters: Deterministic Accepters and Transition Graphs – Languages and DFA's – Regular Languages - Non Deterministic Finite Accepters: Definition of a Non Deterministic Accepter - Equivalence of Deterministic and Non Deterministic Finite Accepters – Reduction of the number of States in Finite Automata.

UNIT II: REGULAR LANGUAGES AND REGULAR GRAMMARS **[15 HRS]**

Regular Expressions: Formal Definition of a Regular Expression – Languages Associated with Regular Expressions – Connection between Regular Expression and Regular Languages: Regular Expression Denote Regular Languages – Regular Expression for Regular Languages - Regular Expression for Describing Simple Patterns - Regular Grammars: Right and Left Linear Grammars - Right Linear Grammars Generate Regular Languages - Right Linear Grammars for Regular Languages Equivalence of Regular Languages and Regular Grammars.

UNIT III: PROPERTIES OF REGULAR LANGUAGES **[15 HRS]**

Closure Properties of Regular Languages: Closure under Simple Set Operations – Closure under Other Operations - Elementary Questions about Regular Languages – Identifying Non regular Languages: Using the Pigeonhole Principle – A Pumping Lemma.

UNIT IV: CONTEXT FREE – LANGUAGES **[15 HRS]**

Context – Free Grammars: Examples of Context Free Languages – Leftmost and Rightmost Derivations – Derivation Tress – Parsing and Ambiguity: Parsing and Membership – Ambiguity in Grammars and Languages - Context – Free Grammars and Programming Languages.

UNIT V: PUSHDOWN AUTOMATA **[15 HRS]**

Nondeterministic Pushdown Automata: Definition of a Pushdown Automaton – The Language accepted by a Pushdown Automaton – Pushdown Automata and Context-free Languages:

Pushdown Automata for Context-free Languages - Context-free Grammar for Pushdown Automata – Deterministic Pushdown Automata and Deterministic Context-free Languages – Grammars for Deterministic Context-free Languages.

TEXT BOOK:

An Introduction to Formal Languages and Automata by Peter Linz, Fourth Edition, Narosa Publishing House

Chapters: 2, 3, 4, 5, 7

REFERENCE BOOKS:

1. An Introduction to Automata Theory and Formal Languages by Adesh K. Pandey

2. Theory of Automata, Formal Languages and Computation by S.P.Eugene Xavier

3. Introduction to Automata Theory, Languages and Computation by John E. Hopcroft, Rajeev Motwani, Jeffery D. Ullman

III B.Sc. MATHEMATICS

VI SEMESTER

M6ME7/G6ME7 – THEORY OF NUMBERS

(For those who join in 2016 onwards)

HRS/WEEK: 5 **CREDITS: 4**

Objective: The objective of this course to present the students an introduction to an area of Pure mathematics which has intrigued nonprofessionals as well as the greatest minds of human kind since the dawn of history. A brief history of the development of numbers and some of the influential number theorist will be presented. Some application will also be considered.

UNIT I: DIVISIBILITY THEORY [15 HRS]

Introduction – Division Algorithm - Greatest Common Divisor – Relatively Prime Integers – Algorithm to find GCD - Least Common Multiple - Least Common Multiple of „n‟ integers - Fibonacci sequence.

UNIT II: PRIME AND THEIR DISTRIBUTIONS [15 HRS]

Introduction – Prime Number - The Sieve of Eratosthenes - The Goldbach Conjecture - Positive Divisors of a Positive Integer.

UNIT III: CONGRUENCES [15 HRS]

Introduction - Congruences – Properties of Congruences – Least and Minimal Residue - Complete and Reduced Residue system – Special Divisibility Tests - Linear Congruence - Chinese Remainder Theorem – Congruence of Higher Degree.

UNIT IV: QUADRATIC RESIDUES [15 HRS]

Introduction – Quadratic Residues – Elementary Properties - Legendre Symbols - Quadratic Reciprocity Law – Jacobi Symbol – Quadratic Congruence with Prime and Composite Modulus.

UNIT V: FERMAT'S THEOREM AND ITS APPLICATIONS [15 HRS]

Introduction - Fermat‟s Factorization Method - Fermat‟s Little Theorem - Fermat‟s Last Theorem - Wilson‟s Theorem – Euler‟s Factorization Method – Mersenne‟s Factorization Method.

TEXT BOOK: PundirPundir, Theory of Numbers , A Pragati Edition, 2006.

Unit I	Chapter 2	**Unit II**	Chapter 4
Unit III	Chapter 5	**Unit IV**	Chapter 6
Unit V	Chapter 9		

REFERENCE BOOK:

David M. Burton, Elementary Number Theory, 6th Ed., Tata McGraw-Hill, Indianreprint, 2007.

III B.Sc. MATHEMATICS

VI SEMESTER

SKILL BASED - MATHEMATICS SKILL DEVELOPMENT

M6SB5 / G6SB5 - MATLAB

(For those who join in 2014 onwards)

HRS/WEEK: 2 **CREDITS: 2**

Objective: To learn the MATLAB tools and its applications in various areas of Mathematics.

LIST OF MATLAB PROGRAMS:

1. To evaluate the arithmetic operators namely addition, subtraction, multiplication,division, unary minus, unary plus, exponentiation.
2. To calculate the sum of a series.
3. To use various arithmetic operations on matrices such as addition, subtraction, multiplication, division, exponentiation.
4. To find some useful commands related to matrices such as determinant, rank, eigen vectors, orthogonal.
5. To compute characteristic polynomial of a matrix, polynomial differentiation, polynomial integration.
6. To compute polynomial addition, subtraction, multiplication, division and root of a polynomial.
7. To solve a set of linear algebraic equations.
8. To find the mean, median, standard deviation, cumulative sum, cumulative product of a given statistical data
9. To plot a bar graph , horizontal bar graph for a given data
10. To obtain the differentiation of a given expression and evaluating the definite integral.

TEXT BOOK:

1. Rajkumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, MATLAB and its applications in Engineering.

2. RudraPratap, Getting started with MATLAB – A quick introduction for scientistsand Engineers.

BOOK-1

Sections 2.5.1, 2.9, 3.9, 3.10.1, 4.4, 4.5, 4.6, 4.7, 4.9, 4.10, 4.11, 6.7.4, 6.7.5, 9.3.2.1, 9.3.2.3

BOOK -2

Sections 5.1.1, 5.3

III B.Sc. MATHEMATICS

VI SEMESTER

SKILL BASED - MATHEMATICS SKILL DEVELOPMENT

M6SB6 / G6SB6 – APPLIED DYNAMICS

(For those who join in 2014 onwards)

HRS/WEEK: 2 **CREDITS: 2**

OBJECTIVE: To enable the students to apply the laws and principles Governing Dynamics of the system in Physical reality.

UNIT I: IMPULSIVE FORCES **[6 HRS]**

Impulse-Impulsive forces-Impact of two bodies- -Loss of Kinetic Energy in impact - Motion of a Shot and Gun – Impact of water on a surface.

UNIT II: COLLISION OF ELASTIC BODIES **[6 HRS]**

Introduction-Definitions-Fundamental laws of impact-Impact of a Smooth Sphere on a Fixed Smooth Plane

UNIT III: COLLISION OF ELASTIC BODIES - DIRECT IMPACT **[6 HRS]**

Direct Impact of Two Smooth Spheres-Loss of kinetic energy due to direct impact of smooth spheres.

UNIT IV: PARALLEL AND PERPENDICULAR AXES **[6 HRS]**

Definition-The Theorem of Parallel Axes- The Theorem of Perpendicular Axes

UNIT V: MOMENT OF INERTIA **[6 HRS]**

Moment of Inertia in some particular cases- Dr. Routh's Rule –Equimomental systems.

TEXT BOOK:

Dr. M. K. Venkataraman - A Text book of Dynamics - Agasthiar Publications,Fourteenth Edition-2011

Unit – I : Chapter 7 **Unit – II** : Chapter 8 (8.1 – 8.4)

Unit – III : Chapter 8 (8.5 & 8.6) **Unit – IV** : Chapter 12 (12.1 – 12.3)

Unit – V : Chapter 12 (12.4 – 12.6)

REFERENCE BOOKS:

1. P. Duraipandian & Lakshmi Duraipandian-Mechanics –S. Chand &Company- Fourth Edition-Reprint-2003.

2. Kaushal Kumar Singh- A Text book of Dynamics-Asoke K.Ghosh ,PHI Learning Private Limited-2011.

HOD's Signature

Dr. E. Helena
Head & Assistant Professor
Department of Mathematics (SF)