

DEPARTMENT OF MATHEMATICS

PREAMBLE

UG : Course Profile, list of courses offered to the other departments & the syllabi of courses offered in the III and IV semesters (With effect from 2018-2021 batch onwards)

PG : Course Profile, list of courses offered to the other departments & the syllabi of courses offered in the III and IV semesters (With effect from 2018-2020 batch onwards)

COURSE PROFILE B.Sc. (Mathematics)

PSO 1 : Interpretation of effective use of mathematical skills to solve quantitative problems from a wide array of authentic contexts.

PSO 2 : Ability to apply rigorous mathematical arguments in axiomatic and non-axiomatic systems.

PSO 3 : Demonstration of effective written communication of mathematical concepts.

PSO 4 : Capacity to formulate and develop mathematical arguments in a logical manner

Semester	Part	Category	Course code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
I	I	Language	UTAL105/UTAL106/ UHIL101/UFRL101	Basic Tamil-I/Advanced Tamil-I/Hindi-I / French-I	4	2	3
	II	English	UENL107/ UENL108	General English-I/ Advanced English-I	5	3	4
	III	Core I	UMAM107	Fundamentals of Mathematics	2	1	1
	III	Core II	UMAM104	Differential calculus	5	4	4
	III	Core III	UMAM106	Analytical Solid Geometry	6	5	5
	III	Allied	UMAA111	Mathematical Statistics	6	5	5
	IV	Value Education			2	1	1
TOTAL					30	21	23
II	I	Language	UTAL205/UTAL206/ UHIL201/UFRL201	Basic Tamil II/ Advanced Tamil-II/Hindi-II /French-II	4	2	3
	II	English	UENL207/UENL208	General English II/ Advanced English II	5	3	4
	III	Core IV	UMAM204	Integral Calculus	5	5	5
	III	Core V	UMAM402 / UMAM205	Graph Theory	5	4	4
	III	Core VI	UMAM606/ UMAM206	Discrete Mathematics	5	4	4
	IV	Non Major Elective			4	2	2
	IV	Soft Skill			2	1	1
	V	Extension Programme/ Physical Education			-	1	2
TOTAL					30	22	25
III	I	Language	UTAL305/UTAL306/ UHIL301/UFRL301	Basic Tamil III/ Advanced Tamil-III/ Hindi-III /French-III	4	2	3
	II	English	UENL307/UENL308	Basic English III/	5	3	4

				Advanced English III			
	III	Core VII	UMAM306	Differential Equation	5	4	4
	III	Core VIII	UMAM307	Introduction to Probability Theory	5	5	5
	III	Allied	UCSA303	Mathematical Programming in C	3	3	3
	III	Allied Practical	UCSR305	Mathematical Programming in C Practical	3	2	2
	IV	Online Course		NPTEL/Spoken Tutorial	3	1	2
	IV	Value Education			2	1	1
TOTAL					30	21	24
IV	I	Language	UTAL405/UTAL406/ UHIL401/UFRL401	Basic Tamil IV/ Advanced Tamil-IV/ Hindi-IV/French-IV	4	2	3
	II	English	UENL407/UENL408	Basic English IV/ Advanced English IV	5	3	4
	III	Core IX	UMAM405	Applications of Transforms	4	3	3
	III	Core X	UMAM406	Mechanics	4	4	4
	III	Core XI	UMAM404	Mathematical modeling	4	4	4
	III	Core XII	UMAP408/ UMAR409	Project / R Programming	2	--	-
	III	Allied	UPHA402	Electronics for Mathematics	3	3	3
		Allied Practical	UPHR404	Electronics for Mathematics Practical	2	2	2
	IV	Soft Skill			2	1	1
V	Extension programme/ Physical Education			-	-	2	
TOTAL					30	22	26
V	III	Core XIII	UMAM501	Modern Algebra	6	6	5
	III	Core XIV	UMAM505	Real Analysis I	6	5	5
	III	Core XV	UMAM510	Number Theory	6	5	5
	III	Core XVI	UMAM510	Numerical Methods	3	3	3
		Core XVII	UMAR501	Numerical Methods Using R Programming	3	2	2
	III	Core XVIII	UMAP501/ UMAM511	Project/ R Programming	4	4	5
	IV	Value Education			2	1	1
TOTAL					30	25	26
VI	III	Core XIX	UMAM610	Linear Algebra	5	5	5
	III	Core XX	UMAM611	Real Analysis II	6	6	6
	III	Core XXI	UMAM602/ UMAM507	Complex Analysis	6	6	6
	III	Major Elective	UMAM613	Operations Research	6	6	6
			UMAM614	Mathematics in Space Science	5	4	4
	III	Major Elective	UMAO606	Mathematics for construction craft	5	4	4
	III	Comprehensive Viva	UMAC601				
	IV	Soft Skill					
	V	Extension programme/ Physical Education			-	-	2
TOTAL					30	29	31
GRAND TOTAL					180	140	156

COURSES OFFERED TO OTHER DEPARTMENTS-UG ALLIED

Class & Major	Semester	Category	Course Code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
I B Com & I BCom (CA)		Allied	UMAA112	Business Mathematics	5	4	4
I B.SC PHY			UMAA104	Mathematics for Physics-I	5	5	5
I BCA			UMAA110	Mathematical Methods I	5	4	4
I B.Sc (CS) & I B.Sc ISM			UMAA113	Statistical Methods	6	4	4
I B.Sc (CS)	II		UMAA218	Mathematics for computer Science	6	4	4
I B.A (C.E)			UMAA105/UMAA213	Statistics-I	5	4	4
II BCA			UMAA216	Mathematical Methods II	5	4	4
I B.SC PHY			UMAA212	Mathematics for Physics-II	5	5	5
II B.ScChem	III		UMAA304	Algebra, Differential Calculus and Trigonometry	5	5	5
II B.Sc BIO			UMAA305	Bio-Statistics	5	4	4
II B.A(CE)			UMAA205/UMAA303	Statistics-II	5	5	5
II BBA/ II B.COM/ II B.COM CA			UMAA211/UMAA403/UMAA107/ UMAA301	Business Statistics	5	4	4
II B.ScChem			IV	UMAA406	Integral Calculus, Laplace Transform And Ordinary Differential Equations	5	5
II BBA	UMAA505/ UMAA410			Quantitative techniques for Business	5	4	4

NON-MAJOR ELECTIVE

Semester	Part	Category	Course Code	Course Title	Contact Hrs/ week	Credit
II	IV	Non Major Elective	UMAE204	Basic Mathematics for Science	4	2
			UMAE202	Mathematics for Business and Decision Making	4	2
			UIDE302/ UMAE302/ UMAE206	Numerical Methods using C++	4	2
			UMAE402/UMAE306	Operations Research for Managers	4	2
			UMAA501/UMAE305 UMAE207	Statistical Data Analysis through SPSS	4	2
			UMAE309/ UMAE208	Applied Mathematics	4	4

EXTRA CREDIT EARNING PROVISION

Semester	Part	Category	Course code	Course Title	Contact Hrs/ week	Credit	
						Min	Max
II	III	Core	UMAI201	Summer Internship	-	-	1
IV	III	Core	UMAI401	Summer Internship	-	-	1
VI	III	Core	UMAP601 UMAS601 UMAS602 UMAS603	Project Fourier Transforms Simulation Number Theory	2	-	2

UMAM104 DIFFERENTIAL CALCULUS

Semester : I **Credit : 4**
Category : Core II **Hours/Week : 5**
Class & Major : I- B.Sc Mathematics **Total Hours : 65**

Objectives

To enable the students

- Understand functions, limits, derivative, continuous and inverse trigonometrically functions.
- Solve problems that deal with continuous change in quantities.
- Determine the limit existing, continuous, differentiable functions.

UNIT- I FUNCTIONS 10 Hrs

Functions – Shifting Graphs – Trigonometric functions

UNIT- II LIMITS AND CONTINUITY 12 Hrs

Rules for finding the limits - Definition of limits and its Extension – Continuity.

UNIT- III DERIVATIVES 14 Hrs

The Derivative of a function – Differentiation Rules – Rates of change – Derivatives of Trigonometric functions - The Chain Rule.

UNIT- IV APPLICATIONS OF DERIVATIVES 15 Hrs

Extreme values of Functions – Mean value theorem – The first Derivative test for Local Extreme Value – Graphing with y' and y'' – Limits as $x \rightarrow \pm\infty$, Asymptotes, and Dominant Terms.

UNIT-V TRANSCENDENTAL FUNCTIONS 14 Hrs

Inverse Trigonometric Functions – Derivatives of Inverse Trigonometric Functions; Integrals – Hyperbolic Functions – First order Differential Equations.

Text Book

- Thomas / Finney, "*Calculus and Analytic Geometry*", Addison –Wesley, 13th Edition, 2014.

Reference Book

- Tom.M.Apostol, "*Calculus Volume –I*" , Second Edition, 1966.

UMAM106 ANALYTICAL SOLID GEOMETRY

Semester	: I	Credit	: 5
Category	:Core III	Hours/Week:	6
Class &Major:	I B.SC Mathematics	Total Hours :	78

Objectives

To enable the Students

- Identify the fundamentals aspects of conics, Straight lines, Sphere and cone.
- Apply the geometrical problems of curves, straight lines, cone and sphere.

UNIT-I CONICS 16Hrs

Polar coordinates equation of a conic -directrix -chord tangent-normal-simple problems -only in deriving equation of a conic.

UNIT-II STRAIGHT LINES 16Hrs

Straight lines -co planarity of straight-line-shortest distance (S.D) and equation of Shortest distance between two lines-simple problems.

UNIT- III SPHERE 16Hrs

Standard equation of sphere-results based on the properties of a sphere-tangent plane to a sphere-equation of a circle.

UNIT- IV CONE AND CYLINDER 16Hrs

Cone whose vertex is at the origin-envelope cone of a sphere-right circular cone-equation of a cylinder-right circular cylinder.

UNIT- V CONICOIDES 16Hrs

Nature of a conicoide -standard equation of central conicoid–enveloping cone tangent plane-condition for tangency–director Sphere-director plane

Text Books

- Manickavachagam Pillai ,T.K. and Natarajan,T. "*Analytical geometry (part II)*", Viswanathan.S printers and publishers, 2010.

Reference Book

- Sharma S. Singhal.K, Gupta D.B,"*Text book of Analytical Geometry*", Krishna prakashamMandir, Meerat,1995.

UMAM107 FUNDAMENTALS OF MATHEMATICS

Semester	: I	Credit	: 1
Category	: Core I	Hours/Week	: 2
Class & Major	: I B.SC Mathematics	Total Hours	: 36

Objectives

To Enable the Students

- Acquire in depth knowledge in theory of equation, Algebra and Discrete Mathematics.
- Use Problem solving skill in theory of equation, Function and Discrete mathematics.
- Apply the principle of induction method for proving the theorems.

UNIT - I THEORY OF EQUATION **6 Hrs**
Polynomial equation - Irrational roots - Complex roots-Reciprocal equations

UNIT - II FUNCTIONS **4 Hrs**
Functions and Operators - one-one function - onto functions - Special type of functions
- Invertible functions - Composition of functions.

UNIT- III ALGEBRA **4 Hrs**
Binomial - Exponential and Logarithmic Series.

UNIT - IV DISCRETE MATHEMATICS **4 Hrs**
Propositional logic - Logical operators – Conjunction – Disjunction - Conditional and
Bi-conditional operators - logically equivalent – Tautology.

UNIT – V BASIC DIFFERENTIATION AND INTEGRATION **8 Hrs**
Differentiation: Definition- Standard forms (no proof) - sum, difference, product,
Quotient rule_ function of function rule-inverse functions-Hyperbolic functions-inverse
hyperbolic functions-Logarithmic function.

Integration: Basic integration formula-integration by parts- Trigonometric substitution

Text Books

- Dr.Venkatraman.M .K," *Discrete Mathematic*", National Publishing Company, Chennai, 2003.
- Narayanan and Manicavachagom Pillay.T.K, "*Algebra*", Viswanathan. K Printers & Publishers Pvt, Ltd., Chennai, 2004.

UMAA111 MATHEMATICAL STATISTICS

Semester : I
Category : Allied
Class & Major : I B.Sc Mathematics

Credit : 5
Hours/Week : 6
Total Hours : 78

Objectives

To enable the students

- Discuss some Statistical Characteristics, Discrete and Continuous Distributions and their properties.
- Classify sampling theory significance tests and testing of hypothesis.
- Discuss Correlation and Regression.

UNIT-I DISCRETE AND CONTINUOUS PROBABILITY DISTRIBUTION 15Hrs

Random variable – Probability distributions – Discrete and Continuous-Mathematical expectation- moments, moment generating function-characteristic function.

UNIT-II SPECIAL DISCRETE AND CONTINUOUS DISTRIBUTIONS 15Hrs

Introduction – Binomial, Poisson Distributions – Normal Distributions.

UNIT-III CORRELATION AND REGRESSION 12Hrs

Correlation co-efficient, linear regression – equations of lines of regression.

UNIT-IV TEST OF SIGNIFICANCE – LARGE SAMPLE 18Hrs

Introduction- Types of sampling – Large samples – Testing the significance for a single proportion - Testing of significance for difference of proportions – Sampling of values of a variable – Sampling distribution of the mean – confidence limits – Testing the significance of difference between standard deviations of two large sample.

UNIT-V TESTS OF SIGNIFICANCE - SMALL SAMPLES 18Hrs

Introduction – Chi- square distribution – Student's t - distribution – Snedecor's F distribution(Definitions only) – Properties(Statements only) – Test of Significance based on t , F - distributions, χ^2 test of goodness of fit, χ^2 test of independence.

Text Book

- "*Mathematical Statistics*", Kapur J. N. and H.C. Saxena, 20-th Edition, S. Chand & Co. Ltd., New Delhi, 2010.

Reference Books

- Gupta S.C. &V.K.Kapoor, "*Fundamentals of Mathematical Statistics*", 9-th Edition, Sultan Chand & Sons, New Delhi, 1994.
- Vittal P.R., "*Mathematical Statistics*", Margham Publications, Chennai, 2002.

UMAM204 INTEGRAL CALCULUS

Semester	: II	Credit	: 5
Category	: Core IV	Hours/Week:	5
Class & Major	: I- B.Sc Mathematics	Total Hours	:65

Objectives

To enable the students

- Acquire knowledge of Integration, techniques of Integration, Multiple and line integrals.
- Determine the Area, volume, length of a curve.

UNIT- I INTEGRATION 14Hrs

Indefinite Integrals – Differential Equations, Initial value problem, and Mathematical modeling- Integration by substitution – Running the Chain Rule Backward – Properties, Area, and the Mean value Theorem – The fundamental Theorem – Substitution in Definite Integrals.

UNIT- II APPLICATION OF INTEGRALS 13Hrs

Areas between curves- Finding Volumes by slicing -Volumes of solids of revolution- Cylindrical shells- Lengths of plane curves – Area of Surface of Revolutions.

UNIT- III TECHNIQUES OF INTEGRATIONS 13Hrs

Basic integrations formulas- Integration by Parts- Partial Fractions- Trigonometric Substitution.

UNIT- IV MULTIPLE INTEGRALS 12Hrs

Double Integrals – Areas, Moments and center of mass – Double integrals in polar forms- Triple integrals in rectangular co-ordinates- masses and moments in three dimensions – Triple integrals in cylindrical and spherical co-ordinates.

UNIT-V INTEGRATION IN VECTOR FIELD 13Hrs

Line Integrals – Vector fields, Work, Circulation and Flux – Path independence, Potential Functions and Conservative Fields – Green's Theorem in Plane – Surface area and Surface integrals.

Text Book

- Thomas/ Finney, *Calculus and Analytic Geometry*, Addison –Wesley, 13-th Edition, 2014.

UMAM402/UMAM205 GRAPH THEORY

Semester	: II	Credit	: 4
Category	: Core V	Hours/Week	: 5
Class & Major	: I B.Sc Mathematics	Total Hours	: 65

Objectives

To enable the students

- Understand the fundamentals of graph theory
- Relate the basic concepts of graph theory with the real life problems.
- Apply the concepts of colorings, matching in real life challenges like scheduling, map coloring etc.

UNIT-I GRAPHS & SUB GRAPHS 10Hrs

Graphs and simple graphs – Graph Isomorphism – The incidence and Adjacency Matrices – Sub graphs – Vertex Degrees – Simple exercise problems.

UNIT-II PATHS & CYCLES 10Hrs

Path and Connections – Cycles – Shortest path problem _ Simple exercise problems.

UNIT-III TREES 10Hrs

Trees – Cut edges and Bonds – Cut vertices – The connector problem.

UNIT-IV CONNECTIVITY 17Hrs

Connectivity – Blocks – Euler tours – Hamiltonian Cycles –The Chinese Postman Problem.

UNIT-V MATCHINGS & COLORINGS 18Hrs

Matchings – Matchings and Coverings in Bipartite Graphs – Edge Chromatic number – The Timetabling problem.

Text Book

- J.A. Bondy and U.S.R Murty “*Graph Theory with Applications*” The Macmillan Press Ltd, Associated company in Madras.

Reference Book

- Douglas B. West “*Introduction to Graph theory*” Second edition, Prentice Hall in India, 2000.

UMAM606/UMAM206 DISCRETE MATHEMATICS

Semester	: II	Credit	: 4
Category	: Core VI	Hours/Week	: 5
Class &Major	: I B.Sc. Mathematics	Total Hours	: 65

Objective

To enable the students

- Discuss the concept of automation and Boolean algebra.
- Apply Automata formal Languages in compiling and complexity theory.
- Apply Boolean algebra in Logic circuits

UNIT –I LOGIC 10Hrs

Logic- Introduction- TF Statements- Connectives- Atomic and Compound statements- well formed (statement) formulae-Truth table of a formula- Tautology-Tautological Implications and Equivalence of Formulae.

UNIT – II NORMAL FORMS 10Hrs

Normal forms – Disjunctive Normal forms- conjunctive Normal Forms- Principal Normal Forms – Principal Disjunctive Normal Forms- Principal Conjunctive Normal Forms.

UNIT – III LATTICES 12Hrs

Lattices- Some Properties of Lattices- New Lattices-Modular and Distributive Lattices.

UNIT – IV BOOLEAN ALGEBRA 15Hrs

Boolean algebra- Boolean Polynomials- Karnaugh Map- Switching Circuits.

UNIT – V AUTOMATA THEORY 18Hrs

Automata- Introduction- Finite Automation-Definition- Representation of finite Automation-Acceptability of a string by a Finite Automation- Languages accepted by a Finite automation- Non-Deterministic Finite automata- Acceptability of a String by Non-Deterministic Finite Automata- Equivalence of FA and NFA- Procedure for finding an FA equivalent to a given NFA.

Text Book

- Dr.Venkatraman.M.K, Sridharan.N, Chandrasekaran.N, “ *Discrete Mathematics*”, The National Publishing Company, Chennai. 2006

Reference Books

- Sundaresan.V, GanapathySubramanian.K.S & Ganesan.K“ *Discrete Mathematics*”, A.R.Publications, 1996.

UMAA112 BUSINESS MATHEMATICS

Semester	: II	Credit	: 4
Category	: Allied	Hours/Week:	5
Class & Major	: I B.Com/B.Com(CA)	Total Hours:	65

Objectives

To enable the students

- Define basic in mathematics which are applicable in business.
- Discuss the analytical skills .
- Express the computational skills.

UNIT-I OPTIMIZATION 10Hrs

Basic Calculus – Rules for Differentiation – Maxima and Minima and their Applications to Business.

UNIT-II COMMERCIAL ARITHMETICS 13Hrs

Commercial Arithmetic –Simple and Compound Interest –Annuities-Sinking Funds-Discount and Present Values of Perpetuity.

UNIT-III DETERMINISTIC BUSINESS MODELS 15Hrs

Simple Marketing Models-A Simple Advertising Budget Model-A Simple Inventory Model-determination of optimum warehouse territories.

UNIT-IV MATRICES 15Hrs

Matrix – Operations on Matrices– Inverse of a Square Matrix (not more than 3rd order).

UNIT-V INTEGRATION 12Hrs

Solving simultaneous equations using matrix method- Integration and their applications to business.

Text Book

- Sundaresan.V & Jeyaseelan.S.D, “*An Introduction to Business Mathematics*”, S.Chand and Co, Pvt.Ltd, New Delhi, 2003.

Reference Book

- Aggarwal B.M, “*Business Mathematics and Statistics Fundamentals*”, Sultan Chand and Sons Pvt.Ltd, New Delhi, 2003.

UMAA104 MATHEMATICS FOR PHYSICS-I

Semester	: II	Credit	: 5
Category	: Allied	Hours/Week:	5
Class & Major	: I B.Sc Physics	Total Hours	: 65

Objectives

To enable the students

- Discuss knowledge in Mathematics.
- Apply the techniques of various branches of mathematics.
- Practice the students to apply the techniques in their respective major subjects.

UNIT-I ALGEBRA 15Hrs

Binomial theorem for rational index-exponential and logarithmic series – summation and simple approximations related to binomial, exponential and logarithmic series.

UNIT-II MATRICES 13Hrs

Cayley Hamilton theorem – verification – finding inverse of a matrix using Cayley Hamilton theorem-Eigen values and Eigen vectors (simple problems only for matrices of order upto 3×3).

UNIT-III DIFFERENTIAL CALCULUS 10Hrs

Successive differentiation-Leibentiz theorem and its applications- Jacobian- Concept of polar coordinates radius of curvature in Cartesian coordinates.

UNIT-IV TRIGONOMETRIC SERIES 12Hrs

Complex numbers-Applications of De-Movire's theorem-Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, - Expansions of $\sin^n \theta$, $\cos^n \theta$ -Expansion of $\sin \theta$, $\cos \theta$, $\tan \theta$ in powers of θ .

UNIT-V HYPERBOLIC FUNCTIONS 15Hrs

Hyperbolic Functions-Inverse Hyperbolic Functions -relation between circular and hyperbolic functions-logarithm of complex numbers.

Text Books

- Narayanan and Manichavaschagam Pillay, *Algebra Volume I*, Viswanathan.S (Publishers & Printers) Pvt. Ltd., 1996.
- Narayanan and Manichavachagam Pillay, *Calculus*, Volume I Viswanathan.S (Publishers & Printers) Pvt. Ltd., 1994.
- Narayanan.S & Manicavachan Pillay.T.K, *Trigonometry*, Chennai. Vishwanathan.S Printers & Publishers pvt ltd., 9th edition, 1994.

UMAA110 MATHEMATICAL METHODS – I

Semester : II
Category : Allied
Class & Major : I BCA

Credit : 5
Hours/Week : 6
Total Hours : 78

Objectives

To enable the students

- Discuss the basic concepts of set theory and relations.
- Express themselves to the fundamentals of differentiation.
- Apply binary operators in automation.

UNIT-I SYMBOLIC LOGIC

16Hrs

Proposition- Logical operators- conjunction- disjunction- negation- conditional and bi-conditional operators- converse- Inverse- Contra Positive- logically equivalent- tautology and contradiction-Arguments and validity of arguments.

UNIT-II SET THEORY

10Hrs

Sets- set operations- venndiagram- Properties of sets- number of elements in a set Cartesian product.

UNIT-III RELATIONS

16Hrs

Equivalence relation- Equivalence clas- Partially and Totally Ordered sets- Functions- Types of Functions- Composition of Functions.

UNIT-IV BINARY OPERATORS AND AUTOMATA THEORY

16Hrs

Types of Binary Operations- Commutative- Associative- Distributive and Identity Boolean algebra- Simple Properties.Finite state machine.

UNIT-V DIFFERENTIATION

20Hrs

Derivation-Differential coefficient of a sum (or difference) – Product rule-Quotient rule Successive differentiation- partial differentiation- Applications of differentiation- Tangent and Norma- angle between two curves- Maximum and Minimum values[Second derivatives test].

Text Books

- Venkataraman.M.K,*Discrete Mathematics*, National Publishing Company.Chennai,2003.
- Narayanan.S & Manicavacham pillay.T.K ,*Differential Calculus*,Volume I, Viswanathan.S(Publishers and Printers)Pvt.Ltd,Chennai,2003.

Reference Books

- Balaji.G, *Discrete Mathematics*,G.Balaji Publishers,Chennai, 2006.
- Kandasamy.P,Thilagavathi.K,Gunavathi.K,*Engineering Mathematics-I*,S.Chand & Company Ltd.Chennai,2003.

UMAA113 STATISTICAL METHODS

Semester : II
Category : Allied
Class & Major : I BCA

Credit : 4
Hours/Week:5T+1P
Total Hours :78

Objectives

To enable the Students

- Get adequate knowledge in the distributions involving univariate and bivariate.
- Understand the Significance of Statistical techniques.
- Develop sound statistical techniques for handling, analyzing, and interpreting numerical data.

UNIT – I PRESENTATION OF DATA (12+2)Hrs

Diagrammatic and graphical representation of Statistical data-Significance of diagrams and graphs-types of diagrams-one dimensional diagrams, two dimensional diagrams-pictograms and cartograms. Graphs of frequency distribution-Histogram, frequency polygon, frequency curve-Ogive curves.

UNIT - II MEASURES OF CENTRAL TENDENCY (13+3)Hrs

Measures of central tendency-Requisites of a good average-types of averages-Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean and their merits and demerits-Graphical determination of Median, Quartiles, Deciles, Percentiles and Mode.

UNIT - III MEASURES OF DISPERSION (13+3)Hrs

Measures of Dispersion-Range, Quartile deviation, Mean deviation, Standard deviation, and their relative measures, Combined Standard deviation, Coefficient of Variation-Merits and demerits of these methods-Lorenz curve. Skewness-Measures of Skewness-Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness, Kelly's co-efficient of Skewness-moments-Measures of skewness based on moments and Measure of Kurtosis.

UNIT - IV CORRELATION (15+3)Hrs

Correlation Analysis-Significance or the study of correlation- types of correlation-Methods studying Correlation-Scatter diagram method, Graphical methods, Karl Pearson's co-efficient of correlation, Spearman's Rank correlation coefficient, Concurrent Deviation method-Properties of Coefficient of Correlation.

UNIT - V REGRESSION (12+2)Hrs

Regression Analysis-Uses of Regression analysis-Regression lines-Regression equations-Properties of regression coefficient.

Practical

- Presentation of data-Diagrams & Graphs

- Calculation of Measures of central tendency-Mean, Median, Mode, Geometric mean,
- Harmonic Mean
- Calculation of Measures of Dispersion-Range, Quartile deviation, Mean deviation,
- Standard deviation and its relative measures and Skewness
- Karl Pearson's correlation coefficient
- Regression equation of X on Y & Y on X

Text Book

- Gupta S.P., *Statistical Methods*, Sultan Chand and Sons, 2011.

Reference Books

- Gupta S.C. and Kapoor V.K., *Elements of Mathematical Statistics*, Sultan Chand and Sons, 2006.
- Snedecor G.W and Cochran W.G., *Statistical Methods*, Oxford Press and IBH, 1967.

UMAA 218 MATHEMATICS FOR COMPUTER SCIENCE

Semester	: II	Credit	: 4
Category	: Allied	Hours/Week	: 6
Class & Major:	I B.SC computer science / I B.SC ISM	Total Hours	: 78

Objectives

To enable the Students

- Acquire knowledge in Mathematics.
- Apply the techniques of various branches of mathematics.
- Discuss the students to apply the techniques in their respective major subjects.

UNIT-I ALGEBRA

15 Hrs

Binomial Series – Statement of binomial theorem for any index – A few important expansions – application of the binomial theorem to the summation of Series. Exponential series – summation of series using exponential series – the Logarithmic series.

UNIT-II DIFFERENTIAL CALCULUS

16 Hrs

Higher derivative – n^{th} derivative – Formation of equation involving derivative – Leibnitz formula for the n^{th} derivative of a product (statement only). Radius of curvature (Cartesian formula only) Jacobian

UNIT-III TRIGONOMETRY

15 Hrs

Expansion of $\cos n\theta$ and $\sin n\theta$ - Powers of sines and cosines of θ in terms of function of multiple of θ - Expansion of $\cos^n \theta$ when n is the positive integer – Expansion of $\sin^n \theta$ when positive integer. Logarithm of complex number .

UNIT-IV INTEGRATION

16 Hrs

Definite integral – properties of definite integrals – Integration by parts using Bernouli’s formula – double integral.

UNIT-V LAPLACE TRANSFORM

16 Hrs

Definition – Inverse Laplace transform – Solving second order differential equations using Laplace transform.

Text Books

- Narayanan.S, Hanumantha Rao.R, Manicavachagom Pillay “*Ancillary Mathematics Volume –I*”, S.Viswanathan (Printers & Publishers) Pvt .Ltd, Chennai, 2008.
- Narayanan.S, Hanumantha Rao.R, Manicavachagom Pillay, “*Ancillary Mathematics Volume –II*”, S.Viswanathan (Printers & Publishers) Pvt .Ltd, Chennai, 2008.

Reference Books

- Narayanan.S & Manickavachagom Pillay, T.K “*Algebra Volume I*”, Vishwanathan.S (Printers & Publishers) pvt ltd., Chennai, 1996.
- Narayanan.S & Manickavachagom Pillay, T.K “*Calculus Volume I*”, Vishwanathan.S (Printers & Publishers) pvt ltd., Chennai, 1994.
- Narayanan.S & Manickavachagom Pillay, T.K “*Trigonometry*”, Vishwanathan.S (Printers & Publishers) pvt ltd., Chennai, 9th Edition 1994.

UMAA105/UMAA213 STATISTICS -I

Semester : II

Credit : 4

Category : Allied

Hours/Week: 4T+1P

Class & Major : I B.A. Corporate Economics

Total Hours : 65

Objectives

To enable the Students

- Discuss various Statistical measures applicable in Business and Economic analysis.
- Apply Statistical tools to business problems.

UNIT-I NATURE SCOPE AND SIGNIFICANCE

10 Hrs

Nature and Scope of Statistics-Significance and Limitation of Statistics- Collection, Classification and tabulation of data.

UNIT-II PRESENTATION OF DATA

(10+5) Hrs

Diagrammatic and Graphic representation –Bar diagrams-Pie diagrams-Histogram-Cartograms- Frequency distribution- Frequency curve- Graphs- Ogives- Lorenz curve.

UNIT-III MEASURE OF CENTRAL TENDENCY (12+3) Hrs

Arithmetic mean- Median- Quartiles- Percentiles and Deciles- Mode- Geometric mean and Harmonic mean

UNIT-IV MEASURE OF DISPERSION (10+3)Hrs

Range- Quartile Deviation- Mean Deviation- Standard Deviation- Co-efficient of variation.

UNIT-V SKEWNESS AND KURTOSIS (10+2) Hrs

Karl Pearson,s and Bowley,s co-efficient of Skewness- moments

Practical

- Presentation of data- Diagrams and Graphs.
- Calculation of Measures of central tendency- Mean, Median, Mode, Geometric mean, Harmonic mean
- Calculation of measures of Dispersion – Range, Quartile deviation, Mean deviation, standard deviation and its relative measures and skewness.

Text Books

- Gupta S.P., *Statistical Methods*, Sultan Chand and Sons, 2011.

Reference Books

- Agarwal B.L.,*Basic Statistics*, Wiley Eastern, 2002.

UMAA216 MATHEMATICAL METHODS – II

Semester : II
Category : Allied
Class & Major : I BCA

Credit : 5
Hours/Week: 6
Total Hours :78

Objectives

To enable the students

- Understand the basic concepts of matrices.
- Explore themselves to the fundamentals of integration.
- Apply the technique of differentiation in vectors.

UNIT-I MATRICES 13 Hrs

Multiplication of matrices- Singular and Non-Singular matrices- Adjoint of a Matrix-Inverse of a Matrix Symmetric and Skew –Symmetric-Hermitian and Skew-Hermitian-Orthogonal and Unitary matrices-Rank of a matrix.

UNIT-II SOLVING LINEAR EQUATIONS 15 Hrs

Solution of Simultaneous Linear equations by Matrix Inversion Method- Test for Consistency and Inconsistency of Linear equations(Rank Method) Characteristic roots and Characteristic Vectors-Cayley – Hamilton Theorem.

UNIT-III INTEGRATION**15 Hrs**

Integration by Substitution- Integration of rational and irrational function of the form

$$\frac{1}{ax^2 + bx + c}, \frac{1}{\sqrt{ax^2 + bx + c}}, \sqrt{ax^2 + bx + c}, \frac{px + q}{ax^2 + bx + c}, \frac{px + q}{\sqrt{ax^2 + bx + c}}$$

UNIT-IV DEFINITE INTEGRAL**17 Hrs**

Definition and Properties of definite Integrals- Reduction formulae for

$$\int x^n e^{ax} dx, \int \sin^n x dx, \int \cos^n x dx, \int x^m (1-x)^n dx,$$

UNIT-V DIFFERENTIATION OF VECTORS**18Hrs**

Vector functions-derivatives of vectors-Gradient-Divergence and Curl, Properties of Curl, Properties of a Gradient functions-Directional Derivative-Solenoidal and Irrotational.

Text Book

- Manicavachagom pillay & Natarajan, Ganapathy, *Vector Analysis*, S.Viswanathan Printers and publishers Pvt.Ltd , 2003.

Reference Book

- Duraipandian.P, Dr.Udayabaskaran.S, *Allied Mathematics – Volume I*, Muhil Publishers, Chennai, 1997.

UMAA212 MATHEMATICS FOR PHYSICS-II**Semester : II****Credit : 5****Category : Allied****Hours/Week: 5****Class & Major : I B.Sc Physics****Total Hours: 65****Objectives****To enable the students**

- Discuss knowledge in Mathematics
- Apply the techniques of various branches of Mathematics.

UNIT-I INTEGRATION**12Hrs**

Standard Integrals-Properties of definite integrals.

UNIT-II INTEGRATION BY PARTS**15Hrs**

Integration by parts – Double integrals – Applications of double integrals to find areas.

UNIT-III SEQUENCE AND SERIES **15Hrs**

Sequence and series- functions of a complex variable- Analytic functions- Cauchy Riemanns Equations- Harmonic Functions- Construction of analytic functions.

UNIT-IV LAPLACE TRANSFORM **10Hrs**

Laplace transform of functions – Inverse Laplace transforms – Application of Laplace transforms in solving differential equations.

UNIT-V DIFFERENTIAL EQUATIONS **13Hrs**

Formation of Partial Differential Equation – Second order differential equations with constant co-efficients –Homogeneous linear differential equations of the second order with variable co-efficients.

Text Books

- Manicavachagom pillai, T.K, *Ancillary Mathematics Integral calculus*, Viswanathan.S Publishers & Printers Pvt.Ltd., Chennai, 2010.
- Narayanan.S & Manicavachagom Pillay.T.K, *Complex Analysis*, Vishwanathan.S Printers & Publishers, Pvt.Ltd., Chennai, 1994.

UMAEE204 BASIC MATHEMATICS FOR SCIENCE

Semester	: II	Credit	: 2
Category	: Non Major Elective	Hours/Week	: 4
Class & Major	: I UG	Total Hours	: 52

Objectives

To enable the students

- Understand the basic concepts of Matrices and Trigonometry.
- Explore themselves to the fundamentals of differentiation and integration.

UNIT-I MATRICES **10Hrs**

Multiplication of matrices-Singular and Non-Singular matrices-Adjoint of a matrices-Inverse of a matrices-Symmetric and skew Symmetric-Hermitian and Skew Hermitian-Orthogonal and unitary rank of a matrix.

UNIT-II SOLVING LINEAR EQUATIONS **10Hrs**

Solution of Simultaneous Linear Equations by Matrix Inversion Method-Test for consistency and Inconsistency of Linear equations(Rank Method).

UNIT-III DIFFERENTIATION **11Hrs**

Derivation-Differential coefficient of a sum (or difference)-Product rule-Quotient rule, Function of Function Rule.

UNIT-IV INTEGRATION **11Hrs**

Definition-Standard formulae.

UNIT-V INTEGRATION BY PARTS **10Hrs**

Integration by parts.Simple problems.

Text Books

- S.Narayanan Manicavachagom Pillay & Natarajan, Ganapathy,*Vector Analysis*, Vishwanathan.S Printers & Publishers Pvt,Ltd., Chennai, 1991.
- Kandhasami Thilagavathy, *Allied Mathematics Volume-II*,S.Chand & Co Pvt. Ltd.,New Delhi,2004.
- Dr.Venkatraman.M.K,Manorama Sridhar,*Allied Mathematics*,Agasthiar Publications Pvt.Ltd.,Trichy,2005.

UMAE202 MATHEMATICS FOR BUSINESS AND DECISION MAKING

Semester : II	Credit : 2
Category : Non Major Elective	Hours/Week : 4
Class & Major : I UG	Total Hours : 52

Objectives

To enable the students

- Discuss a scientific basis to the decision-makers for obtaining optimal solution.
- Introduce a few basic concepts of mathematics, their application in business.
- Analyze decision problem, with effective application to real life in optimization of objectives.

UNIT-I SET THEORY **10 Hrs**

Set and set operation – Venn diagrams- elements of co-ordinate systems – the slope intercept form of equation of the straight line.

UNIT-II MATRICES **10 Hrs**

Matrices; Fundamental ideas about matrices and their operational rules – Matrix multiplication – inverse of square matrices of not more than 3×3 order-basic of calculus-rules of differentiation-integration and their applications to business.

UNIT-III MATHEMATICS FOR FINANCE **10 Hrs**

Simple and Compound interest – Annuities – Sinking funds – Discounts and present Values.

UNIT-IV DECISION THEORY **10 Hrs**

Introduction – Decision making environment – the maximin or minimax criterion – the savage criterion – the Hurwitz criterion.

UNIT-V THEORY OF GAMES

12 Hrs

Pure Strategy (Saddle point) – Dominance property – Mixed Strategies (2×2 Games, 2×n Games or m×2 Games, 3×3 Games) – Two-Person Zero Sum Games.

Text Books

- Gupta, P.K, Hira, D.S, *Operations Research*, S.Chand & Company Ltd.
- T Kanthi Swarup, P.K.Gupta, Manmohan, *Operation Research*, S.Chand & Co, Pvt Ltd, New Delhi, 2006.
- Sundharesan and Jayaseelan, *An Introduction to Business Mathematics*, S.Chand and Co Pvt.Ltd, New Delhi, 2003.

UMAE302/UMAE206 NUMERICAL METHODS USING C++

Semester : II
Category : NME
Class & Major : II UG

Credit : 2
Hours/Week : 4
Total Hours : 52

Objectives

To enable the students

- Understand the various tools in solving numerical problems.
- Apply these methods in a computer environment.

UNIT-I INTRODUCTION TO C++

10 Hrs

Variables-input and output—If statement-Logical operators-Nested If and Switch statements – For statement – While statement – Arrays – Pointers – Library functions – user defined function.

UNIT-II SYSTEM OF LINEAR EQUATIONS

10 Hrs

Gauss – Elimination method – Pivoting – Gauss –Jordan Elimination method – Gauss – Seidal Iteration method

UNIT-III NON-LINEAR EQUATIONS AND INTERPOLATION

10 Hrs

Bisection - method – Newton's method – Interpolation – Newton's divided difference formula – Lagrange's interpolation – Newton's forward and backward difference formula. (Application of C++ Programming is included for Units III & IV)

UNIT-IV NUMERICAL DIFFERENTIATION

10 Hrs

Numerical Differentiation – Numerical Integration – Newton's cotes method – Trapezoidal rule – Simpson's rule.

UNIT-V NUMERICAL DIFFERENTIAL EQUATIONS

12Hrs

Initial value problem – Euler's method – Runge – Kutta method – Boundary value problem.

Text Books

- James M.Ortega Andrew S.Grimshaw., *An Introduction to c++ and Numerical Method*, Oxford University Press, New York, 1999.

- Jain M.K, Iyengar S R K and Jain R K., *Numerical Methods for Scientific and Engineering Computation*, Wiley Eastern Ltd. New Delhi, 1999.

Reference Books

- Balagurusamy E., *Object Oriented Programming with C++*, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1996
- Froberg C.E, “*Introduction to Numerical Analysis*”, Addison-Wesely Publishing Company, 1972.

UMAE 402/UMAE306 OPERATIONS RESEARCH FOR MANAGERS

Semester	: IV	Credit	: 2
Category	: NME	Hours/Week	: 4
Class & Major:	II UG	Total Hours	: 52

Objectives

To enable the students

- Understand the various techniques of research.
- Solve real life problems in Business and Management.
- Enlighten on applications in management techniques.

UNIT-I LINEAR PROGRAMMING PROBLEM 12Hrs

Mathematical Formulation of the Problem- Graphical Solution Method- General Linear Programming Problem- The Computational Procedure- Simple problems.

UNIT-II TRANSPORTATION PROBLEM 10Hrs

General Transportation Problem-The Transportation Table-Loops in Transportation Tables-Solution of a Transportation Problem-Finding an Initial Basic Feasible Solution- Test for Optimality-Degeneracy in Transportation Problem-Transportation Algorithm(MODI Method). Simple problems.

UNIT-III ASSIGNMENT PROBLEM 10Hrs

Mathematical Formulation of the problem- the Assignment method- Special Cases in Assignment Problem. Simple problems.

UNIT-IV GAME THEORY 10Hrs

Two-person Zero-sum Games- Some Basic Terms- The Maximin- Minimax Principle- Games Without Saddle Points-Mixed Strategies- Graphic Solution of $2 \times n$ and $m \times 2$ Games- Dominance Property. Simple problems.

UNIT-V NETWORK SCHEDULING BY PERT/CPM 10Hrs

Network and Basic Components- Logical Sequencing- Rules of Network Construction- Critical Path Analysis- Simple problems.

Text Book

- Kanti Swaroop, Gupta P.K. and Manmohan, “*Operation Research*”, Sultan Chand & Sons, Delhi, 2003.

Reference Books

- Kapoor .V.K, “*Introduction to Operation Research*” Sulthan Chand & Sons 1996.
- Sharma S.D, “*Operation Research*” Kedar Nath Ram Nath & Co 1995
- Taha.A Hamdy, “*Operation Research-An Introduction*”, Prentice hall of India pvt ltd, New Delhi, 6th edition, 2000.

UMAA501/UMAE 305/UMAE207 STATISTICAL DATA ANALYSIS THROUGH SPSS

Semester : III
Category : NME
Class & Major : II UG

Credit : 2
Hours/Week: 3T+1P
Total Hours : 52

Objectives

To enable the students

- Understand the techniques of statistical data analysis.
- Analyse data using various statistical techniques to evaluate research results through SPSS.

UNIT-I INTRODUCTION TO SPSS (8+2)Hrs

Essential terminology for all SPSS users – getting to SPSS for windows – the components of window – SPSS for windows screens – crucial preliminaries – entering data into SPSS – editing data – saving data file – retrieving data file.

UNIT-II ANALYSIS USING SPSS (7+2)Hrs

Merging data files – adding scores to existing cases – add variables – running a simple analysis and obtaining the output.

UNIT-III DIAGRAMS AND GRAPHS (7+3)Hrs

Checking the data – Box plots of score distributions – listing of the data using case summarizes – graphs – bar, line, pie chart, scatter plots and histograms.

UNIT-IV PARAMETRIC AND NON PARAMETRIC TEST (9+3)Hrs

Frequency distributions – measures of frequency distributions – cross tabulations – obtaining two sample chi-square tests – log linear analysis – parametric statistical tests – comparing means – paired and unpaired t-test.

UNIT-V CORRELATION AND REGRESSION ANALYSIS (8+3)Hrs

Correlation and multiple regression – analyzing nominal and ordinal data – nonparametric analysis – Wilcoxon, Mann-Whitney and Kruskal Wallis tests – the concept of test reliability – assessing test reliability.

Text Book

- Rajathi.A and Chandran.P, SPSS for you, MJP Publishers, 2010.

Reference Books

- Clifford E. Lunenburg., “*Data analysis by resampling: concepts and applications*” Dusbury Thomson learning, Australia, (2000).
- Everitt, B.S and Dunn.G “*Applied multivariate data analysis*”. Amold London, (2001).
- Jeremy J. Foster., “*Data analysis using SPSS for windows.*”, New edition version 8-10, Sage publications, London, (2001).

PRACTICALS

- Entering data, labels, values.
- Presentation of data – Diagrams & Graphs
- Measures of location
- Measures of Dispersion
- Karl Pearson’s correlation coefficient
- Spearman’s rank correlation
- Regression equation of X on Y
- Regression equation of Y on X
- Cross tabulation
- Test for single mean
- Test for difference between two sample means – Independent samples
- Test for difference between two sample means – dependent samples
- Test for difference between two sample variances.

Non-parametric Test

- Chi- square test of goodness of fit.
- Chi-square test for independence of attributes.

UMAE309/UMAE208 APPLIED MATHEMATICS

Semester : III
Category : NME
Class & Major : II UG

Credit : 2
Hours/Week: 4
Total Hours : 52

Objectives

To enable the Students

- Understand the properties of Matrix and Partial differential equations, and graphs.
- Apply the concept of linear algebra and graph theory for scientific computing
- Analyze numerical problems in science applications.

UNIT - I LINEAR ALGEBRA

10 Hrs

Linear system of equations – Gauss Elimination - Rank of matrix – inverse of a matrix
– Gauss Jordan Elimination- applications.

Chapter 7: Sec 7.2 -7.3,7.8

UNIT - II LINEAR ALGEBRA (CONTD.)**10 Hrs**

The matrix Eigen value problem – Eigen value and Eigen vectors- some applications of Eigen value problems.

Chapter 8: Sec 8.1 -8.2**UNIT- III NUMERICAL APPLICATIONS****10 Hrs**

Solution of equations by iterations – Newton Rapson Method- Interpolation – Lagrange’s interpolation – Spline interpolation

Chapter 19: Sec 19.2 -19.4**UNIT – IV MEASURE THE RATE OF RETURN OF AN INVESTMENT****10 Hrs**

Basic Concepts of PDE –Modeling – Wave equation –Heat equation -Applications

Chapter 12: Sec 12.1 -12.2, 12.5**UNIT – V APPLICATIONS OF GRAPHS****12 Hrs**

Graphs and Digraphs- Computer representation of graphs – shortest paths problems- Spanning tree-Applications

Chapter 23: Sec 23.1, 23.2, 23.4**Text Books**

- Erwin Kreyszig, “*Advanced Engineering Mathematics*”, Wiley publications, Tenth edition, 2016.

Reference Books

- Grewal.B.S, “*Higher Engineering Mathematics*” Khanna Publications,43rd edition, 2015.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core III	UMAM106	Analytical Geometry	Assignment	Assignment
	Core I	UMAM107	Fundamentals of Mathematics	Assignment	Assignment
	Core II	UMAM104	Differential Calculus	Assignment	Assignment
	Allied	UMAA111	Mathematical statistics	Assignment	Assignment
II	Core IV	UMAM204	Integral calculus	Assignment	Assignment
	Core V	UMAM402/ UMAM205	Graph theory	Assignment	Assignment
	Core VI	UMAM606/ UMAM206	Discrete Mathematics	Assignment	Assignment

III and IV EVALUATION COMPONENTS OF CIA-ALLIED

Semester	Category	Course code	Course Title	Component III	Component IV
	ALLIED	UMAA112	Business Mathematics	Assignment	Assignment

I		UMAA104	Mathematics for Physics-I	Assignment	Assignment
		UMAA110	Mathematical Methods I	Assignment	Assignment
		UMAA113	Statistical Methods	Assignment	Assignment
II		UMAA218	Mathematics for computer Science	Assignment	Assignment
		UMAA105/ UMAA213	Statistics-I	Assignment	Assignment
		UMAA216	Mathematical Methods II	Assignment	Assignment
		UMAA212	Mathematics for Physics-II	Assignment	Assignment

III and IV EVALUATION COMPONENTS OF CIA-NME

Semester	Category	Course code	Course Title	Component III	Component IV
II	Non Major Elective	UMAE204	Basic Mathematics for Science	Assignment	Assignment
		UMAE202	Mathematics for Business and Decision Making	Assignment	Assignment
		UIDE302/ UMAE302/ UMAE206	Numerical Methods using C++	Assignment	Assignment
		UMAA501/UMAE305 UMAE207	Statistical Data Analysis through SPSS	Assignment	Assignment
		UMAE309/ UMAE208	Applied Mathematics	Assignment	Assignment

COURSE PROFILE M.Sc. (Mathematics)

PSO 1: Understanding of advanced concepts, principles and techniques from Pure & Applied topics in mathematics and application of problem-solving skills.

PSO 2: Development of abstract mathematical thinking and mathematical intuition.

PSO 3: Assimilation and communication of detailed technical arguments

PSO 4: Proficiently to construct and formulate logical arguments, conjectures and construction of rigorous proof by abstracting principles.

PSO 5: Ability to carry out extended investigation of mathematical work as various projects independently.

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Mini	Max
I	Core I	PMAM107	Abstract Algebra	6	4	4
	Core II	PMAM102	Real Analysis	6	4	4
	Core III	PMAM103	Ordinary Differential Equations	6	4	4
	Core IV	PMAM105	Calculus Of Variations And Integral Equations	6	4	4
	Core V	PMAM106/ PMAM407	Fuzzy Analysis	6	4	4
TOTAL				30	20	20
II	Core VI	PMAM209	Linear Algebra	5	4	4
	Core VII	PMAM202	Measure and Integration	5	4	4
	Core VIII	PMAM206	Partial Differential Equations	5	4	4
	Core IX	PMAM204	Classical Mechanics	5	4	4
	Core X	PMAM208	Operations Research	5	4	4
	Non Major Elective			5	4	4
	Service Learning	PMAX201/ PMAX202	Mathematics for High School Students \Elementary Mathematics for Higher Secondary Students	-	1	1
TOTAL				30	25	25
III	Core XI	PMAM305	Complex Analysis	6	4	4
	Core XII	PMAM310	Fluid Dynamics	6	4	4
	Core XIII	PMAM311	Topology	6	4	4
	Core XIV	PMAM309	Stochastic process	5	4	4
	Core XV	PMAM312	Data Analytics using SAS	5	4	4
	Core XX	PMAM401	Project	2	-	-
TOTAL				30	20	20
IV	Core XVI	PMAM405	Functional Analysis	6	5	5
	Core XVII	PMAM406	Mathematical Statistics	6	5	5
	Core XVIII	PMAM407	Numerical Analysis using MaT Lab	7	5	5
	Core XIX	PMAM403	Differential Geometry	6	5	5
	Core XX	PMAM401	Project	4	5	5
Library				1	-	-
TOTAL				30	25	25
GRAND TOTAL				120	90	90

COURSES OFFERED TO OTHER DEPARTMENTS – PG

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Min	Max
II	Core III	PCAM103/ PCAM207	Mathematical Foundations	4	3	3
		PCSM108/ PCSM208	Theoretical foundations for computers	6	4	4
		PCAM509	Operations Research	4	4	4
	Non Major Elective	PMAE101/ PMAE209	LaTeX and MAT Lab			
	Practical					
	Non Major Elective	PMAE102/ PMAE208	Operations Research	5	4	4
	Core VI	PCAM206	Applied statistics	5	4	4
	PMAE203	Discrete mathematics	5	4	4	

EXTRA CREDIT EARNING PROVISION

Semester	Category	Course code	Course Title	Hrs/ week	Credit	
					Min	Max
III	Self study paper	PMAS301/ PMAS302	Difference Equation Combinatorial Analysis	2	-	1

PMAM107 ABSTRACT ALGEBRA

Semester	: I	Credit	: 4
Category	: Core I	Hours/Week	: 6
Class & Major	: I M.SC Mathematics	Total Hours	: 78

Objectives

To enable the students

- Analyze the basis in algebraic structures.
- Create computational skill in abstract algebra.
- Determine working knowledge on Galois theory.

UNIT-I SYLOW'S THEOREM AND FINITE ABELIAN GROUPS 16 Hrs

Another Counting principle- class equation for finite groups and its applications-
Sylow's theorem- Direct products- Solvability by radicals.

UNIT-II LINEAR TRANSFORMATIONS 15 Hrs

Linear Transformations: Canonical forms – Triangular form- Nilpotent transformations- Jordan form.

UNIT-III TRACE AND TRANSPOSE **15 Hrs**
Trace and transpose – Hermitian, Unitary, normal transformations, and real quadratic form.

UNIT-IV EXTENSION FIELD **20 Hrs**
Extension fields – Transcendence of e-Roots of Polynomials – More about roots.

UNIT-V GALOIS THEORY **12 Hrs**
Elements of Galois Theory - Finite fields – Wedderburn’s Theorem on finite division rings.

Text Book

- Herstein.N. "*Topics in Algebra* ",Wiley Eastern Limited, New Delhi, 2000.

Reference Books

- Bhattacharya P.B., Jain S.K., & Nagpaul S.R., "*Basic Abstract Algebra* " Cambridge University press, New York, 1997.
- Jacobson.N & W.H. Freeman, "*Basic Algebra, Vol. I&II* ", Hindustan publishing Company, New Delhi, 1980.
- Malik D.S., Mordeson J.N. & Sen M.K., "*Fundamental of Abstract Algebra*", Mc Graw Hill, New York, 1997.
- Artin.M, "*Algebra*", Prentice Hall of India, New Delhi, 1991.

PMAM105 CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

Semester	: II	Credit	: 4
Category	: Core VII	H ours/Week:	6
Class & Major:	II M.SC Mathematics	Total Hours :	78

Objectives

To enable the Students

- Analyze the problem solving skill.
- Determine Variational problems and integral equation

UNIT-I ARIATIONAL PROBLEMS **16 Hrs**

Variational problems with fixed boundaries: The concept of variation and its properties – Euler’s equation- Variational problems for Functionals – Functionals dependent on higher order derivatives – Functions of several independent variables – Some applications to problems of Mechanics. **Text Book: 1**(Chapter 1: Sections 1.1 to 1.7)

UNIT-II MOVABLE BOUNDARY **12Hrs**

Variational problems with moving boundaries: Movable boundary for a functional dependent on two functions – one-side variations. **Text Book: 1** (Chapter 2: Sections 2.1 to 2.3)

UNIT- III INTEGRAL EQUATION

17Hrs

Integral Equation: Introduction – Types of Kernels – Eigen Values and Eigen functions – Connection with differential equation – Solution of an integral equation – Initial value problems – Boundary value problems. **Text Book: 2** (Chapter 1: Section 1.1 to 1.3 and 1.5 to 1.8) 25

UNIT-IV SOLUTION OF FREDHOLM INTEGRAL EQUATION

17Hrs

Solution of Fredholm integral equation: Second kind with separable kernel – Orthogonality and reality eigen function – Fredholm Integral equation with separable kernel – Solution of Fredholm integral equation by successive substitution – Successive approximation – Volterra Integral equation – Solution by successive substitution.

Text Book: 2 (Chapter 2: Sections 2.1 to 2.3 and Chapter 4 Sections 4.1 to 4.5)

UNIT-V HILBERT – SCHMIDT THEORY

16 Hrs

Hilbert – Schmidt Theory: Complex Hilbert space – Orthogonal system of functions- Gram Schmitorthogonolization process – Hilbert – Schmit theorems – Solutions of Fredholm integral equation of first kind. **Text Book: 2** (Chapter 3: Section 3.1 to 3.4 and 3.8 to 3.9)

Text Books

- Gupta A.S, "*Calculus of Variations with Application*", Prentice Hall of India, New Delhi, 2005.
- Sudir K.Pundir and Rimple Pundir, "*Integral Equations and Boundary Value Problems*", Pragati Prakasam, Meerut, 2005.

References Books

- Hildebrand F.B, "*Methods of Applied Mathematics*", Prentice – Hall of India Pvt. New Delhi, 1968.
- Kanwal R.P, "*Linear Integral Equations, Theory and Techniques*", Academic Press, New York, 1971.
- Elsgolts L, "*Differential Equations and Calculus of Variations*", Mir Publishers, Moscow, 1973.

PMAM102 REAL ANALYSIS

Semester : I

Category : Core II

Class & Major: I M.SC Mathematics

Credit : 4

Hours/Wee : 6

Total Hours : 78

Objectives

To enable the students

- Discuss functions of bounded variation, Riemann- Stieltjes Integration, Convergence and its interplay between various limiting operations.
- Apply functions of bounded variation, Riemann- Stieltjes Integration, Convergence and its interplay between various limiting operations.

UNIT-I SEQUENCES AND SERIES

16Hrs

Double sequences – Double series – Rearrangement theorem for double series- A sufficient condition for equality of iterated series – Multiplication of series – Cesaro summability – Infinite products. Power series – Multiplication of power series – The Taylor's series generated by a function – Bernstein's theorem - Able's limit theorem – Tauber's theorem.

UNIT-II CONVERGENCE SEQUENCE

16Hrs

Point wise convergence of sequences of functions – Examples of sequences of real Valued functions – Definitions of uniform convergence – Uniform convergence and continuity – The Cauchy condition for uniform convergence – Uniform convergence of infinite series of functions – Uniform convergence and Riemann – Stieltjes integration – Non uniform convergence and Term -by- term Integration – Uniform convergence differentiation – Sufficient condition for uniform convergence of a series – Mean convergence.

UNIT-III ORTHOGONAL SYSTEM OF FUNCTIONS

16Hrs

Introduction – Orthogonal system of functions – the theorem on best approximation – The Fourier Series of a function relative to an orthonormal system – Properties of Fourier Coefficients – The Riesz-Fischer Theorem – The Convergence and representation problem in trigonometric series – The Riemann – Lebesgue Lemma – The Dirichlet Integrals – An Integral representation for the partial sums of Fourier series – Riemann's localization theorem – Sufficient condition for convergence of a Fourier series – Consequence of Fejes theorem – The Weierstrass approximation theorem.

UNIT-IV DIRECTIONAL DERIVATIVE

15Hrs

Introduction – The Directional derivative – Directional derivative and continuity – The total derivative - The total derivative expressed in terms of partial derivatives – The Matrix of linear function – The Jacobian Matrix – The Chain rule – Matrix form of chain rule – The mean – value theorem for differentiable functions – A sufficient condition for differentiability condition for equality of mixed partial derivatives – Taylor's theorem for functions of R^n to R^1 .

UNIT-V IMPLICIT FUNCTION THEOREM

15 Hrs

Functions with non zero Jacobian determinants – The inverse function theorem – The Implicit function theorem – Extrema real valued function of severable variables – Extremum problems with side conditions.

Text Books

- Barra G. de., "*Measure Theory and Integration*", Wiley Eastern Ltd, New Delhi, 1981.
- Tom M. Apostol, "*Mathematical Analysis*", Addison – Wesley Publishing Company Inc, New York, 1974.

Reference Books

- Burkill, J.C. "*The Lebesgue Integral*", Cambridge University Press, New York, 1951.
- Gelbaum, B.R. and J. Olmsted, "*Counter Examples in Analysis*", Holden day, San Francisco, 1964.

PMAM103 ORDINARY DIFFERENTIAL EQUATIONS

Semester : I	Credit : 4
Category : Core II	Hours/Week : 6
Class &Major: I M.SC Mathematics	Total Hours : 78

Objectives

To enable the students

- Develop a strong background on finding solutions to linear differential equations with constant and variable coefficients and also with singular points.
- Apply the existence and uniqueness of the solutions of first order differential equations.
- Understand and develop analytical skills.

UNIT-I SECOND ORDER HOMOGENEOUS EQUATIONS 16Hrs

Second order homogeneous equations-Initial value problems-Linear dependence and independence - Wronskian and a formula for Wronskian – Non-homogeneous equation of order two.

UNIT-II HOMOGENEOUS AND NON-HOMOGENEOUS EQUATION 15Hrs

Homogeneous and non-homogeneous equation of order n – Initial value problems-Annihilator method to solve non-homogeneous equation- Algebra of constant coefficient operators.

UNIT-III INITIAL VALUE PROBLEMS 16Hrs

Initial value problems – Existence and uniqueness theorems – Solutions to solve a non-homogeneous equation – Wronskian and linear dependence – reduction of the order of a homogeneous equation – homogeneous equation with analysis coefficients – The Legendre equation.

UNIT-IV EULER EQUATION 15Hrs

Euler equation – Second order equations with regular singular points – Exceptional cases – Bessel Function.

UNIT-V EXACT EQUATION 16Hrs

Equation with variable separated – Exact equation – method of successive approximations – the Lipschitz condition – convergence of the successive approximations and the existence theorem.

Text Book

- Coddington E.A., “*An Introduction to Ordinary Differential Equations*”, Prentice-Hall of India Ltd., New Delhi, 1987.

Reference Books

- Lebedev. N.N, “*Special functions and their applications*”, Prentice Hall of India, New Delhi, 1965.
- Reid W.T., “*Ordinary Differential Equations*”, John Wiley and Sons, New York, 1971

- Raisinghania M.D., “*Advanced Differential Equations*”, S. Chand & Company Pvt.Ltd ,New Delhi, 2001.

PMAM106 FUZZY ANALYSIS

Semester : I	Credit : 4
Category :Core V	Hours/Week: 6
Class & Major : I M.Sc. Mathematics	Total Hours: 78

Objectives

To enable the students

- Discuss fuzzy set, fuzzy subset and fuzzy logic.
- Distinguish fuzzy logic from classical logic.
- Apply fuzzy logic whenever uncertainty arises

UNIT-I FUZZY SETS

16 Hrs

Crisp sets – Fuzzy sets – Additional properties of Alpha cut – Representations of fuzzy sets – Extensions principle for fuzzy sets

chapter 1 : Section 1.2- 1.4

chapter 3 : Section 2.1 - 2.3

UNIT-II OPERATIONS ON FUZZY SETS

16 Hrs

Types of operations – Fuzzy complements – Fuzzy intersections – Fuzzy unions – Combinations of operations – Aggregation operations.

chapter 3: Section 3.1- 3.6

UNIT-III ARITHMETIC

16 Hrs

Fuzzy numbers – Linguistic variables – Arithmetic operations on intervals – Arithmetic operations on fuzzy numbers – Lattice of fuzzy numbers – Fuzzy equations.

chapter 4 : Section 4.1- 4.6

UNIT-IV FUZZY RELATIONS

16 Hrs

Crisp versus fuzzy relations – Binary fuzzy relations-binary relations on a single set – Fuzzy equivalence relations – sup-i-compositions of fuzzy relations-inf- ω_1 compositions of fuzzy relations

chapter 5 : Section 5.1, 5.3, 5.4, 5.5, 5.9, 5.10

UNIT-V FUZZY LOGIC

14 Hrs

Classical logic-multi valued logics-fuzzy Propositions-fuzzy quantifiers.

Chapter 8 :Section 8.1 - 8.4

Text Book

- George J.Klir and Bo Yuan, “*Fuzzy sets and Fuzzy logic-Theory and applications*” Prentice

Reference Books

- Timothy J.Ross, “*Fuzzy Logic with Engineering Applications*”, John Wiley & Sons Pvt. Ltd, The Atrium, Southern Gate Chichester, West Sussex PO198SQ, England, 2004.
- Kaufman.A, “*Introduction to the theory of Fuzzy subsets*” Volume - I, Academic Press, New York, 1975.
- Zimmermann.H.J, “*Fuzzy set theory and its Application*”, Allied Publishers, Chennai, 1996.

PMAM209 LINEAR ALGEBRA

Semester : II

Category : Core VI

Class & Major: II M.SC Mathematics

Credit : 4

Hours/Week : 6

Total Hours : 78

Objectives

To enable the Students

- Classify various algebraic structures.
- Estimate computational skill in linear algebra.

UNIT-I LINEAR TRANSFORMATION

16 Hrs

Algebra of Linear transformations, Minimal polynomials, Regular and singular transformation, Range and rank of a transformation and its properties, characteristic roots and characteristic vectors.

UNIT-II DUAL SPACE

15 Hrs

The matrix representation of a linear transformation, Composition of a linear transformation and matrix multiplication, The change of coordinate matrix, transition matrix, The dual space.

UNIT-III POLYNOMIAL EQUATION

16 Hrs

Characteristic polynomials, Diagonalizability, Invariant subspaces, Cayley-Hamilton theorem. Canonical Forms-Triangular canonical form, Nilpotent transformations, Jordan canonical form, The rational canonical form.

UNIT-IV INNER PRODUCT SPACES

15 Hrs

Inner Product Spaces, Orthogonal complements, Gram-Schmidt Orthonormalization process-Positive Definite Matrices, Maxima, minima and saddle points, Tests for positive definiteness, Singular value Decomposition and its applications

UNIT-V QUADRATIC EQUATION

16 Hrs

Bilinear forms, symmetric and skew-symmetric bilinear forms, real quadratic forms, rank and signature, Sylvester's law of inertia.

Text books

- Hoffman.K and Kunze.R, "*Linear Algebra*", Pearson Education (India), 2003.
Prentice-Hall of India, 1991.

Reference books

- Herstein.I.N, "*Topics in Algebra*", 2nd Ed., John Wiley & Sons, 2006
- Freidberg.S, Insel A, and Spence L: "*Linear Algebra*", Fourth Edition, PHI, 2009.
- Gilbert J and Gilbert L, "*Linear Algebra and Matrix theory*", Academic Press, 1995.
- Lang.S, "*Linear Algebra*", Springer-Verlag, New York, 1989
- Artin.M, "*Algebra*", Prentice Hall of India, 1994.
- Strang.G: "*Linear Algebra and its Applications*", Brooks/Cole Ltd., New Delhi, Third Edition, 2003.

PMAM202 MEASURE AND INTEGRATION

Semester	: II	Credit	: 4
Category	: Core VI	Hours/Week	: 5
Class & Major	: I M.SC	Total Hours	: 65

Objectives

To enable the students

- Understand basics of knowledge in Lebesgue Measure.
- Acquire indepth knowledge in Multivariable differential calculus.

UNIT-I MEASURE ON THE REAL LINE 13Hrs

Lebesgue Outer Measure – Measurable Sets – Regularity – Measurable Functions – Borel and Lebesgue Measurability.

UNIT-II INTEGRATION OF FUNCTIONS OF A REAL VARIABLE 13Hrs

Integration of Non negative functions – The General Integral – Riemann and Lebesgue Integrals.

UNIT-III ABSTRACT MEASURE SPACES 13Hrs

Measures and outer measures- Completion of a measure- Measure Spaces- Integration with respect to measure. L^p Spaces- Completeness of L^p .

UNIT-IV MEASURABLE DECOMPOSITION SPACE 13Hrs

Signes Measures- Hahn, Jordan Decompositions- The Randon Nikodym theorem- some applications of the Nikodym Theorem.

UNIT-V PRODUCT MEASURE SPACE 13Hrs

Measurability in a product space- The Product measure and Fubini's theorem- Lebesgue measure in Euclidean space.

Text Book

- Barra G. de., "*Measure Theory and Integration*", Wiley Eastern Ltd., New Delhi, 1981.

Reference Books

- Natanson.I.P. "*Theory of functions of a Real Variable Vol.I& II*", Cambridge University Press, New York, 1960.

- Royden.H.L, “*Real Analysis*”, Prentice- Hall of India private Limited, New Delhi, 2003.
- GanapathyIyer.v, “*Mathematical Analysis*”, Tata McGraw Hill Publishing Company Ltd,New Delhi,1977.

PMAM206 PARTIAL DIFFERENTIAL EQUATIONS

Semester	: II	Credit	: 4
Category	: Core VII	Hours/Week	: 5
Class &Major	: I M.Sc Mathematics	Total Hours	: 65

Objectives

To enable the students

- Understand the physical behavior of the mathematical model.
- Discuss the solution of higher order partial differential equations.

UNIT - I LINEAR PARTIAL DIFFERENTIAL EQUATIONS 16Hrs

Formation of PDE -solution of PDE First order – Integral surfaces – Cauchy Problem order equation – Orthogonal surfaces – First order non- linear – Characteristics – Compatible system – Charpit’s method. Fundamentals classifications and canonical forms of PDE.

UNIT - II NON-LINEAR FIRST ORDER PDE 13Hrs

First order non- linear – Characteristics – Compatible system – Charpit’s method.

UNIT - III SECOND ORDER PDE 10Hrs

Introduction- classification of second order PDE-Canonical forms - Adjoint operators.

UNIT - IV HYPERBOLIC PDE 13Hrs

Derivation of one- dimensional wave equation -Solution of one- dimensional wave equation by Canonical reduction – IVP – D’ Almembert’s solution – Vibrating string – Forced Vibration – IVP and BVP for two dimensional wave equation.

UNIT - V ELLIPTIC AND PARABOLIC PDE 13Hrs

Derivation of Laplace and Poission equation – BVP – Separation of Variables - Dirichlet’s Problem and Newmann Problem for a rectangle – Elementary solution of Diffusion equation – Dirac-Delta function – Separation of variables method.

Text Book

- Shankar Rao S., “*Introduction to Partial Differential Equations*”, 2nd Edition, New Delhi, Prentice Hall of India, 2005.

Reference Books

- Dennemeyer.R, “*Introduction to Partial Differential Equationsand Boundary*

McOwen.R.C, “*Partial Differential Equations*, 2ndEdn, New Delhi. Pearson Education,2005.

- Raisinghania.M.D, “*Advanced Differential Equations*”, New Delhi, S.Chand& Company Ltd., 2001.
- Sneddon. I.N, “*Elements of Partial Differential Equations*”, New Delhi, McGraw hill,1983.

PMAM207 CLASSICAL MECHANICS

Semester	: II	Credit	: 4
Category	: Core VIII	Hours/Week	: 5
Class&Major	: I M.Sc Mathematics	Total Hours	: 65

Objectives

To enable the students

- Discuss the structure of classical mechanics and to outline some of its applications in physics .
- Acquire Knowledge of Lagrange’s and Hamilton’s Principle.

UNIT - I MECHANICAL SYSTEMS 16Hrs

Mechanics of a Particle - Mechanics of a System of Particle-Constraints- D’Alembert’s Principle and Lagrange’s Equations-Simple Applications of the Lagrangian Formulation.

UNIT - II VARIATIONAL PRINCIPLES AND LAGRANGE’S EQUATION 10Hrs

Hamilton’s Principle-Some Techniques of the Calculus of Variations-Derivation of Lagrange’s Equations from Hamilton’s Principle-Extension of Hamilton’s Principle to Nonholonomic Systems.

UNIT - III VARIATIONAL PRINCIPLES AND LAGRANGE’S EQUATION (CONTD) 13Hrs

Advantages of Variational Principle Formulation-Conservation Theorems and Symmetry Properties-Energy Function and the Conversion of Energy.

UNIT - IV HAMILTON-JACOBI THEORY 10Hrs

The Hamilton –Jacobi Equation for Hamilton’s Principle Function-The Harmonic oscillator Problem as an example of the Hamilton Jacobi Method - The Hamilton –Jacobi Equation for Hamilton’s Characteristic Function-Seperation of Variables in the Hamilton-Jacobi Equation-Ignorable Coordinates and the Kepler Problem.

UNIT - V CANONICAL TRANSFORMATIONS 16Hrs

The Equations of Canonical Transformations- Examples of Canonical Transformations-The Symplectic Approach Canonical Transformations-Poisson Brackets and Other Canonical Invariants-Equations of Motions,Infinitesimal Canonical Transformations, and Conservation Theorems in the Poisson Brackets Formulation-The Angular Momentum Poisson Brackets Relations-Liouville’s Theorem.

Text Book

- Green Wood.D, “*Classical Mechanics*” Prentice Hall of India, New Delhi 1985.

Reference Book

- Herbert Goldstein, Charles Poole, John Safko, “*Classical Mechanics*”, Addison Wesley, 3rd edition 2000.

PMAM208 OPERATIONS RESEARCH

Semester	: II	Credit	: 4
Category	: Core IX	Hours/Week	: 5
Class & Major:	I M.SC Mathematics	Total Hours	: 65

Objectives**To enable the students**

- Acquire Knowledge on queuing systems, Network Schedule, Sensitivity and Decision Analysis.
- Use algorithms for solving problems.

UNIT - I SENSITIVITY ANALYSIS 12Hrs

Graphical Sensitivity Analysis - Algebraic Sensitivity Analysis–Right-hand Side of the Constraints - Algebraic Sensitivity Analysis–Objective-Function Coefficients - Sensitivity Analysis with TORA, Excel Solver, and AMPL.

UNIT - II INTEGER LINEAR PROGRAMMING 14Hrs

Illustrative Application - Integer Programming Algorithms: Branch-and-Bound (B&B) Algorithm Cutting-Plane Algorithm.

UNIT - III CPM and PERT 12Hrs

Network Representation - Critical Path Computations - Construction of the Time Schedule - PERT Calculations.

UNIT - IV QUEUING SYSTEMS 16Hrs

Generalized Poisson Queuing Model - Specialized Poisson Queues: Steady-State Measures of Performance - Single-Server Models - Multiple-Server Models - Machine Servicing Model–(M/M/R) : (GD/K/K), $R < K$ - Pollaczek-Khintchine (P-K) Formula.

UNIT - V DECISION ANALYSIS 11Hrs

Decision Making under Certainty–Analytic Hierarchy Process (AHP) - Decision Making under Risk - Expected Value Criterion - Variations of the Expected Value Criterion - Decision under Uncertainty.

Text Book

- Hamdy A. Taha, “*Operations Research*”, Prentice Hall, 2010.

Reference Book

- Kapoor V.K, “*Introduction to Operations Research*”, Sultan Chand & Sons, New Delhi, 1996.

**PMAX 201/PMAX202 MATHEMATICS FOR HIGH SCHOOL
STUDENTS /ELEMENTARY MATHEMATICS FOR HIGHER
SECONDARY STUDENTS**

Semester : II **Credit** : 1
Category : Service Learning
Class and Major: I M.Sc. Mathematics

Objectives**To enable the students**

- Acquire indepth knowledge about matrices and complex numbers.
- Inculcate innovative teaching methods.
- Apply the technique of differentiation to motion in physics.

UNIT- I MATRICES

Introduction to Matrix-Adjoint of the matrix-Inverse of the matrix-Rank of the matrix-Consistency of the linear equations.

Activity: Lecture, Chart presentation

UNIT- II VECTOR ALGEBRA

Vectors - Angle between two vectors-scalar product-vector product-product of three vectors-lines and planes.

Activity: Lecture, Chart presentation

UNIT- III COMPLEX NUMBERS

The Complex number system - Conjugate of the complex numbers-ordered pair of representation-modulus of the complex numbers-De-moivre’s theorem and its applications roots of the complex numbers.

Activity: Lecture, Chart presentation.

UNIT- IV ANALYTICAL GEOMETRY

Conic: parabola-ellipse-hyperbola. Parametric forms of conics.

Activity: Lecture, Model presentation.

UNIT- V DIFFERENTIAL CALCULUS

Derivative as measure – Rate of Change – Velocity – Acceleration – Related Rates derivative as a measure of Slope.

Activity: Lecture, Power Point presentation

Reference Books

- Narayanan and Manicavachagom Pillay.T.K,*Algebra VolumeI*, Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1996.
- Narayanan and Manicavachagom Pillay. T.K, *Trignometry* ,Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1994.
- Narayanan and Manicavachagom Pillay. T.K,*Vector Algebra*, Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1997.
- Narayanan and Manicavachagom Pillay.T.K, *Analytical Geomentry of 2D*, Viswanathan.S Publishers & Printers, Pvt.Ltd. Chennai,1993.

PCAM103/PCAM207 MATHEMATICAL FOUNDATIONS

Semester	: II	Credit	: 3
Category	: Core III	Hours/Week	: 4
Class & Major	: I MCA	Total Hours	:52

Objectives

To enable the students

- Discuss the various tools in solving numerical problems.
- Apply these methods in a computer environment.

UNIT-I LOGIC 10Hrs

Logic:introduction – TF statements – connectivities – atomic and compound statements – well formed formulae – tautology – tautology implications and equivalence of a formulae.

UNIT-II REPLACEMENT PROCESS 10Hrs

Replacement process – functionally complete sets of connectives and duality law – normals forms – principles of normal forms – theory of inference for predicate calculus – statement involving more than one quantifier.

UNIT-III SYSTEM OF LINEAR EQUATIONS 10Hrs

Gauss - Elimination methods - Pivoting-Gauss - Jordan Elimination method –Gauss - Seidal iteration method.

UNIT-IV NUMERICAL DIFFERENTIATION 10Hrs

Numerial Differentiation – Numerical Intergration – Newton’s Cotes method – trapezoidal rule – Simpon’s rule.

UNIT-V NUMERICAL DIFFERENTIAL EQUATIONS 12Hrs

Initial value problem – Euler’s method – Runge – kutta method – Boundary value problem.

Text Book

- Termbly.J.P, Manohar.R, *Discrete Mathematical Structures with Applications to Computer science*, Tata Mc Graw Hill Publications Company, Pvt.Ltd, New Delhi, 1997 .

Reference Books

- Sastry.S.S., *Introductory Methods of Numerical Analysis*, Prentice Hall of India Pvt.Ltd, New Delhi, 2000.
- Rajaraman.V, *Computer Oriented Numerical Methods*, Prentice Hall of India Pvt.Ltd, New Delhi, 2000.

PCSM108/PCSM208 THEORETICAL FOUNDATIONS FOR COMPUTERS

Semester : II

Category : Core III

Class & Major: I- M.Sc Mathematics

Credit : 4

Hours/Week : 6

Total Hours : 78

Objectives

To enable the students

- Acquire basic knowledge in Linear System
- Understand the concept of relations and operators.

UNIT-I LOGIC

15 Hrs

Introduction – TF Statements- Connectivities-Atomic and Compound Statements- Well Formed Formulae-Tautology-Tautology implications and equivalence of a formulae.

UNIT-II RELATIONS AND OPERATORS

15 Hrs

Relations: Representation of a Relation-Operations on Relation-Equivalence Relation-Closure and Warshall's Algorithm-Partitions and Equivalence Classes-Functions: Function and Operators-One-to-one, Onto Functions, Special types of Functions-Invertible Functions-Composition of Functions.

UNIT-III VECTOR SPACES

16 Hrs

Vector Spaces and Subspaces-Solving $Ax=0$ and $Ax=b$ Linear Independence, Basis, and Dimension-linear Transformation.

UNIT-IV ORTHOGONALITY

14 Hrs

Orthogonal Vectors and Subspaces-Cosines and Projections onto lines-Projections and Least Squares-Orthogonal Bases and Gram-Schmidt.

UNIT-V DETERMINANTS

18 Hrs

Introduction-Properties of the Determinant-Formulas for the Determinants-Applications of Determinants

Text Book

- Tremblay.J.P., Manohar.R, *Discrete Mathematical Structures with Applications to Computer science*, Tata Mc Graw Hills Publications Company Pvt. Ltd., Fourth Edition.
- Gilbert Strang, *Linear Algebra and its Applications*, Cengage Learning, 2006.

PMAE101/PMAE209 LATEX AND MATLAB

Semester : I

Credit : 4

Category : Non Major Elective

Hours/Week : 5

Class & Major: I PG

Total Hours : 65

Objectives

To enable the students

- Introduces documentation in computer
- Develop computer skill.

UNIT- I DOCUMENTATION

10Hrs

Document layout and organization-Document class- page style- parts of the document- text formatting- TeX and its Offspring- What's different in Latex 2 ϵ - Distinguishing Latex 2 ϵ and Basics of Latex file.

UNIT- II COMMANDS

15Hrs

Commands and environment-commands names and argument- Environments- Contents,-Fine – tuning text- Word Division- Labeling-Referencing- Displayed Text- Changing font- Centering and indenting- Lists-Generalised Lists- theorem-like declaration - Tabulator stops- Boxes.

UNIT- III TABLES

15Hrs

Tables- printing literal text- Footnodes and marginal notes-Drawing pictures using Latex-Mathematical formulas-Mathematical environment- Main elements of math mode- Mathematical symbols- Addition elements- Fine – tuning Mathematics.

UNIT- IV MATLAB

12Hrs

Introduction-Basics of MATLAB- Input-Output- File types-Platform dependence- General commands-Interactive Computation: Matrices and Vectors.

UNIT- V FUNCTIONS

13Hrs

Matrix and Array operation-creating and using Inline functions-Using Built –in functions and On-Line Help-Saving and loading data-Plotting Simple graphs-Basics programming in MATLAB-creating cps files using MATLAB.

Text Books

- Daly P.W, *A Guide to LaTeX* by H.Kopka, Adison Wesley, London,1999.
- Rudra Pratap,*Getting started with MATLAB – A Quick introduction for Scientists and Engineers*, Oxford University Press, New York, 2003.

PMAE102/PMAE208 OPERATIONS RESEARCH

Semester : I

Credit : 4

Category : NME

Hours/Week : 5

Class & Major: I PG

Total Hours : 65

Objectives

To enable the students

- Introduce various techniques of research.
- Discuss real life problems in Business and Management.
- Enlighten on applications in management techniques.

UNIT-I LINEAR PROGRAMMING PROBLEM

13 Hrs

Mathematical Formulation of the Problem- Graphical Solution Method -General Linear Programming Problem - The Computational Procedure- Use of Artificial Variable Techniques- Big- M Method Simple problems.

UNIT-II TRANSPORTATION PROBLEM

13Hrs

General Transportation Problem-The Transportation Table-Loops in Transportation Tables-Solution of a Transportation Problem-Finding an Initial Basic Feasible Solution-Test for Optimality-Degeneracy in Transportation Problem-Transportation Algorithm(MODI Method). Simple problems.

UNIT-III ASSIGNMENTPROBLEM

13Hrs

Mathematical Formulation of the problem- the Assignment method- Special Cases in Assignment Problem. Simple problems.

UNIT-IV GAME THEORY

13Hrs

Two-person Zero-sum Games- Some Basic Terms- The Maximin - Minimax

Principle- Games Without Saddle Points-Mixed Strategies- Graphic Solution of $2 \times n$ and $m \times 2$ Games- Dominance Property. Simple problems.

UNIT-V NETWORK SCHEDULING BY PERT/CPM

13Hrs

Network and Basic Components- Logical Sequencing- Rules of Network Construction- Critical Path Analysis- Probability Considerations in PERT- Distinction between PERT and CPM. Simple problems.

Text Book

- Kanti Swaroop, Gupta P.K. and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi, 2003.

Reference Books

- Kapoor .V.K, *Introduction to Operations Research*, Sulthan Chand & Sons, New Delhi, 1996.
- Taha.A Handy, *Operations Research-An Introduction*, Prentice hall of India Pvt Ltd, New Delhi, 2000.

PCAM206 APPLIED STATISTICS

Semester : II

Credit : 4

Category : Core VI

Hours/Week : 5

Class & Major: I MCA

Total Hours : 65

Objectives

To enable the students

- Develop problem solving skills in sampling techniques and statistical inference
- Provide basic principles of experimentation and discuss the analysis of data relating to agriculture, biological sciences and industry.

UNIT-I CORRELATION AND REGRESSION

13Hrs

Correlation Analysis-Karl Pearson's correlation coefficient-rank correlation coefficient-Multiple and partial correlation (3 variables only)-regression analysis-regression equations-methods of least squares -fitting of the curve of the form

i. $Y=ax+b$ ii. $Y=ax^2+bx+c$ iii. $Y=ax^b$ iv. $Y=ae^{bx}$, $Y=ab^x$

UNIT-II PROBABILITY

13Hrs

Sample space-definitions of events-Axiomatic approach to probability-conditional probability-Bayes's theorem-random variables-continuous and discrete random variables-distribution function of random variable-characteristics of distribution-mathematical expectation, variance-moment generating function-Chebychev's inequality.

UNIT-III THEORETICAL AND CONTINUOUS DISTRIBUTION **13Hrs**

Bivariate distribution - distribution function-marginal and conditional distributions- discrete distributions-binomial,poisson distribution-continuous distribution-Normal and exponential distribution.

UNIT-IV TESTS OF SIGNIFICANCE **13Hrs**

Tests of significance –Sampling distribution-Standard Error – Hypothesis – Errors in Sampling – Critical region – level of significance - Large sample Tests – Sampling of Attributes –Sampling of Variables – Small sample tests – Student’s t-Test – Test for single mean –Test for difference of means – Dependent and Independent samples –Test for Correlation coefficient –Applications in Medicine- Non parametric test- Chi-square test – Test for population variance, Goodness of fit, Independence of Attributes – F-test for testing equality of population variances.

UNIT-V ANALYSIS OF VARIANCE **13Hrs**

Analysis of variance – one- way and two- way classifications. Statistical Quality Control-Introduction-types of control chart-x-charts-chart,c-chart,p-chart and its application in industry.

Note: No derivation required Emphasis on concepts and applications.

Text Books

- Gupta S.C. and Kapoor,V.K, *Elements of Mathematics Statistics*, Sultan Chand and Sons, 2006
- Gupta S.P., *Statistical Methods*, Sultan Chand and Sons, 2011.

Reference Books

- Murthy M.N.(1967) “ Sampling Theory and Methods”, Statistical Publishing Society, Calcutta.
- Robert V. Hogg & Elliot A. Tanis (1983), “ Probability and Statistical Inference”, Macmillan Publishing Company, New York.
- Mood A.M.,Graybill.F.A. & Boes. D.G., “ Introduction to Mathematical Statistics”, McGraw Hill, 1974.
- Dr.Parimal Mukhopadhyay, “ Applied Statistics”, Books abd allied(P) Ltd. 2011.
- Sundar Rao.P.S.S & Richard.J, “ Introduction to Biostatistics and Research Methods”, PHI Learning Private Ltd., 2009.

PMAE203 DISCRETE MATHEMATICS

Semester	: II	Credit	: 4
Category	: Non-Major Elective	Hours/Week	: 5
Class & Major	: I PG	Total Hours	: 65

Objectives

To enable the students

- Understand the concepts of Set Theory and Finite Automata.
- Apply these methods in a computer environment.

UNIT-I LOGIC **15 Hrs**

Introduction – TF statements – Connectives – atomic and compound statements – Well formed Formulae.

UNIT-II TAUTOLOGY **15 Hrs**

Tautology – Tautology implications and equivalence of a formulae. Replacement process.

UNIT-III LATTICES AND BOOLEAN ALGEBRA **15 Hrs**

Functionally complete sets of connectives and duality law – normal forms Principles of normal forms –Lattices – Some properties of lattices – Hasse digrams – notations- Boolean algebras – Boolean polynomials.

UNIT-IV GRAPH THEORY **10 Hrs**

Basic concepts – Digraph, Incidence and Degree-Subgraph - Isomorphism.

UNIT-V FINITE AUTOMATA **10 Hrs**

Introduction – Finite automata - Definition of finite automation-representation of finite automation-acceptability of a string by finite automata.

Text Book

- Venkataraman.M.K., Sridharan.N & Chandrasekaran.N., *Discrete Mathematics*, The National publishing company, 2000.

Reference Books

- Sundaresan.V.ganapathy Subramanian.K.S & Ganesan.K *Discrete Mathematics*, A.R.Publications, 1996.
- Tremblay.J.P, Manohar.R, *Discrete Mathematical Structures with Applications to Computer Science*, Tata Mc Graw Hills Publications Company Pvt.Ltd., New Delhi, 1999.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core IV	PMAM105	Calculus of Variations and Integral equations	Assignment	Seminar
	Core V	PMAM106/ PMAM407	Fuzzy Analysis	Assignment	Seminar
	Core I	PMAM107	Abstract Algebra	Assignment	Seminar
	Core II	PMAM102	Real Analysis	Assignment	Seminar
	Core III	PMAM103	Ordinary Differential Equations	Assignment	Seminar
II	Core VI	PMAM209	Linear Algebra	Assignment	Seminar
	Core VII	PMAM202	Measure and Integration	Assignment	Seminar
	Core VIII	PMAM206	Partial Differential	Assignment	Seminar

			Equations		
	Core IX	PMAM204	Classical Mechanics	Assignment	Seminar
	Core X	PMAM208	Operations Research	Assignment	Seminar

III and IV EVALUATION COMPONENTS OF CIA-Allied

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core III	PCAM103/ PCAM207	Mathematical Foundations	Assignment	Seminar
		PCSM108/ PCSM208	Theoretical foundations for computers	Assignment	Seminar
	Core VI	PCAM206	Applied statistics	Assignment	Seminar

III and IV EVALUATION COMPONENTS OF CIA-NME

Semester	Category	Course code	Course Title	Component III	Component IV
I	Non Major Elective	PMAE101/ PMAE209	LaTeX and MAT Lab	Assignment	Seminar
		PMAE102/ PMAE208	Operations Research	Assignment	Seminar

COURSE PROFILE M.Phil (Mathematics)

Semester	Category	Course Code	Course Title	Contact Hrs/ Week	Credit	
					Min	Max
I	Core 1	MMA103	Algebra and Analysis	6	5	5
	Core 2	MMA102	Topology and Differential Geometry	6	5	5
	Core 3	MMA105	Special Area Study Paper	6	5	5
II		MMAD201	Dissertation	30	15	15
<p>▪ Paper Presentation (minimum one) and /or Publication of articles in Journals (minimum one) is mandatory for submission of Dissertation.</p>						

MMA103 ALGEBRA AND ANALYSIS

Semester : I
Category : Core II
Class & Major : M.Phil-Mathematics

Credit : 5
Hours/Week: 6
Total Hours : 78

Objectives

To enable the students

- Explore the concept of Topology through Manifold Differential geometry etc.
- Develop analyzing skill.

UNIT-I THE RADIAL

15Hrs

The Radial of an Algebra – Wakayama’s lemma – Jacobson Radial – The Radial of an Artinian Algebras – Artinian Algebras are Noe theorem – Nilpotent Algebras – The Radial of a group Algebra – Ideals in artinian Algebras.

UNIT-II TENSOR PRODUCTS

15Hrs

Tensor Products of R – modules – Tensor Products of Algebras.

UNIT-III ABSTRACT INTEGRATION **18Hrs**

The concept of measurability – Simple functions – Elementary properties of measures-Integration of positive functions – Integration of complex functions – the Role played by Sets of measure zero.

UNIT-IV POSITIVE BOREL MEASURES **15Hrs**

Vector spaces – Topological Preliminaries – The Riesz Representation theorem – Regularity properties of Borel measures – Lebesgue measure - Continuity properties of Measurable functions.

UNIT-V FOURIER TRANSFORMS **15Hrs**

The inversion Theorem – The Plancherel Theorem – The Banach algebra L^1

Text Books

- Pierce. R.S., *Treatment as in Associative Algebra*.
- Walter Rudin, *Real & Complex Analysis*, Third Edition, New Delhi Prentice Hall of India Private Limited, 1997.

MMA102 TOPOLOGY AND DIFFERENTIAL GEOMETRY

Semester	: I	Credit	: 5
Category	: Core I	Hours/Week	: 6
Class & Major	: M.Phil-Mathematics	Total Hours	: 78

Objectives

To enable the students

- Gain Knowledge in Foundations of Algebra and Analysis for further developments in Research.
- Develop analyzing skill.

UNIT-I FUNDAMENTAL GROUP AND COVERING SPACES **15Hrs**

Homotography – Fundamental group – Covering spaces

UNIT-II SIMPLICIAL COMPLEXES **15Hrs**

Geometry of simplicial complexes – Barycentric subdivisions – simplicial approximation Theorem.

UNIT-III **18Hrs**

Differentiable manifolds –Differential Forms.

UNIT-IV **15Hrs**

Miscellaneous Facts

UNIT-V **15Hrs**

De Rham's Theorem

Text Books

- Singer I.M., Thorpe Singer. J. A., *Lecture Notes on Elementary Topology and Geometry*, New York, Thorpe Publishers 1967.

III and IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course code	Course Title	Component III	Component IV
I	Core 1	MMA103	Algebra and Analysis	Assignment	Seminar
	Core 2	MMA102	Topology and Differential Geometry	Assignment	Seminar
	Core 3	MMA105	Special Area Study Paper	Assignment	Seminar