CORE COURSE:1 B.Sc MATHEMATICS SEM: I

DIFFERENTIAL CALCULUS AND TRIGONOMETRY

OBJECTIVES:

- *Training the students in finding the derivatives of functions.*
- *To study the fundamental concepts of calculus.*
- *To review and update knowledge of trigonometry.*
- *To develop and strengthen the student problem- solving skills.*
- *To apply the tools of calculus to variety of situations.*

UNIT-I: DIFFERENTIATION AND MEANING OF THE DERIVATIVE

Successive Differentiation – the n^{th} derivative – Standard Results – Trigonometrical transformations- Formation of equations involving derivatives- Leibnitz's formula for the n^{th} derivative of a product- Geometrical interpretation – Meaning of the sign of the differential coefficient.

UNIT-II: CURVATURE

Curvature- Circle, radius and centre of curvature- Cartesian formula for the radius of the Curvature- The co-ordinate of the centre of curvature- Evolute and Involute- Radius of curvature when the curve is given in polar co-ordinates- P-R equations: Pedal equations of curve.

UNIT-III: PARTIAL DIFFERENTIATION

Successive Partial derivatives, functions of function rule, Total differential coefficients- A special case- implicit Functions- homogeneous functions- Euler's theorem- Partial derivatives of functions of two variables - Maxima and minima of functions two variables.

UNIT- IV: TRIGONOMETRICAL EXPANSIONS

Expansion: Power of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of powers of θ- Expansion of $\sin^n\theta$,$\cos^n\theta$,$\sin^n\theta\cos^m\theta$- Expansions of $\sin\theta$, $\cos\theta$ in a series of ascending power of θ.

UNIT- V HYPERBOLIC FUNCTIONS

Definition of Hyperbolic functions- formulae involving Hyperbolic functions- Relations between hyperbolic & circular functions- Expansion of sinh x, cosh x, tanh x in power if x- Expansion of inverse hyperbolic functions $\sinh^{-1} x$, $\cosh^{-1} x$, $\tanh^{-1} x$.

TEXT BOOKS:

[1] "Calculus vol I ", T.K Manichavasagampillai and others S.V Publications 2011.
[2] " Trigonometry" T.K Manichavasagampillai and others S.V Publications 2011.

Unit I : Chapter 3, sec 1.2 to 2.1 and chapter 4, sec 2., 2.2 [1]
Unit II : Chapter 10, sec 2.1 to 2.8 [1]
Unit III : Chapter 8, sec 1.2 to 1.7 and sec 4 [1]
Unit IV : Chapter 3 Sec 4 & 5 [2]
Unit V : Chapter 4 full [2]

REFERENCES:

1) Calculus vol.I, S.Arumugam and Issac, New Gamma Publications.
2) Trigonometry, S.Arumugam and Issac, New Gamma Publications.
3) Trigonometry, P.R.Vittal, Margham Publications.
4) Differential calculus, Shanthi Narayanan, S.Chand& Co.

ALLIED COURSE : 1 B.SC., MATHEMATICS SEM : I

MATHEMATICAL STATISTICS – I

Objectives:

- To calculate and apply measures of location and measures of dispersion -- grouped and ungrouped data cases.
- The student will see the Central Limit Theorem (CLT) arise from experimental data.
- Specify and test the fit of multiple time series model specifications for the same data. Compute Correlation coefficients and to estimate Regression Analysis.
- Provide some basic statistical tools, statistical decision theory and statistical inference, useful for the future research.

Unit I – Statistics- Introduction and Presentation of Data

Definition of statistics - importance and scope of statistics - limitations of statistics - statistical data - primary and secondary data - frequency distribution - discrete and continuous frequency distribution - histogram - frequency polygon.

Unit II - Measures of Averages and Dispersion

Definition - requisites - Arithmetic Mean - Geometric Mean - Harmonic Mean - Median - Mode. (definition, merits & demerits, graphical location, problems based on raw, discrete and continuous frequency distribution)

Measures of Dispersion : Definition - range - Quartile Deviation - Mean Deviation - Standard Deviation and Coefficient of Variation (Definition, Merits and Demerits, problems based on Raw, Discrete and Continuous Frequency Distribution)-Concept of Skewness and Kurtosis.

Unit III – Law of Large Numbers and Central Limit Theorem

Chebychev's inequality - convergence in probability - weak law of large numbers - Bernoulli's, Markov's Khinchin's Theorem (Statement only) - BorelCantelli lemma without proof.

Central limit theorem - De-Moivre's Laplace theorem - Lindeberg - levy theorem - Liapounoff's central limit theorem - relation between central limit theorem and weak law of large numbers - applications of central limit theorem-Cramer's Theorem.

Unit IV - Time series

Concept - components of a time series - trend - periodic changes - irregular component - analysis of time series - additive and multiplicative models - uses of times series

- measurement of trend - graphical method - semi average - methods of curve fitting by principles of least squares - growth curves and fitting - moving averages - measurement of seasonal fluctuations - simple averages - ratio to trend - ratio to moving average - link relative methods - related problems.

Unit IV - Correlation and Regression

Correlation : scatter diagram - correlation coefficient - Karl Pearson - limits for correlation coefficients - probable error - properties of correlation - Rank correlation - limits for rank correlation coefficient spearman rank correlation coefficient (Related Problems).

Regression : Lines of regression - regression curves - regression coefficients - properties of regression coefficients (Related Problems).

Text Books:

[1] "Fundamentals of Mathematical Statistics" - S.C.Gupta, V.K.Kapoor - Sultan Chand & sons - New Delhi,1994.

[2] "Fundamentals of Applied Statistics" - S.C.Gupta, V.K.Kapoor - Sultan Chand & Sons - New Delhi,2007.

Unit I : Chapter 1 : Sec. 1.2 , 1.4 and 1.5 [1] Chapter 2 : Sec. 2.1 and 2.2 [1]

Unit II : Chapter 2 : Sec. 2.3 - 2.9 [1] Chapter 3 : Sec. 3.1 – 3.7, 3.8.1, 3.13 - 3.14 [1]

Unit III : Chapter 6 : Sec. 6.13 - 6.16 [1] Chapter 8 : Sec. 8.10 [1]

Unit IV : Chapter 2 : Sec. 2.1 - 2.5.4. [2]

Unit V : Chapter 3 : Sec. 3.1 - 3.4, 3.6, 3.9, 3.10 [2]

References:

1. "Mathematical statistics" - J.N.Kapur, H.C.Sazena - S.Chand& Company Ltd. - New Delhi.

2.**"**Introduction to Biostatistics" – Sokaland Rohlf – Toppan Co. Japan

3. "Primer of Biostatistics" – Stanton A. Clantz – The McGraw Hill Inc. Newyork.

CORE COURSE: 2 B.Sc., MATHEMATICS SEM: I & II

PROBABILITY AND STATISTICS

Objectives:

- To create and analyze the elementary Probability models.
- To understood the concepts of Random variable with its properties.
- To review the basic concepts and knowledge in Mathematical expectation and Generating functions.
- To know the limitations of Discrete distributions
- To create confidence in finding the Index numbers

Unit I - Theory of Probability

Concept of probability - definition of various terms - classical probability - empirical probability - Axiomatic Probability - Definition of probability sample space - Probability of an event - Addition theorem - Multiplication theorem - Conditional probability - Independence of events - Baye's theorem (related problems)

Unit II - Random Variables

Introduction of random variables - Distribution function and its properties - Discrete random variables - Probability mass function - Discrete distribution function - Continuous random variables - Probability density function - Joint probability law - Joint probability mass function - Joint probability distribution function - Marginal distribution function - Joint probability density function - Conditional distribution function - Conditional probability density function. (Related Problems)

Unit III - Mathematical Expectation and Generating Function

Mathematical expectation *:* Expectation of a function of a random variable - Addition and Multiplication theorem of expectation - Expectation of a linear combination of random variables - Variance - Variance of linear combination of random variables – covariance. Generating Functions: - Moment generating function - Theorems on moment generating function. (Simple Problems)

Unit IV - Discrete Distributions

Binomial Distribution : Moments - Recurrence relation - Mean deviation about mean - Mode - Moment generating function - Additive property - Characteristic function - Recurrence relation for cumulants - Fitting of binomial.

*Poisson Distribution :*Moments - Mode - Recurrence relation - Moment generating function - Characteristic function - Additive property - Fitting of poisson.

Unit V: Index numbers

Concept - construction of index numbers - calculation of index number - simple and weighted (Kelly's and Wall's are excluded) - quantity index number, value index number, chain indices - criteria of good index number (unit, time, factor reversal test) - classification of index number - cost of living index number (construction and uses) - uses of index number - limitation of index number.

Text Books:

[1] "Fundamental of Mathematical Statistics"- S.C.Gupta and V.K.Kapoor - Sultan Chand & Sons - New Delhi(2002)

[2] " Business Mathematics and Statistics", PA. Navanitham, Jai Publishers (2014)

Unit I : Chapter 3, Sec. 3.1, 3.3-3.5, 3.8.5, 3.9-3.12, [1]
Chapter 4, Sec. 4.2 [1]
Unit II : Chapter 5, Sec. 5.1 - 5.5.5 [1]
Unit III: Chapter 6, Sec. 6.1 – 6.6.1. [1]
Unit IV : Chapter 8, Sec. 8.4 - 8.4.12, 8.5-8.5.9 [1]
Unit V : Chapter 10- Pg 444 – 471, Pg 486 [2]

Reference Books:

[1] "Mathematical Statistics" - J.N. Kapur, H.C.Saxena - S.Chand& Company Ltd - New Delhi (2011)

[2] " Statistical and Numerical Methods", by P.R. Vittal and V. Malini, Margham Publications

CORE COURSE: 3 B.Sc MATHEMATICS SEM: II CODE:U2RMTCC3

ANALYTICAL GEOMETRY (3D) AND INTEGRAL CALCULUS

Objectives:

- *To understand fundamental concepts of Three Dimensional Analytical Geometry.*
- *To develop logical and systematic computational skills.*
- *To introduce the fundamental principles, concepts and knowledge in the areas of Differential and Integral Calculus.*
- *To prepare the students to apply these fundamental concepts.*
- *To gain the working knowledge to other courses.*

Unit I: Plane

Standard equation of a plane - intercept form - normal form - plane passing through given points - angle between planes - plane through the line of intersection of two planes - equation of the straight line - shortest distance between two skew lines - equation of the line of shortest distance.

Unit II: Sphere

Sphere - Standard equation - length of a tangent from any point - sphere passing through a given circle- intersection of two spheres - Tangent plane.

Unit III: Integration

Integration by parts - Bernoulli formula - definite integrals - properties of definite integrals - reduction formulae for i) $\int x^n e^{ax} dx$, ii) $\int x^n \cos ax dx$, iii) $\int \text{Sin}^n x$ or $\text{Cos}^n x dx$, iv) $\int \tan^n x dx$ v) $\int \text{Sin}^m x \text{Cos}^n x dx$

Unit IV: Multiple Integrals

Definition of Double integrals - Evaluation of double integral - change of order of integration - applications of multiple integrals - triple integrals –simple problems only.

Unit V: Beta and Gamma Functions

Beta functions - Definition - properties of Beta function - Gamma function - Definition - properties of Gamma function - relations between Beta and Gamma functions.

Text Books.

[1]T.K.ManickavasagomPillai& Others, "**Analytical Geometry**" S.V.Publications - 2013 Revised Edition.

[2] T.K. ManickavasagomPillai& others, "I**ntegral calculus**" S.V. Publications, 2011.

Unit I : Chapter 2, Sec. 1 to 9 & Chapter 3, Sec. 1 to 8 [1]

Unit II : Chapter 4, Sec. 1 to 8 [1]

Unit III : Chapter 1, Sec. 11, 12 & 13.1 to 13.5 [2]

Unit IV : Chapter 5, Sec. 2.1 to 6 [2]

Unit V : Chapter 7, Sec. 2.1 to 5 of [2]

References

1)Duraipandian and Chatterjee, "**Analytical Geometry**" S.Chand& Co, June 1997.

2)Shanti Narayan, **"Differential & Integral Calculus"** S. Chand & company ltd Reprint 1994.

ALLIED COURSE : 2 B.Sc., MATHEMATICS SEM : I & II

S P S S LAB

Objectives:

- To understand the concepts used in routines in SPSS.
- To understand how to start SPSS.
- To enter, modify and analyze data.
- To define a variety of statistical variables.
- To work with multiple data sources.

LIST OF PRACTICAL

1. Mean, Median, Mode, Standard Deviation, Skewness, and Kurtosis (page no:50-56).
2. Bar Diagram, Pie Diagram, Line Diagram and Histogram (page no:77-84 & 95-109).
3. Coefficient of Correlation (page no :192 – 204).
4. Regression Equation of X on Y and Y on X (page no :212-218).
5. Multiple Regression Analysis (page no : 224 – 229).
6. Application of t-test for two sample problem (page no :112-125).
7. Application of t-test for one sample problem (page no : 126-134).
8. Chi-square test for goodness of fit (page no : 237-256).
9. Chi-square test for independent of attributes (page no : 257-266).
10. Application of Analysis of Variance – one way & two way (page no : 154-174).

TEXT BOOK

1. "SPSS for you", by A.Rajathi and P.Chandran. MJP Publishers. Edition 2010.

ALLIED COURSE:3B.Sc., MATHEMATICS SEM:II SUB. CODE:U2RSTAC3

MATHEMATICAL STATISTICS – II

Objectives:

- To update and expand the basic knowledge of mathematical statistics
- To review the basic concepts and knowledge in Continuous distribution
- To develop the skills pertinent to Theory of estimation.
- To train the students to collect and analyze data using biological materials.
- To study about the Test of significance using t- test and chi-square test.

Unit I - Continuous distributions

Normal distribution : A limiting form of binomial - Characteristics of normal - Mode - Median - Moment generating function - Cumulants generating function - Moments - Linear combination of independent normal variate is also a normal variate - Points of inflexion of normal curve - Mean deviation from mean - Fitting of normal

*Rectangular distribution :*Moments - Moment generating function - Characteristic function

*Exponential distribution :*Moment generating function - Moments lack of memory property.

Unit II – Continuous and Sampling distribution

Gamma distribution : Moment generating function - Moments - Cumulants generating function - Additive property

Beta distribution: 1^{st} kind and 2^{nd} kind - Constants.

Chi-square distribution : Chi-square variate - Derivation - Moment generating function - Cumulants generating function - Caracteristic function - Additive property.

*Student's t- distribution :*Derivation – Constants.

*F distribution :*F statistic- derivation of Snedecor's F distribution - Constants - Mode.

Unit III – Theory of Estimation

Concepts - characteristics of estimator - Consistency - Unbiasedness - Efficiency - sufficiency - Invariance property of consistent estimators - Methods of estimation - Maximum likelihood estimator - Moments - Properties of these estimators based on these two methods.

Unit IV - Test of Significance

Concept of testing of hypothesis - Statistical hypothesis - Test of a statistical hypothesis - Population - Sample - Parameter - Statistic - Sampling distribution - Standard error - Null and Alternative hypothesis (concept only) - Types of error - Level of significance - power of the test - One tail and Two tail test - Test of significance based on normal and students t-distribution for mean, proportion and correlation.

Test of significance: Chi-square test : Goodness of fit, independence of attributes

Unit V – Analysis of Variance

F-test : Variance.Introduction - Analysis of variance – One way classification – Two way classification.

Text Books :

[1] "Fundamentals of Mathematical Statistics" - S.C.Gupta, V.K.Kapoor - Sultan Chand & Sons - New Delhi (2002).

[2] "Fundamentals of Applied Statistics" - S.C.Gupta, V.K.Kapoor - Sultan Chand & Sons - New Delhi (2007).

Unit I : Chapter 9, Sec. 9.2 – 9.3.4, 9.8 – 9.8.1 [1]

Unit II :Chapter9, Sec. 9.5 – 9.7 [1] Chapter 15, Sec. 15.1 – 15.3.5 [1]

Chapter 16, Sec. 16.2, 16.2.1, 16.2.4, 16.3.1 - 16.3.4, 16.5 – 16.5.3 [1]

Unit III :Chapter 17, Sec. 17.1 - 17.2.4, 17.6 - 17.6.3. [1]

Unit IV :Chapter 18, Sec. 18.2 - 18.2.7,[1] Chapter 14, sec 14.3- 14.8.4 [1]

Unit V : Chapter 5, 5.1 – 5.2.3, 5.3 – 5.3.3 [2]

Reference Books:

[1] "Mathematical statistics" - J.N.Kapur, H.C.Sazena - S.Chand& Company Ltd. - New Delhi.

[2]**"**Introduction to Biostatistics" – Sokal and Rohlf – Toppan Co. Japan

[3]. "Primer of Biostatistics" – Stanton A. Clantz – The McGraw Hill Inc. Newyork.

CORE COURSE:4 B.Sc., MATHEMATICS SEM:IIISUB.

CODE:U3RMTCC4

ALGEBRA AND THEORY OF NUMBERS

Objectives:

- Students are required to use algebra as a tool for representing and solving a variety of practical problems
- The students will solve multistep linear, quadratic and n^{th} degree equations.
- To study about inequalities and applications to Maxima and minima
- Solving real world problems involving equations and system of equations.
- To recognize prime numbers and composite numbers and study about Euler's Theorem.

Unit I - Theory of Equations

Algebraic equation - Remainder Theorem, Formation of Equations - Relation between roots & coefficients of Polynomial Equations - Symmetric functions - Solving the roots of the equation which are in A.P, G.P and H.P – Newton's Theorem on the sum of the powers of the roots..

Unit II - Transformation of Equations

Roots with signs changed- Roots multiplied by a given number- - Forming equations with the given roots - Reciprocal equations - all types- Diminishing, Increasing & multiplying the roots by a constant- Removable of terms - Descarte's rule of Signs (Statement only) - simple problems.

Unit III - Inequalities

Proofs by various inequalities - elementary principles - Geometric & Arithmetic means - Weirstrass inequalities - Cauchy inequality - Applications to Maxima & Minima.

Unit IV - Matrix

Rank of a Matrix - Consistency - Eigen values, Eigen vectors - Cayley Hamilton's Theorem (statement only) - Symmetric, skew Symmetric, Orthogonal, Hermitian, skew Hermitian, & Unitary Matrices - Simple problems only.

Unit V - Theory of Numbers

Introduction to Theory of Numbers - Prime and Composite numbers - divisors of a given number - Euler's function $\phi(N)$ and its value - The highest power of a prime p contained in N! - Congruences - Fermat's, Wilson's & Lagrange's Theorems.

Text Books

[1] T.K.ManickavasagamPillai& Others "Algebra Volume I", S.V. Publications - 1985 Revised Edition

[2] T.K.ManickavasagamPillai& Others "Algebra Volume II", S.V. Publications - 1985 Revised Edition

[3] S.Arumugam&A.ThangapandiIssac, "Modern Algebra", New Gamma Publishing House, 2000

Unit I : Chapter 6, Sec. 1,2, 9, 11 to 14 of [1]

Unit II : Chapter 6, Sec. 15 to 20& 24 of [1]

Unit III : Chapter 4 [2]

Unit IV : Chapter 7, Sec. 7.1 to 7.8 of [3]

Unit V : Chapter 5 of [2]

Reference

1) "Higher algebra "H.S.Hall and S.R.Knight, , Prentice Hall of India, New Delhi.
2) " Allied Mathematics" , S.G. Venkatachalapathy, Margham Publications
3) "Engineering Mathematics" - by Babu Ram

CORE COURSE:5 B.Sc., MATHEMATICS SEM:III SUB. CODE:U3RMTCC5

SEQUENCES AND SERIES

Objectives:

- To understand the concept of convergence and divergence in sequences and series.

- To understand how to apply the method of difference to sum the finite series and to extend its use to infinite series.
- To know how to use Binomial, Exponential and Logarithmic series.
- To know the method of proof by mathematical induction.
- To appreciate that some of the standard series are valid for all real values of x, while others are valid only for specific range of x.

Unit I: Sequences

Sets, Sequences – Limit of a Sequence – Aggregate – Upper and lower bounds – Dedikind's theorem – upper and lower bound of an aggregate – Bounded sequences – The upper and lower limits of a sequence – Cauchy's general principle of convergence – Monotonic sequence – a monotonic sequence always tend to a limit – Finite or Infinite.

Unit II: Test for convergency of Series

Convergence of infinite series, Geometric series – some general theorems concerning infinite series – series of positive terms – Comparison tests – Convergent of the given series – D'Alembert's Ratio test.

Unit III: Cauchy's test

Cauchy's root test – Raabe's test – Absolutely convergent series - Absolutely convergent series and conditional convergent series – Series whose terms are alternately positive and negative.

Unit IV: Binomial, Exponential and Logarithmic series

Binomial theorem for a Rational index – some important particular cases of Binomial expansion – sign of terms in Binomial expansion – Application of Binomial expansion to the summation of series - Exponential theorem - summation - Logarithmic series which can be summed up by the Logarithmic series, modification of logarithmic series, Euler's constant.

Unit V - Summation of Series

Application of Partial Fractions - Summation of series whose general term is given – Sum to n terms of the given series - Summation by difference series - Successive difference Series - Recurring series - The generating functions - sum to n terms of a given recurring series.

Text Books:

[1] T.K.ManicavachagomPillai, T.Natarajan, K.S.Ganapthy, "Algebra Vol.I", S.Viswanathan Pvt. Limited, Chennai, 2004.

Unit I : Chapter 2 Sec: 4 to 7[1]

Unit II : Chapter 2 Sec: 8 to 16 [1]

Unit III : Chapter 2 Sec: 17 to 24 [1]

Unit IV : Chapter 3 Sec: 1 to 7, 10, 13 & Chapter 4 Sec. 2, 3, 5 to 9 [1]

Unit V : Chapter 5 Sec: 2 to 7 [1]

References:

1) M.K.Singal&Asha Rani Singal, "A first course in Real Analysis", R.Chand& Co., 1999.
2) 'A guide to Mathematics', L.R.Dhanda, Kalyani Publishers.
3) Dr. S.Arumugam "Sequences & Series", New Gamma Publishers.

CORE COURSE:6 B.Sc., MATHEMATICS SEM:IVSUB.

CODE:U4RMTCC6

VECTOR CALCULUS AND FOURIER SERIES

Objectives:

- To give a systematic study of Vector Calculus and Fourier Series.
- To understand the basic concepts of vector differentiation and integration.
- To study Green's, Gauss andStoke's theorem.
- To learn the techniques of calculus and its applications in finding line integral, surface integral and volume integrals.
- To gain knowledge in Fourier cosine & sine series.

Unit I - Vector differentiation and Integration

Vector function – Limit and Continuity of a vector function- Derivative of a vector function with respect to a scalar – Curves in space – Velocity and Acceleration – Integration of Vector functions.

Unit II –Gradient, Divergence and Curl

Partial derivatives of vectors – The vector differential operator ∇ - Gradient of a scalar field – Definition – Level Surfaces – Directional derivative of a scalar point function – Tangent plane and normal to a level surface – Divergence of a vector point function – The Laplacian operator ∇^2 - Important vector identities.

Unit III –Green's, Gauss's and Stoke's Theorem

Line Integrals – Surface Integrals – Volume Integrals – Green's theorem in the plane – The divergence theorem in the plane- The divergence theorem of the Gauss – Green's Theorem – Stoke's theorem (without proof) – Related problems.

Unit IV - Fourier series

Definition - To determine the value of a_0, a_n, and b_n, Fourier Series expansion of periodic functions with period 2π, Fourier series- Even and Odd Functions – Properties of Odd and Even functions.

Unit V - Fourier series - Half range

Definition - Development in Cosine Series - Development in Sine series - Formulas problems of Half range Fourier Sine series and Half range Cosine series - Change of interval.

Text Books:

[1] “Vector Calculus” by J. N. Sharma and A.R. Vasishtha published by Krishna PrakashanMandir(1984) Co., 9th Edition.

[2] “Calculus Vol III” by T.K. ManicavachagomPillay and S. Narayanan, S.V Publications(2011)

Unit I : Chapter I- All sections [1]

Unit II: Chapter I- Sec 1 to 11 [1]

Unit III :Chapter III – Sec 2 to 9 [1]

Unit IV :Chapter 6 – Sec 1, 2, 3, 3.1, 3.4 [2]

Unit V : Chapter 6 - Sec 4, 5.1,5.2, 6, 6.1 [2]

Reference Books:

1) “Vector Algebra and Analysis”, T.K. ManicavachagomPillay and S. Narayanan, S.V Publications
2) “Allied Mathematics” - S.G.Venkatachalapathy - Margham Publications
3) “Engineering Mathematics” - by Babu Ram
4) “Mathematics – III” - A.Singaravelu

CORE COURSE :7B.SC., MATHEMATICS SEM:IV SUB CODE:U4RMTCC7

DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Objectives:

- To study the methods used to solve differential equation of first order and second order.
- To provide the standard methods for solving differential equations as well as methods based on the use of Laplace transforms.

UNIT I: ODE –First Order

Type F: Exact differential equations – Sufficient condition – practical rule for solving an exact differential equation – equations solvable for dy/dx – equations solvable for y – equations solvable for x – Clairaut’s form – equations that do not contain x explicitly – equations that do not contain y explicitly – equations homogeneous in x and y.

UNITII: ODE – Second Order

Definition – the operator D – complementary function of a linear equation with constant coefficients – particular integral – general method of finding P.I – special methods for finding P.I such as e^{ax}, cosax, sinax, x^k, e^{ax}cosbx, e^{ax}sinbx.

UNIT III: Laplace Transform

Definition – sufficient conditions for the existence of the Laplace transform – Laplace transform of periodic function- some general theorem – evaluating certain integrals – using inverselaplace transform – solving system of Differential equations using Laplace transform with constant coefficients.

UNIT IV: PDE First Order

Classification of integrals - derivation of PDE – by elimination of constants – by elimination of an arbitrary function – Lagrange's method –special method: standard form – Clairaut's form –equations reducible to the standard form – Charpit's method.

UNIT V : PDE Second Order

Some useful results – linear differential equations with constant coefficients- auxillary equation – working rule for finding C.F. –Example of Type- I.

TEXT BOOKS

[1] M.D. Raisinghania, Ordinary& Partial Differential Equations. S. Chand& Co.,

[2] S. Narayanan, "Differential Equations", S. Viswanathan Publishers, 2011.

Unit I: Chapter II Sections 6.1 -6.4 and Chapter IV: Sections 1-4 [2].

Unit II: Chapter V Sections 1-4 [2].

Unit III: Chapter IX Except section 9[2].

Unit IV: Chapter XII All sections [2].

Unit V: Chapter IV Sections 4.1-4.5[1].

References:

1) M.L.Khanna, " Differential Calculus", Jaiprakashnath and Co., Meerut – 2004.
2) M.K. Venkataraman, " Engineering Mathematics", S.V. Publication, 1985, Revised Edition.

CORE COURSE :8B.SC MATHEMATICS SEM:V CODE:U5RMTCC8

MECHANICS

OBJECTIVES:

- To understand the basic concepts of forces, moments, couple, friction law virtual displacement and work.
- To develop the skills in formation of suitable mathematical models and problems solving techniques.
- To study Simple Harmonic Motion and Projectiles.
- To develop mathematical formulation of the physics aspects of the problems.

UNIT I:Forces acting at a point and parallel forces.

Resultant and Component – Parallelogram forces – Triangle of forces – Perpendicular Triangle of forces – the polygon forces – Lami's theorem – Resolution of a force – Conditions of equilibrium – Parallel forces – Resultant of two parallel forces – Conditions of equilibrium of three coplanar forces – Centre of two parallel forces (simple problems only).

UNIT II :Moment, Couples and Equilibrium of three forces acting on a rigid body

Moment of a force – Geometrical representation – Moment of a force about an axis – Couples – Equilibrium of two couples – Resultant of coplanar couples.

UNIT III :Friction

Introduction – Statistical, Dynamical and Limiting Friction – Laws of friction – Angle of Friction – Cone of Friction – Equilibrium – Problems on Friction – Miscellaneous Problems.

UNIT IV:Projectiles

Definitions – Two fundamental principles – Path of the Projectile – Characteristic of the motion of the projectile – Horizontal range – Range on an inclined plane.

UNIT V: Simple Harmonic Motion

Introduction – Simple Harmonic Motion in a Straight line – Geometrical Representation – change of Origin – Composition of two simple harmonic motion – Motion of a particle suspended by a spiral spring – Horizontal oscillations of a particle tied to an elastic spring – Simple Pendulum – Equivalent simple pendulum – The seconds pendulum – Loss or Gain in the number of oscillation made by the pendulum.

TEXT BOOK(S)

[1] M.K.Venkataraman, "**Statics"**, Agasthiyar Publications, 2002

[2] M.K.Venkataraman, "**Dynamics"**, Agasthiyar Publications, 2002

UNIT – I -Chapter 2 full, Chapter 3 Sec:1 – 6[1]

UNIT – II -Chapter 3 Section 7 to 14, Chapter 4 Section 1 – 10[1]

UNIT – III -Chapter 7 Page no. 206 - 234[1]

UNIT - IV -Chapter 6 section 6.1 – 6.15 Page No. 139 - 177[2]

UNIT - V -Chapter 10 [2]

REFERENCE(S)

[1]P.Duraipandiyan, "**Mechanics (Vector Treatment)"**, S.Chand& Co. -June 1997

[2] A.V.Dharmapadham, "**Statics"**, S. Viswanathan Publishers Pvt Ltd, 1979.

[3] S.L. Lony, "**Elements of Statics and Dynamics"**, Part-I, A.I.T. Publishers,1991.

CORE COURSE:9 B.SC MATHEMATICS SEM:V CODE:U5RMTCC9

MODERN ALGEBRA

OBJECTIVES:

- *To educate the basic concepts of Modern Algebra.*
- *To help the student attach meaning to the abstract concepts of algebra.*
- *To study different mathematical structures such as groups, rings, vector spaces,….*

UNIT I-GROUPS

Introduction –Definition and Examples – Elementary Properties of Group – Equivalent definitions of a group – Permutation Groups – Subgroups – Cyclic groups – Order of an element.

UNIT II- NORMAL SUBGROUPS AND HOMOMORPHISM

Cosets and Lagrange's Theorem – Normal subgroups and Quotient groups – Isomorphism – Homomorphism.

UNIT III-RINGS AND FIELDS

Definition and Examples – Elementary Properties – Isomorphism – Types of rings – Characteristics of a ring – Subrings – Ideals – Quotient rings – Maximal and Prime ideals – Homomorphism of rings.

UNIT IV- VECTOR SPACES AND LINEAR TRANSFORMATION

Introduction – Definition and examples – Subspaces – Linear Transformation – Span of a set – Linear Independence.

UNIT V- BASIS, DIMENSION AND INNER PRODUCT SPACE

Basis and Dimension – Matrix of a linear Transformation – Definition and Examples – Orthogonality- Orthogonal complement.

TEXT BOOKS

[1] N.Arumugam&A.Thangapandi Isaac, "Modern Algebra", scitech Publication (2003).

Unit I : Chapter III sections 3.0 to 3.7

Unit II : Chapter III sections 3.8 to 3.11

Unit III : Chapter IV sections 4.1 to 4.10

Unit IV : Chapter V sections 5.0 to 5.5

Unit V : Chapter V sections 5.6, 5.8 and Chapter VI sections 6.1 to 6.3

REFERENCES

1) I. N. Herstein, 'Topics in Algebra', 2nd edition, Wiley Publication.
2) M.L. Santiago, Modern Algebra, Tata McGraw Hill, 2003.

CORE COURSE:10 B.Sc., MATHEMATICS SEM:V SUB. CODE:U5RMTCC10

REAL ANALYSIS

Objectives:

- To familiarize the fundamentals of Real analysis.
- To learn about different mean value theorems.

Unit I - Real Number System

Introduction to Real Number System - Field axioms - Order relation in R.Absolute value of a real number & its properties - Supremum&Infimum of a set - Order completeness property - countable & uncountable sets.

Unit II - Continuous Functions

Definition of Continuous functions - Limit of a Function - Algebra of Limits - Continuity of a function - Types of discontinuities- Algebra of continuous functions- Intermediate value theorem - Elementary properties of continuous functions - Uniform continuity of a function.

Unit III - Derivative of function

Differentiability of a function - Derivability & continuity - Algebra of derivatives - Inverse function theorem - Daurboux's Theorem on derivative.

Unit IV – Mean Value Theorems

Derivatives - Rolle's Theorem - Mean Value Theorems on derivative - Lagrange's mean value theorem Cauchy's mean value theorem - Taylor's Theorem with remainder - Power series expansion.

Unit V - Riemann Integrability

Riemann integration – definition – Darboux's theorem- Necessary and sufficient condition for integrability –integrability of continuous and monotonic functions – integral functions - Properties of Integrable functions – continuity and derivability of integrable functions – the first mean value and the fundamental theorem of calculus.

Text Books

[1] "A First Course in Real Analysis", M.K.Singhal&Asha Rani Singhal, R.Chand& Co., June 1997 Edition

[2] "A Course of Mathematical Analysis", Shanthi Narayan, S.Chand& Co., 2014.

Unit I : Chapter 1 [1]

Unit II : Chapter 5 Except sec 5 [1]

Unit III : Chapter 6 Except sec 6, 7 [1]

Unit IV : Chapter 8 Except sec 7, 8 [1]

Unit V : Chapter 6 [2]

Reference

1. "Methods of Analysis", Gold Berge, Richar. R, Oxford and IBHP Publishing co. New Delhi. (1970)
2. " Real Analysis", H.L. Royden, P.M. Fitzpatrick, PHI Learning Pvt. Ltd, 2010.

CORE COURSE:11 B.SC., MATHEMATICS SEM: V SUB CODE:U5RMTCC11

DISCRETE MATHEMATICS

Objectives:

- To understand the theory of logic and techniques of algebraic system.
- To learn about Recurrence relations and generating functions.

Unit I: Mathematical Logic

Introduction- Statements and Notations- Connectives- Normal forms- The theory of Inferences for Statement calculus.

Unit II: Predicate calculus and Inference Theory

The Predicate calculus- Predicates, statement functions, variables and quantifier, Predicate formulas, Free and Bound variables, Universe of discourse, Inference Theory- Valid formulas, Equivalences, Theory of inferences for the Predicate calculus, formulas involving more than one quantifier.

Unit III: Lattices and Boolean Algebra

Introduction- Lattices as partially ordered sets- Boolean Algebra- Boolean functions- Representation and minimization of Boolean functions.

Unit IV: Combinatorics

Permutations – Combinations – Permutations with Repetitions Combinations with Repetition – Permutations of sets with Indistinguishable objects-Miscellaneous problem on permutations and combinations- Binomial Identities.

Unit V: Recurrence Relations

Formulation - Solving by iteration method-Solving Recurrence Relations- Solving Linear Homogeneous Recurrence Relations of order two- Solving Linear Non- Homogeneous Recurrence Relations-Generating functions.

Text Books:

[1] " Discrete Mathematical Structures with applications to computer science", J.P. Tremblay and R. Manohar, McGraw Hill, 1987.

[2] " Discrete Mathematics", N.Chandrasekaran and M.Umaparvathi, PHI Learning Private Limited, New Delhi, 2010.

Unit I : Chapter 1: Sec 1,1, 1.2- Except 1.2.5, 1.3- Except 1.3.5, 1.3.6, 1.4- Except 1.4.4 [1]

Unit II : Chapter 1: Sec 1.5, 1.6 full [1]

Unit III: Chapter 4: Sec 4.1 – 4.4 [1]

Unit IV : Chapter3: Sec 3.1 to 3.6, 3.7.1 [2]

Unit V : Chapter 6: Sec 6.1 to 6.6 [2]

Reference Books:

1] "Application Oriented Algebra" by James L.Fisher, Dun Donnelly Publisher.

2] "Elements of Discrete Mathematics``, C.L. Liu, second edition. McGraw Hill.

CORE COURSE:12 B.SC., MATHEMATICS SEM: VISUB CODE:U6RMTCC12

NUMERICAL METHODS

Objectives:

- To make the students to learn the methods of solving algebraic and transcendental equations.
- To study appropriate numerical methods to evaluate a definite integral.

Unit I - Algebraic & Transcendental equations

Introduction - Bisection Method - Iteration method - Method of False Position - Newton Raphson Method.

Unit II –ODE second order

Introduction - Finite differences –Newtons method for Interpolation - Lagrange's interpolation formulae - Newton'sgeneral interpolation formulae - Method of successive approximation.

Unit III - Numerical differentiation & Integration

Introduction - Numerical differentiation –Errors in Numerical differentiation – The cubic spline method - Numerical Integration using Trapezoidal rule & Simpson's $1/3^{rd}$, $3/8^{th}$ rules - Theory and Problems.

Unit IV - Numerical Solution of ODE

Introduction - Solution by Taylor Series Method - Picard's method of successive approximations - Euler's method - Modified Euler's Method - RungeKutta 2^{nd} and 4^{th} order methods – predictor – Corrector method – Adams Moulton method – Milne's method.

Unit V -Numerical Solution of PDE

Introduction - Finite – Difference approximations to derivatives – Laplace's equation – Jaccobi's method – Gauss- seidel - Successive over – relaxation or SOR Method – the ADI method

Text Book :

[1] "Introductory Methods of Numerical Analysis" - S.S.Sastry, Prentice Hall of India Pvt. Limited, 1995.

Unit I : Chapter 2 section 2.1 to 2.5 (except 2.3.1), 2.4 – 2.5 (except 2.5.1) [1]

Unit II : Chapter 3 section 3.1, 3.3, 3.6, 3.9(3.9.1 only), 3.11(3.11.1 only), 3.12(3.12.1 only) [1]

Unit III : Chapter 5 sections 5.1,5.2,5.4(5.4.1, 5.4.2, 5.4.3 only)[1]

Unit IV : Chapter 7 Section 7.1 – 7.3 , 7.4 , 7.42,7.5,7.6 [1]

Unit V : Chapter 8 Sections 8.1 - 8.3 [1]

References:

1) "Numerical Analysis" - S.Narayanan& Others S.Viswanathan Publishers, 1994.
2) "Numerical Methods" - A.Singaravelu, Meenachi Agency, June 2000.

CORE COURSE:13 B.SC ., MATHEMATICS SEM:VI SUB CODE:U6RMTCC13

COMPLEX ANALYSIS

Objectives :

- Tounderstand the fundamental concepts of complex analysis.
- Demonstrate an understanding of the application of the theory both to other mathematical areas and to physics and engineering.
- Prove the basic results relating to analytic and harmonic functions.
- To know about various expansions of functions.
- To develop the skills in finding the definite integrals.

Unit I: Analytic Functions

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

Unit II: Bilinear Transformations and power series

Introduction- Elementary transformations- Bilinear transformations- Cross ratio- Fixed points of Bilinear transformations- Power series- Elementary Functions.

Unit III: Complex Integration

Introduction - Definite integral – Cauchy's Theorem- Cauchy's integral formula- Higher Derivatives.

Unit IV: Series Expansions

Introduction- Taylor's series- Laurant's series – Zeroes of Analytic functions- Singularities.

Unit V:Calculus of Residues

Introduction – Residues- Cauchy's Residue Theorem- Evaluation of Definite integrals.

Text Book:

[1] " Complex Analysis", S. Arumugam, A. ThangapandiIssac and A.Somasundaram, SCITECH Publications, Reprint 2014.

Unit I: Chapter 2: sec 2.0 to 2.8

Unit II: Chapter 3: sec 3.0 to 3.4 and Chapter 4: sec 4.3 and 4.4.

Unit III: Chapter 6 , full

Unit IV: Chapter 7 full

Unit V: Chapter 8 Full

Reference Books:

1. "Complex Analysis", T.K. ManichavasagamPillai and others, S.V Publications
2. " Functions of a complex variable", J.N. Sharma, Krishna Prakasan Media Ltd, 13 th edition.

CORE COURSE:14 B.SC MATHEMATICS SEM:VI

CODE:U6RMTCC14

FUZZY LOGIC

OBJECTIVES

- *To introduce the comparative study of fuzzy and crisp set.*
- *To acquire knowledge of fuzzy relations.*
- *To provide the knowledge of membership functions.*
- *To compare classical logic and fuzzy logics.*
- *To learn how to convert fuzzy to crisp.*

UNIT I: FUZZY SES AND CLASSICAL SETS

Basic definitions – Classical sets – Representation of a fuzzy set – Fuzzy measures – Cardinality of fuzzy set – Special α-cuts of a fuzzy set – Normalized fuzzy set – Height of a fuzzy set - Basic Theoretic operation of fuzzy sets – Algebraic operations on fuzzy sets – Logical operations on fuzzy sets.

UNIT II: FUZZY RELATIONS AND CLASSICAL RELATTIONS

Cartesian product – Crisp relation – Operations on crisp relations – Composition operator – Fuzzy Relations – Fuzzy Cartesian product and composition – Equivalence relations – Binary relation on a fuzzy set – Properties of binary relations.

UNIT III: MEMBERSHIP FUNCTIONS

Features of the membership function – Fuzzification – Membership functions shapes – Assignment of membership function to fuzzy variables – Evaluation of membership function.

UNIT IV: CLASSICAL LOGIC AND FUZZY LOGIC

Classical predicate logic – logical connectives – Tautologies – Condradictions – Equivalence – Logical proofs – Fuzzy logic – Approximate Reasoning.

UNIT V: FUZZY TO CRISP CONVERSIONS

Introduction – Defuzzification techniques – Lamda cuts – Defuzzification method-applications – Comparison and evaluation of defuzzification methods.

TEXT BOOK:

[1] 'Fuzzy Logic and Neural networks', M.Amirthavalli, Published by Scitech 2004.

UNIT I: Chapter 2
UNIT II: Chapter 3
UNIT III: Chapter 4
UNIT IV: Chapter 5
UNIT V: Chapter 7

REFERENCES:

(1) George J.Klir and Bo Yuan, 'Fuzzy sets and Fuzzy logic', Prentice Hall of India, New Delhi, 1995.
(2) 'Introduction to Fuzzy sets and Fuzzy logic', M.Ganesh – PHI Private Limited.

ELECTIVE COURSE :1 B.SC MATHEMATICS SEM:V

CODE:U5RMTMBE1

OPERATIONS RESEARCH

OBJECTIVES:

- *To introduce Operation Research, Linear programming formation and role of Computer in OR.*
- *To develop computational skill and logical thinking in formulating industry oriented problems as a mathematical problem and finding solutions to these problems.*
- *To introduce concepts of slack and surplus variables.*
- *To improve the skills of solving very common problems which we come across in various fields like transportation, Sequencing Problems and industries with machines.*
- *To introduce Network and to find critical path.*
- *To introduces The inventory Decisions and objectives of Scientific inventory control.*

UNIT I: Linear Programming Problem

Introduction to OR – An overview of OR – Mathematical Formulation of linear Programming problem – Graphical Solution – Simplex Methods for <, =, >constrsins.

UNIT II: Transportation problem

Introduction - LP Formulalation of Transportation problem –Solution of Transportation problem – Finding . an initial basic Feasible solution - Test for Optimality – MODI Method - Stepping Ston Method – Unbalanced Transportation problem..

UNIT III : Assignment problem

Introduction – Mathematical Formulation of problem –Solution Methods of Assignment - Unblanced Assignment problem - Travelling saleman problem.

UNIT IV: Network

Introduction Network: Basic components- Logical sequencing – Rules of Network Construction – Concurent Activities - Critical Path Analysis – Probability Consideration in PERT- Distinction between PERT and CPM.

UNIT V : Inventory control

Introduction- Types of inventories- Reasons for carrying Inventories - The inventory Decisions- objectives of Scientific inventory control - Cost Associated with Inventories- Factors Affecting inventory control- An inventory control Problem- The concept of EOQ- Deterministic inventory Problems with and without shortages- problems of EOQ with price breaks.

TEXT BOOKS

[1] KantiSwarup, Gupta.P.K,&Manmohan," **Operations Research**", Sultan Chand & Co,Sixteenth edition-2012,Reprint 2013.

UNIT – I Chapter I Sec:1.1,1.2,1.4 to1.6 ,Chapter II sec: 2.2 , 2.3 ,Chapter III Sec:3.2 to 3.5 and Chapter IV Sec:4.1,4.3,4.4 only[1].

UNIT – II -Chapter X Sections 10.1 to 10.16 Except (10.11,10.12)[1] .

UNIT – III -Chapter XI Sections 11.1 to 11.4 and11.7 [1]

UNIT – IV -Chapter XXV Sections 25.1 to 25.8[1].

UNIT – V -Chapter IXX Sections 19.1 to 19.12[1].

REFERENCES

[1] Hamdy A. Taha, "**Operations Research**" (7th Edn.), Prentice Hall of India, 2002.

[2] Richard Bronson, "**Theory and Problems of Operations Research",** Tata McGraw Hill Publishing Company Ltd, New Delhi, 1982.

ELECTIVE COURSE :2 B.SC MATHEMATICS SEM:VI

CODE:U6RMTMBE2

GRAPH THEORY

Objectives

- To know about the concepts of graph theory such as Euler's graphs, trees, Hamiltonian graphs, etc and to learn about their applications..
- To introduce matrix form of graph theory.

Unit I - Graphs - Paths and Circuits

Definition of a graph – Application of graphs finite & infinite graphs - incidence, degree, isolated & pendent vertices – Null graph - isomorphism - sub graphs - walks, paths & circuits - connected & disconnected graphs - components - Euler graphs - Operations on Graphs - More on Euler graphs - Hamiltonian paths & circuits.

Unit II - Trees and Fundamental Circuits

Trees - properties of trees - pendent vertices in a tree - distances &centres in a tree - Rooted & binary trees - Spanning trees - fundamental circuits - finding all spanning trees of a graph - spanning trees in a weighted graph.

Unit III - Cut-sets & Cut-vertices

Cut sets – Some properties of a cut set - all cut set in a graph - fundamental circuits & cut sets - connectivity &separability - Edge connectivity, vertex connectivity, separable graph.

Unit IV - Matrix Representation of Graphs

Incidence matrix – Sub matrices - Circuit Matrix - Fundamental Circuit Matrix and rank of the circuit matrix - cut set matrix - adjacency matrix

Unit V –Coloring and Partition

Chromatic Number - Chromatic partitioning - Chromatic polynomial.

Text Book:

[1] "Graph Theory with applications to Engineering and Computer Science", NarsinghDeo, Prentice Hall of India, New Delhi, 1997.

Unit I : Chapter 1, Sec. 1.1 to 1.5 & Chapter 2, Sec. 2.1, 2.2, 2.4 to 2.9 [1]

Unit II : Chapter 3, Sec. 3.1 - 3.5, 3.7 - 3.10[1]

Unit III: Chapter 4, Sec. 4.1 to 4.5[1]

Unit IV: Chapter 7, Sec. 7.1 to 7.4, 7.6, 7.9[1]

Unit V :Chapter 8, Sec. 8.1 to 8.3[1]

References:

1)"Basic Graph Theory" - K.R.Parthasarathy, Tat McGraw Hill Publishing Company, New Delhi, 1994.

G.T. John Clark, Derek Allan Holten, A First Look at Graph Theory, World Scientific Publishing Company, 1995.

2) "Invitation to Graph theory" – Dr.S. Arumugam and Dr. S. Ramachandran – Scitech publications.

3) "A first look at Graph theory" – G. T. John clark, Derek Allan Holten – World scientific publishing company, 1995.

ELECTIVE COURSE :3 B.SC MATHEMATICS SEM:VI

CODE:U6RMTMBE3

ASTRONOMY

OBJECTIVES:

- *To increase the scientific awareness among the students on Astronomy.*

- *To educate the student in the field of advanced science and technology.*

UNIT I - SPHERICAL TRIGONOMETRY - CELESTIAL SPHERE

Relevant properties of a sphere & relevant formulae for spherical trigonometry (All without proof) - Celestial sphere - Diurnal motion, Cardinal points, Sidereal Time, Latitude of a place, relation between them.

UNIT II - EARTH

Dip of the horizon - Effects of Dip - Twilight - Duration of Twilight - Astronomical refraction - Law's of refraction - Tangent & cosine's formula - properties & simple problems applying them.

UNIT III - KEPLER'S LAW & TIME

Kepler's Law of Planetary motion (statement only) - Verification of laws in the case of earth - Newton's deductions from them - Three anomalies of the Earth and relation between them - Time - Equation of time - mean time, true time, effects of equation of time seasons.

UNIT IV – YEARS, CALENDAR, PARALLAX AND ABERRATION

Different kinds of Years and Calendar - Conversion of time, relation between them - Geocentric Parallax - Aberration of light - simple problems in the above.

UNIT V - MOON

Sidereal month, Synodic month phases of moon, age of the moon, summer and winter, full moon - motions of planet (assuming that orbits are circular) - eclipses.

TEXT BOOKS

[1] S.Kumaravelu and Prof.SusheelaKumaravelu, "Astronomy", SKV Publications, 2004.

Unit I :Chapter 1 & 2

Unit II :Chapter 3, Sec. 5, 6 & Chapter 4

Unit III :Chapter 6 and Chapter 7, Sec. 1 & 2

Unit IV :Chapter 7, Sec. 3, 4 , Chapter 5 & Chapter 9

Unit V : Chapter 12 and Chapter 13.

REFERENCES

1) "An introduction to Astrophysics" by BidynathBasu, PragathiPrakasam (1981).
2) G.V. Ramachandran "Astronomy"

ELECTIVE COURSE :4 B.SC MATHEMATICS SEM:VI

CODE:U6RMTMBE4

MATHEMATICAL MODELING

Objectives:

- *To develop skills in solving real life problems through mathematical modeling.*
- *To learn graph theoretical conceptsthrough mathematical modeling.*

Unit I : Mathematical modeling Through ODE of first Order

Mathematical Modeling Through Differential Equation - Linear Growth and Decay Models, Compartment Models - Mathematical modeling in Dynamics Through ODE of first order.

Unit II : Mathematical modeling Through Systems ODE of first Order

Mathematical Modeling in Population Dynamics – Mathematical Modeling of Epidemics Through Systems of ODE of First - Compartment Model Through ODE - Mathematical modeling Economics Through System ODE of first order.

Unit III : Mathematical Modeling Through ODE of Second Order

Mathematical modeling of Planetary Motions - Mathematical modeling of Circular Motion and Motion of Satellites - Mathematical modeling Through Linear Differential Equation of Second order.

Unit IV: Mathematical modeling Through Linear Differential Equations

The Need for Mathematical modeling Through Linear Differential Equations: Some Simple Models – Basic Theory For Linear Differential Equation with Constant Coefficients - Mathematical Modeling Through Linear Differential Equations in Economics and Finance - Mathematical Modeling Through Linear Differential Equations in Dynamics and Genetics.

Unit V: Mathematical modeling Through Graphs

Situations that can be Modeled through Graphs - Mathematical Modeling in terms of Directed Graphs - Mathematical Modeling in terms of signed Graphs - Mathematical Modeling in terms of Weighted Digraphs.

Text Book

[1] Mathematical modeling – J. N. Kapur, Wiley Eastern Limited, Third print

Unit I: Chapter 2. Sec 2.1, 2.2, 2.4, 2.5 [1]

Unit II: Chapter 3. Sec 3.1-3.5 [1]

Unit III: Chapter 4. Sec 4.1- 4.3[1]

Unit IV: Chapter 5. Sec 5.1-.5.4 [1]

Unit V: Chapter 7. Sec 7.1- 7.4 [1]

References:

1. Mathematical Modeling ByMeerscharet. Mark M., Academic Press. New York, 1993.
2. Concepts of Mathematical Modeling. Meyer W.Megraw Hill, New York, 1994.

CLASS: B.Sc MATHEMATICS SEM:IV SUBJECT CODE: U4RMTSBE1

Skill Based Elective Course – IV

THEORY OF GAMES AND DECISION THEORY

OBJECTIVES:

- *To solve two – person zero sum game.*
- *To understand the concept of Dominance property.*
- *To learn about Decision Theory.*

Unit I – Game Theory

Two – person – Zero – Sum Game, Pay off matrix, Saddle point, value of the game – problems. Methods for solving game without saddle point – problems, algebraic method of solve a 3 x 3 game.

Unit II – Graphical method

Graphical method to solved a 2 x n (or) n x 2 game – problems – dominance property modified dominance property problems.

Unit III – Linear Programming

Applications to solve a game – simple problems – solving the game using the method of approximation problems.

Unit IV – Decision theorems

Decision criteria, the maximum (or) minimum criteria – problems.The Maximum (or) Minimum criteria – problems.The expected value / Laplace criteria the minimum regret / savage criterion – The Hurwitz criterion – problems.

Unit V – Decision Under Risk

The Expected Monetary Value (EMV) criterion and the Expected Opportunity Loss (EOL) criterion. Expected Value of Perfect Information (EVP) – problems, decision trees – roll – back technique.

Text Book

[1] "Operations Research methods and applications" Prof. P.Mariappan, New Century Book House Pvt. Ltd. Chennai (2002)

Unit I : Chapter 11, Sec. 11.1 to 11.3

Unit II : Chapter 11, Sec. 11.4 to 11.5

Unit III : Chapter 11, Sec. 11.6

Unit IV : Chapter 11, Sec. 11.7

Unit V : Chapter 11, Sec. 11.8 & 11.9

Reference

1) OR by V.K.Kapoor, Sultan Chand & Sons
2) OR by Handy A.Taha

CLASS: B.Sc MATHEMATICS SEM: V SUBJECT CODE: U5RMTSBE2

Skill Based Elective Course – II

QUANTITATIVE MATHEMATICS FOR COMPETITIVE EXAMINATIONS

OBJECTIVES:

- *To develop analytical ability of students.*
- *To educate the students in computational skills.*
- *To make the students prepare for competitive examinations.*

UNIT I - PERCENTAGE, PROFIT AND LOSS

Basic concepts - important formula - profit and loss - short cut methods - simple problems.

UNIT II - SIMPLE AND COMPOUND INTEREST

Introduction - formula for simple interest - relation between amount and price - simple problems on simple interest - compound interest - some important rule - simple problems based on compound interest.

UNIT III - PARTNERSHIP

Introduction - simple partnership - compound partnership - working partner - sleeping partner - monthly equivalent investments.

UNIT IV - RATIO AND PROPORTION

Introduction - Definition of ratio - compounding of ratio - comparison of ratio - properties of ratio - equal ratio - proportion - continued proportion - fourth proportional - Third proportional - mean proportional - direct proportion - inverse proportion - use of proportion in geometry.

UNIT V – ALLIGATION OR MIXTURE AND AVERAGE

Problems on allegation or mixture – Arithmetic mean –weighted Arithmetic mean – Geometric mean.

TEXT BOOK

[1] 'Quantitative Aptitude' - Naresh Sharma, Anjali Kaushik - variety bookspublishers distributors 2008.

Unit I: Chapter 1 All sections [1]

Unit II: Chapter 2 All sections [1]

Unit III: Chapter 3 All sections [1]

Unit IV: Chapter 6 All sections [1]

Unit V: Chapter 4& 5 All sections [1]

REFERENCES:

(1) 'Quantitative Aptitutde for Competative Examinations' by R.S.Aggarwal – S.Chand& sons, New Delhi 2006.

(2) 'Quantitative methods' by D.C. Sonchati, S.Chnad& sons Delhi.

CLASS: B.Sc MATHEMATICS SEM:VI SUBJECT CODE: U6RMTSBE3

Skill Based Elective Course – III

FOUNDATION MATHEMATICS FOR COMPETITIVE EXAMINATIONS

Objectives:

- To develop the aptitude of Reasoning
- To Guess & Check the Problems quickly
- To prepare for Competitive & Entrance Examinations in various fields.

Unit – I : Problems on Numbers and Ages

Problems on Numbers – Consecutive Numbers – Fraction of Numbers – worked out Problems on Ages.

Unit – II : Time & Work, Time & Distance

Relation between time and work – Problems – Formulae - Relation between time and Distance – Worked out problems.

Unit – III : Area

Definition – Formulae – Results on Quadrilateral – Area on Square, Rectangle, Triangle, Rhombus, Parallelogram – Applications.

Unit – IV : Volume and Surface Area

Definitions – Formulae – Problems on cuboid, cube, cylinder, cone, sphere & Hemisphere – simple Applications only.

Unit – V : True Discount & Banker's Discount

Important concepts – Formulae – Problems – Definitions – Banker's Discount – Problems.

Text Book:

[1] "Quantitative Aptitude for Competitive Examination" – R.S.Aggarwal – S. Chand & Sons – New Delhi –seventh edition – 2006.

Unit – I : Chapter 7 & 8 [1]
Unit – II : Chapter 15 & 17 [1]
Unit – III : Chapter 24 [1]
Unit – IV : Chapter 25 [1]
Unit – V : Chapter 32 & 33 [1]

Reference Book:

[1] "Quantitative Aptitude and Reasoning" – R.V.Praveen –Phi – Second Edition - 2012.
[2] "Quantitative Methods" – D.C. Sanchati – S. Chand & Sons – New Delhi .
[3] Quantitative Aptitude - Naresh Sharma, Anjali Kaushik - variety book publishers distributors.

CLASS: B.Sc MATHEMATICS SEM: VI SUBJECT CODE:

Skill Based Elective Course – I

A PRIMER ON DIVISIBILITY & NUMBER SEQUENCES

Objectives:

- To connect number theory to the real world.
- To examine the solution for the problem.
- To apply the strategies to solve routine and non- routine problems.
- To develop problem solving skills and to gain self assess knowledge.
- To determine which concepts and procedures are needed to complete the problem.

Unit I - Introduction &Congruences

What is Number Theory? - Terms and Symbols - Odd and Even Numbers - The Remainder symbol - other divisors - The congruence symbol - Using congruences - A test for divisibility by 13 - Using negative remainders.

Unit II - Elementary and Remaining Cases

Introduction - Divisibility by 2, 5, 4 - A generalization. Introduction - Divisibility by 9, 11 - More general results - Divisibility by 101 - Divisibility by 7 and 13 - Divisibility by 27 and 37 - Other Divisors - concluding remarks - Divisibility by 7 - Another formulation - searching for new rules - divisibility by 17, 53, 11.

Unit III –The Method of differences

Introduction - what is a pattern? - Number sequences - sequences in mathematics - terms and symbols - polynomial sequences - introduction - a symbolic apparatus.

Unit IV - Exponential Sequences

Sequences of the form $\{a^n\}$ - The sequence $\{(-1)^n\}$ - The sequence $\{z^n\}$ - The sequence $\{2^n\}$ - The sequences $\{3^n\}$ - Mixed sequences - seeking an explanation.

Unit V –Square root

Closeness – Sum of square roots - A Square roots spiral – A random sequence – Worked out problems.

Text Book:

[1] FIRST STEPS IN NUMBER THEORY - ShaileshShirali - Universities press.

[2] A prime on number sequences - ShaileshShirali - Universities press.

Unit I : Chapter 1 & 2 All sections [1]

Unit II : Chapter 3, 4, 5 All sections [1]

Unit III: Chapter 1, 2, 3 All sections [2]

Unit IV: Chapter 5 All sections [2]

Unit V : Chapter 14 All sections [2]

References :

[1] **"**ElementaryNumber theory**" –** David .M.Burton – Tata McGraw – Hill - Edition

[2] "First steps in number theory – A prime on divisibilityA prime on number sequences" - ShaileshShirali - Universities press.