Department of Mathematics

TELANGANA UNIVERSITY

NIZAMABAD, TELANGANA

B.Sc. (Mathematics) Course Structure

With effect from the Academic Year 2019-2020

TELANGANA UNIVERSITY, HYDERABAD

B.Sc. Mathematics Course Structure

(Common Core Syllabus for All Universities of Telangana State for the Students Admitted from the Academic Year 2019-20 Batch onwards)

Paper	Semester	Subject	Hours/ per week	Hours/per week		Max. Marks	Credits
				Theory	*Tutorials		
DSC – 1A	I	Differential & IntegralCalculus	6	5	1	100	5
DSC – 1B	II	Differential Equations	6	5	1	100	5
DSC – 1C	III	Real Analysis	6	5	1	100	5
SEC-I	III	**University Specific**	2	2	-	50	2
SEC-II	III	(A) Theory of Equations (OR) (B) Logic & Sets	2	2	-	50	2
DSC – 1D	IV	Algebra	6	5	1	100	5
SEC-III	IV	**University Specific**	2	2	-	50	2
SEC-IV	IV	(A) Number The (OR) (B) Vector Calculus	2	2	-	50	2
DSC – 1E	V	Linear Algebra	6	5	1	100	5
Generic Elective	V	(A) Basic Mathematics (OR) (B) Mathematics for Economics & Finance	4	4	-	100	4
DSE – 1F(A)	VI	(A) Numerical Analysis	6	5	1	100	5
DSE – 1F(B)	VI	(B) Integral Transforms	6	5	1	100	5
DSE – 1F(C)	VI	(C) Analytical Solid Geometry	6	5	1	100	5
Project/ Optional	VI**	Mathematical Modeling	4	4	-	100	4

****The students are required to opt either the optional paper **Mathematical Modeling** or **Project**.

B.Sc. I Year I Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester - I)

Paper – I : Differential and Integral Calculus

(w.e.f. academic year 2019-20)

DSC-1A **BS: 101**

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The course is aimed at exposing the students to some basic notions in differential calculus.

Outcome: By the time students complete the course they realize wide ranging applications of the subject.

Unit- I

Partial Differentiation: Introduction - Functions of two variables - Neighborhood of a point (a, b) - Continuity of a Function of two variables, Continuity at a point - Limit of a Function of two variables - Partial Derivatives - Geometrical representation of a Function of two Variables - Homogeneous Functions.

Unit- II

Theorem on Total Differentials - Composite Functions - Differentiation of Composite Functions - Implicit Functions - Equality of $f_{xy}(a, b)$ and $f_{yz}(a, b)$ - Taylor's theorem for a function of two Variables - Maxima and Minima of functions of two variables – Lagrange's Method of undetermined multipliers.

Unit- III

Curvature and Evolutes: Introduction - Definition of Curvature - Radius of Curvature - Length of Arc as a Function, Derivative of arc - Radius of Curvature - Cartesian Equations - Newtonian Method - Centre of Curvature - Chord of Curvature.

Evolutes: Evolutes and Involutes - Properties of the evolutes.

Envelopes: One Parameter Family of Curves - Consider the family of straight lines - Definition - Determination of Envelope.

Unit- IV

Lengths of Plane Curves: Introduction - Expression for the lengths of curves $y=f(x)$ - Expressions for the length of arcs $x = f(y)$; $x = f(t)$, $y = \phi(t)$; $r = f(\theta)$.

Volumes and Surfaces of Revolution: Introduction - Expression for the volume obtained by revolving about either axis - Expression for the volume obtained by revolving about any line - Area of the surface of the frustum of a cone - Expression for the surface of revolution - Pappus Theorems -Surface of revolution.

Text:

- Shanti Narayan, P.K. Mittal Differential Calculus, S.CHAND, NEW DELHI
- Shanti Narayan Integral Calculus, S.CHAND, NEW DELHI

References:

- William Anthony Granville, Percey F Smith and William Raymond Longley; Elements of the differential and integral calculus
- Joseph Edwards , Differential calculus for beginners
- Smith and Minton, Calculus
- Elis Pine, How to Enjoy Calculus
- Hari Kishan, Differential Calculus

B.Sc. I Year II Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -II)

Paper – II : Differential Equations

(w.e.f. academic year 2019-20)

DSC-1B **BS:201**

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineeringand science.

Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

Unit- I

Differential Equations of first order and first degree: Introduction - Equations in which Variables are Separable - Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form - Linear Differential Equations - Differential Equations Reducible to Linear Form - Exact differential equations - Integrating Factors - Change in variables - Total Differential Equations - Simultaneous Total Differential Equations - Equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

Unit- II

Differential Equations first order but not of first degree: Equations Solvable for p - Equations Solvable for y - Equations Solvable for x - Equations that do not contain x (or y)- Equations Homogeneous in x and y - Equations of the First Degree in x and y - Clairaut's equation.

Applications of First Order Differential Equations: Growth and Decay - Dynamics of Tumour Growth - Radioactivity and Carbon Dating - Compound Interest - Orthogonal Trajectories.

Unit- III

Higher order Linear Differential Equations: Solution of homogeneous linear

differentialequations with constant coefficients - Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}$, $b \sin ax/b$, $\cos ax$, bx^k, $V e^{ax}$ - Method of undetermined coefficients.

Unit- IV

Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy - Euler Equation - Legendre's Linear Equations - Miscellaneous Differential Equations. **Partial Differential Equations**: Formation and solution - Equations easily integrable - Linear equations of first order.

Text:

- **Zafar Ahsan**, Differential Equations and Their Applications

References

- **Frank Ayres Jr**, Theory and Problems of Differential Equations.
- **Ford, L.R**, Differential Equations.
- **Daniel Murray**, Differential Equations..
- **Balachandra Rao**, Differential Equations with Applications and Programs.
- **Stuart P Hastings, J Bryce McLead**, Classical Methods in Ordinary Differential Equations.

B.Sc. II Year III Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -III)

Paper – III **: Real Analysis**

(w.e.f. academic year 2020-21)

DSC-1C **BS:301**

Theory: 5 credits and Tutorials: 0 credits

Theory: 5 hours /week and Tutorials: 1 hour/week

Objective: The course is aimed at exposing the students to the foundations of analysis which willbe useful in understanding various physical phenomena.

Outcome: After the completion of the course students will be in a position to appreciate beautyand applicability of the course.

Unit- I

Sequences: Limits of Sequences- A Discussion about Proofs-Limit Theorems for Sequences - Monotone Sequences and Cauchy Sequences – Subsequences - Lim sup's and Lim inf's – Series - AlternatingSeries and Integral Tests.

Unit- II

Continuity: Continuous Functions - Properties of Continuous Functions - Uniform Continuity - Limits of Functions

Unit- III

Differentiation: Basic Properties of the Derivative - The Mean Value Theorem - L' Hospital Rule - Taylor's Theorem.

Unit- IV

Integration: The Riemann Integral - Properties of Riemann Integral- Fundamental Theorem of Calculus.

Text:

- **Kenneth A Ross**: Elementary Analysis-The Theory of Calculus

References:

- **S.C. Malikand Savita Arora**, Mathematical Analysis, Second Edition, Wiley Eastern Limited, New Age International (P) Limited, New Delhi, 1994.

- **William F. Trench,** Introduction to Real Analysis
- **Lee Larson,** Introduction to Real Analysis I
- **Shanti Narayan and Mittal,** Mathematical Analysis
- **Brian S. Thomson, Judith B. Bruckner, Andrew M. Bruckner;** Elementary Real analysis
- **Sudhir R., Ghorpade, Balmohan V., Limaye;** A Course in Calculus and Real Analysis

B.Sc. II Year III Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -III)

SEC – I(A) **: Skills University Specific**

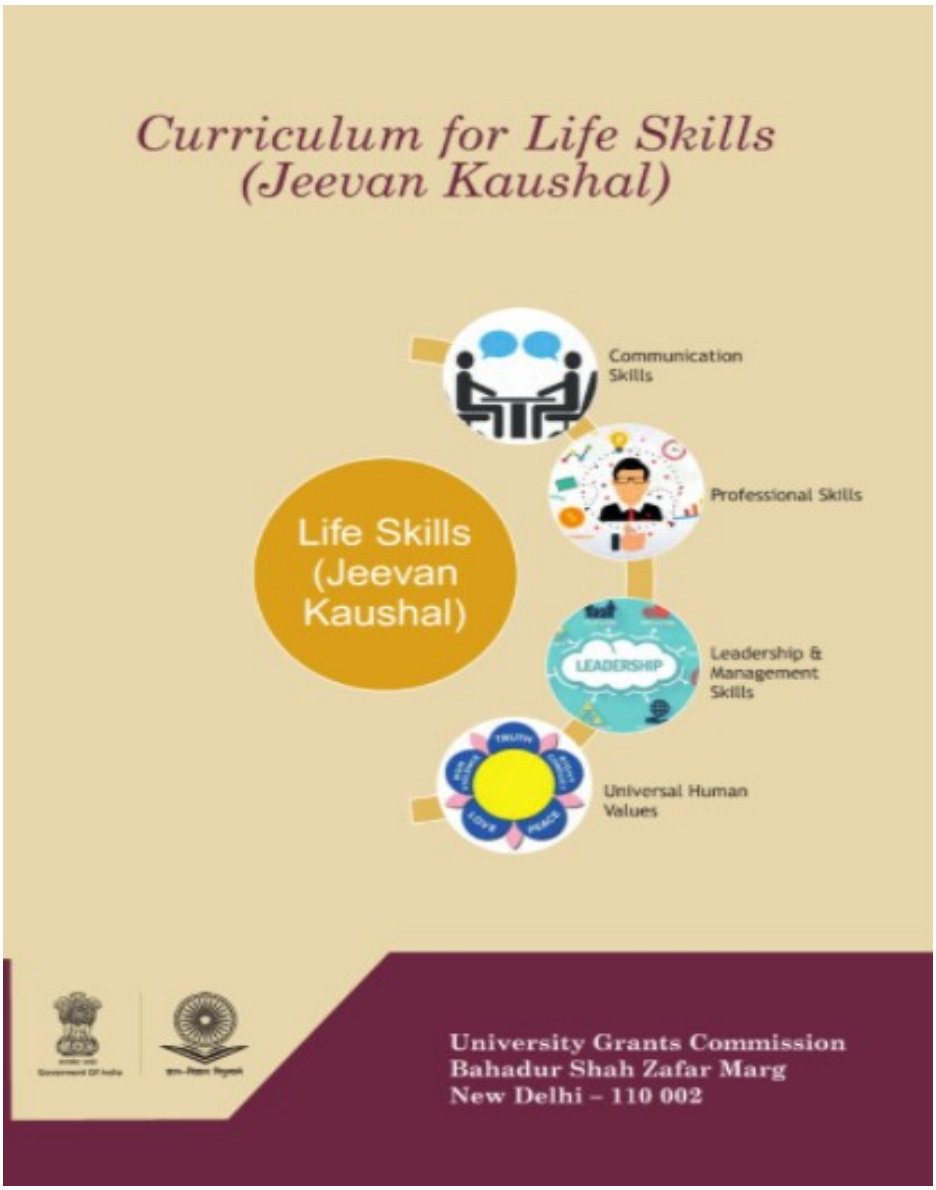
(w.e.f. academic year 2020-21)

SEC - I (A)

Theory: 2 credits Theory: 2 hours /week

For Syllabus refer:

https://ugc.ac.in/e-book/SKILL%20ENG/mobile/index.html



B.Sc. II Year III Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -III)

SEC – II(A): Theory of Equations

(w.e.f. academic year 2020-21)

SEC – II(A)

Theory: 2 credits Theory: 2 hours /week

Objective: Students learn the relation between roots and coefficients of a polynomial equation, Descartes's rule of signs in finding the number of positive and negative roots if any of a polynomialequation besides some other concepts.

Outcome: By using the concepts learnt the students are expected to solve some of the polynomialequations.

Unit- I

Graphic representation of a polynomial-Maxima and minima values of polynomials-Theorems relating to the real roots of equations-Existence of a root in the general equation -Imaginary roots- Theorem determining the number of roots of an equation-Equal roots-Imaginary roots enter equations in pairs-Descartes' rule of signs for positive roots- Descartes' rule of signs for negativeroots.

Unit- II

Relations between the roots and coefficients-Theorem-Applications of the theorem-Depression ofan equation when a relation exists between two of its roots-The cube roots of unity Symmetric functions of the roots-examples.

Text:

- **W.S. Burnside and A.W. Panton**, The Theory of Equations

References:

- **C. C. Mac Duffee**, Theory of Equations
- **Hall and Knight**, Higher Algebra

B.Sc. II Year III Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -III)

SEC – II(B): Logic and Sets

(w.e.f. academic year 2020-21)

SEC – II(B)

Theory: 2 credits Theory: 2 hours /week

Objective: Students learn some concepts in set theory and logic.

Outcome: After the completion of the course students appreciate its importance in the developmentof computer science.

Unit- I

Basic Connectives and truth tables - Logical equivalence: Laws of Logic - Logical Implication: Rules Inference: The Use of Quantifiers - Quantifiers, Definitions, and proofs of Theorems.

Unit- II

Sets and Subsets - Set Operations and the Laws of Set Theory - Counting and Venn Diagrams - A First Word on Probability - The axioms of Probability - Conditional Probability: Independence - Discrete Random variables.

Text:

- **Ralph P Grimaldi**, Discrete and Combinatorial Mathematics (5e)

References:

- **P R Halmos**, Naive Set Theory
- **E Kamke**, Theory of Sets

B.Sc. II Year IV Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -IV)

Paper – IV **: Algebra**

(w.e.f. academic year 2020-21)

DSC-1D **BS: 401**

Theory: 5 credits and Tutorials: 0 credits

Theory: 5 hours /week and Tutorials:1 hour/week

Objective: The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc.

Outcome: On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

Unit- I

Groups: Definition and Examples of Groups - Elementary Properties of Groups -Finite Groups - Subgroups -Terminology and Notation -Subgroup Tests - Examples of Subgroups.

Cyclic Groups: Properties of Cyclic Groups - Classification of Subgroups Cyclic Groups.

Unit- II

Permutation Groups: Definition and Notation -Cycle Notation-Properties of Permutations - A Check Digit Scheme Based on $D5$. Isomorphisms; Motivation - Definition and Examples - Cayley's Theorem Properties of Isomorphisms – Automorphisms - Cosets and Lagrange's Theorem Properties of Cosets 138 - Lagrange's Theorem and Consequences-An Application of Cosets to Permutation Groups -The Rotation Group of a Cube and a Soccer Ball.

Unit- III

Normal Subgroups and Factor Groups: Normal Subgroups-Factor Groups - Applications of Factor Groups -Group Homomorphisms - Definition and Examples -Properties of Homomorphisms -The First Isomorphism Theorem.

Introduction to Rings: Motivation and Definition -Examples of Rings -Properties of Rings -Subrings.

Integral Domains: Definition and Examples - Fields –Characteristics of a Ring.

Unit- IV

Ideals and Factor Rings: Ideals -Factor Rings -Prime Ideals and Maximal Ideals.

Ring Homomorphisms: Definition and Examples-Properties of Ring-Homomorphisms.

Text:

- **Joseph A Gallian**, Contemporary Abstract algebra (9th edition)

References:

- **Bhattacharya, P.B Jain, S.K.; and Nagpaul, S.R,** Basic Abstract Algebra
- **Fraleigh, J.B,** A First Course in Abstract Algebra.
- **Herstein, I.N**, Topics in Algebra
- **Robert B. Ash**, Basic Abstract Algebra
- **I Martin Isaacs**, Finite Group Theory
- **Joseph J Rotman**, Advanced Modern Algebra

B.Sc. II Year IV Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -IV)

SEC – III**: University Specific**

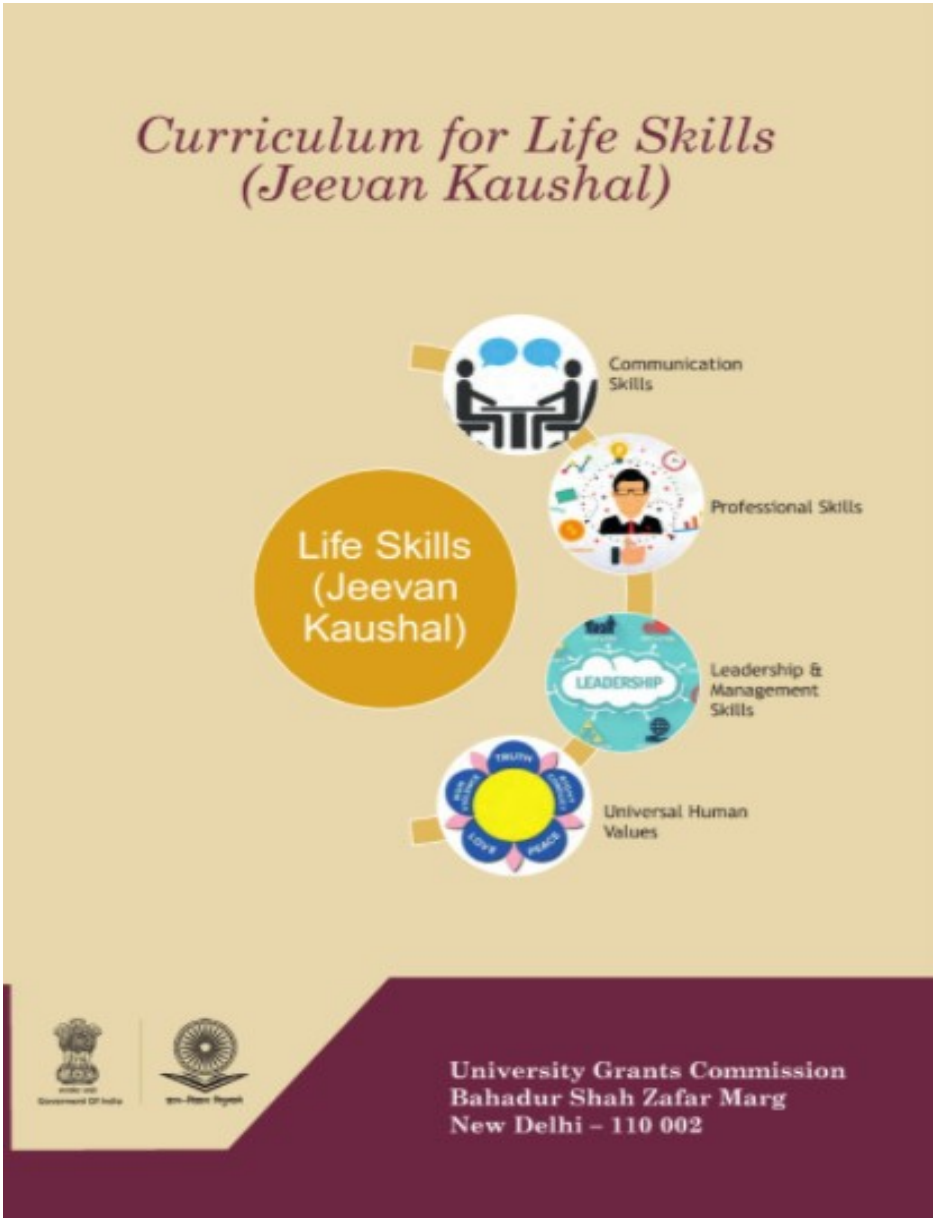
(w.e.f. academic year 2020-21)

SEC - III(A)

Theory: 2 credits Theory: 2 hours /week

For Syllabus refer:

https://ugc.ac.in/e-book/SKILL%20ENG/mobile/index.html



B.Sc. II Year IV Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -IV)

SEC – IV(A): Number Theory

(w.e.f. academic year 2020-21)

SEC – IV(A)

Theory: 2 credits Theory: 2 hours /week

Objective: Students will be exposed to some of the jewels like Fermat's theorem, Euler's theorem in the number theory.

Outcome: Student uses the knowledge acquired solving some divisor problems.

Unit- I

The Goldbach conjecture - Basic properties of congruences- Binary and Decimal Representation of integers - Number Theoretic Functions; The Sum and Number of divisors- The Mobius Inversion Formula- The Greatest integer function.

Unit- II

Euler's generalization of Fermat's Theorem: Euler's Phi function- Euler's theorem Some Propertiesof the Euler's Phi function.

Text:

- **David M Burton,** Elementary Number Theory (7e)

References:

- **Thomas Koshy,** Elementary Number Theory and its Applications
- **Kenneth H Rosen,** Elementary Number Theory

B.Sc. II Year IV Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -IV)

SEC – IV(B): Vector Calculus

(w.e.f. academic year 2020-21)

SEC – IV(B)

Theory: 2 credits Theory: 2 hours /week

Objective: Concepts like gradient, divergence, curl and their physical relevance will be taught.

Outcome: Students realize the way vector calculus is used to addresses some of the problems ofphysics.

Unit- I

Line Integrals: Introductory Example - Work done against a Force-Evaluation of Line IntegralsConservative Vector Fields.

Surface Integrals: Introductory Example: Flow Through a Pipe Evaluation of Surface Integrals.

Unit- II

Volume Integrals: Evaluation of Volume integrals.

Gradient, Divergence and Curl: Partial differentiation and Taylor series-Partial differentiation Taylor series in more than one variable-Gradient of a scalar field-Gradients, conservative fields and potentials-Physical applications of the gradient.

Text:

- **P.C. Matthews**, Vector Calculus

References:

- **G.B. Thomas and R.L. Finney**, Calculus
- **H. Anton, I. Bivens and S. Davis,** Calculus
- **Smith and Minton**, Calculus

B.Sc. III Year V Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -V)

Paper – V : Linear Algebra

(w.e.f. academic year 2021-22)

DSC-1E **BS: 501**

Theory: 5 credits and Tutorials: 0 credits

Theory: 5 hours /week and Tutorials:1 hour/week

Objective: The students are exposed to various concepts like vector spaces, bases, dimension,Eigen values etc.

Outcome: After completion this course students appreciate its interdisciplinary nature.

Unit- I

Vector Spaces: Vector Spaces and Subspaces -Null Spaces, Column Spaces, and Linear Transformations - Linearly Independent Sets; Bases - Coordinate Systems -The Dimension of a Vector Space.

Unit- II

Rank-Change of Basis - Eigen values and Eigenvectors - The Characteristic Equation

Unit- III

Diagonalization - Eigenvectors and Linear Transformations - Complex Eigenvalues - Applications to Differential Equations.

Unit- IV

Orthogonality and Least Squares: Inner Product, Length, and Orthogonality - OrthogonalSets - Orthogonal Projections - The Gram-Schmidt Process.

Text:

- **David C Lay**, Linear Algebra and its Applications 4e

References:

- **S Lang,** Introduction to Linear Algebra
- **Gilbert Strang,** Linear Algebra and its Applications
- **Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence;** Linear Algebra
- **Kuldeep Singh**; Linear Algebra
- **Sheldon Axler;** Linear Algebra Done Right

B.Sc. III Year V Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -V)

GE (A): Basic Mathematics

(w.e.f. academic year 2021-22)

Generic Elective – (A)

Theory: 4 credits

Theory: 4 hours /week

Objective: Students learn the techniques which have been applied successfully to an increasingly wide variety of complex problems in business. Also learn the scientific approach to managerial decision making.

Outcome: Student realizes how the quantitative analysis will be an aid to decision-making process. Also the quantitative analysis how it will be linked with other information in making decisions.

Unit- I

Coordinate Geometry: Fundamentals – Cartesian Coordinates system – Polar Coordinates – Distance Formula – Section Formula -Centroid of a Triangle – Area of a Triangle.(Chapter 11)

Unit- II

Straight Line: Introduction - Definitions of the Terms - Different Forms of the Equations of a Straight Line - Distance of a point from a Straight Line - Angle between two Lines and Condition of Parallelism and Perpendicularity of Lines - Point of intersection of Two Lines – Condition of Concurrency of Three Given Straight Lines - Position of a Point with respect to a given Line.(Chapter 13)

Unit- III

Matrices: Introduction - Definitions and Notations - Operations on Matrices - Determinant of a Square Matrix - Non Singular matrix and Singular Matrix - Sarrus Diagram for Expansion of Determinant of a matrix 3X3 - Properties of Determinants.

(15.1,15.2,15.3,15.5.1,15.5.2,15.5.3 of Chapter 15)

Unit- IV

Linear System of Equations: Conversion of a business problem into a Linear System ofEquations – Rank of a Matrix – Application of Rank concept – Minor and Cofactor – Adjoint of a Square matrix -Inverse of a Square Matrix – Matrix Equation – Methods to Solve Linear System of Equations – Solution to the linear system of Equations – Types of Solutions - Cramer"s rule - Matrix Inversion method.

(15.4,15.5.4,15.5.5,15.5.6,15.5.7,15.5.8,15.6,15.7.1,15.7.2,15.7.3,15.7.4,15.7.4 of Chapter15).

Text:

- **P. Mariappan**, Business Mathematics, Pearson Publication 2015, New Delhi.

B.Sc. III Year V Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -V)

GE (B): Mathematics for Economics and Finance

(w.e.f. academic year 2021-22)

Generic Elective – (B)

Theory: 4 credits

Theory: 4 hours /week

Objective: Many models and problems in modern economics and finance can be expressed using the language of mathematics and analyzed using mathematical techniques. The aim is to show how a range of important mathematical techniques work and how they can be used to explore and understand the structure of economic models.

Outcome: Student was chiefly interested in learning the mathematics that had applications to economics and finance. Students gain a familiarity with economics and finance principles and are confident in applying them.

Unit- I

Linear Equations: Introduction – Solution of Linear Equations – Solutions of Simultaneous Linear Equations – Graphs of Linear Equations – Budget Lines – Supply and Demand Analysis . **Quadratic Equations:** Introduction – Graphs of Quadratic Functions – Quadratic Equations - Applications to Economics.

Unit- II

Functions of a Single Variable: Introduction – Limits – Polynomial Functions – ReciprocalFunctions – Inverse Functions. **The Exponential and Logarithmic Functions:** Introduction – Exponential Functions – Logarithmic Functions – Returns to Scale of Production Functions – Compounding of Interest.

Unit- III

Matrices and Determinants: Introduction – Matrix Operations – Solutions of Linear Systems of Equations – Cramer's Rule – More Determinants – Special Cases.

Unit-IV

Linear Difference Equations: Introduction – Difference Equations – First Order Linear Difference Equations.

Text:

- **Vassilis. C. Mavron and Timothy N.Phillips**, Elements of Mathematics for Economics andFinance; Springer Publishers.

B.Sc. III Year VI Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -VI)

Paper – VI(A) **: Numerical Analysis**

(w.e.f. academic year 2021-22)

DSC-1F(A) **BS: 601(A)**

Theory: 5 credits and Tutorials: 0 credits

Theory: 5 hours /week and Tutorials:1 hour/week

Objective: Students will be made to understand some methods of numerical analysis.

Outcome: Students realize the importance of the subject in solving some problems of algebra andcalculus.

Unit- I

Errors in Numerical Calculations - **Solutions of Equations in One Variable**: The Bisection Method - The Iteration Method - The Method of False Position- Newton's Method - Muller's Method - solution of Systems of Nonlinear Equations.

Unit- II

Interpolation and Polynomial Approximation: Interpolation - Finite Differences - Differences of Polynomials - Newton's formula for Interpolation - Gauss's central differences formulae - Stirling's and Bessel's formula - Lagrange's Interpolation Polynomial - Divided Differences - Newton's General Interpolation formula - Inverse Interpolation.

Unit- III

Curve Fitting: Least Square Curve Fitting: Fitting a Straight Line-Nonlinear Curve Fitting. **Numerical Differentiation and Integration**: Numerical Differentiation - Numerical Integration: Trapezoidal Rule-Simpson's 1/3rd-Rule and Simpson's 3/8th-Rule - Boole's and Weddle's Rule - Newton's Cotes Integration Formulae.

Unit- IV

Numerical Solutions of Ordinary Differential Equations: Taylor's Series Method - Picard'sMethod - Euler's Methods - Runge Kutta Methods.

Text:

- **S. S. Sastry,** Introductory Methods of Numerical Analysis, PHI

References:

- **Richard L. Burden and J. Douglas Faires,** Numerical Analysis (9e)
- **M K Jain, S R K Iyengar and R K Jain,** Numerical Methods for Scientific and Engineering computation
- **B.Bradie** , A Friendly introduction to Numerical Analysis

B.Sc. III Year VI Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -VI)

Paper – VI(B) **: Integral Transforms**

(w.e.f. academic year 2021-22)

DSC-1F(B) **BS: 601(B)**

Theory: 5 credits and Tutorials: 0 credits

Theory: 5 hours /week and Tutorials:1 hour/week

Objective: Students will be exposed to Integral Transforms. The students also learning the Applications of Laplace Transforms to Differential Equations which arises in Physics and Engineering Problems.

Outcome: Students apply their knowledge to solve some problems on special functions andDifferential Equations by using the Integral Transforms.

Unit- I

Laplace Transforms-Definition-Existence theorem-Laplace transforms of derivatives and integrals – Periodic functions and some special functions.

Unit- II

Inverse Transformations - Convolution theorem - Heaviside's expansion formula.

Unit- III

Applications to ordinary differential equations - solutions of simultaneous ordinary differential equations - Applications to Partial differential equations.

Unit- IV

Fourier Transforms- Sine and cosine transforms-Inverse Fourier Transforms.

Text:

- **Vasishtha and Gupta**, Integral Transforms, Krishna Prakashan Media(P) Ltd, Meerut (2e)

B.Sc. III Year VI Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -VI)

Paper – VI(C) **: Analytical Solid Geometry**

(w.e.f. academic year 2021-22)

DSC-1F(C) **BS: 601(C)**

Theory: 5 credits and Tutorials: 0 credits

Theory: 5 hours /week and Tutorials:1 hour/week

Objective: Students learn to describe some of the surfaces by using analytical geometry.

Outcome: Students understand the beautiful interplay between algebra and geometry.

Unit- I

Sphere: Definition-The Sphere through Four Given Points-Equations of a Circle - Intersection of a Sphere and a Line-Equation of a Tangent Plane-Angle of Intersection of Two Spheres-Radical Plane.

Unit- II

Cones and Cylinders: Definition-Condition that the General Equation of second degree Represents a Cone-Cone and a Plane through its Vertex - Intersection of a Line with a Cone.

Unit- III

The Right Circular Cone-The Cylinder- The Right Circular Cylinder.

Unit- IV

The Conicoid: The General Equation of the Second Degree-Intersection of Line with a Conicoid- Plane of contact-Enveloping Cone and Cylinder.

Text:

- **Shanti Narayan and P K Mittal**, Analytical Solid Geometry (17e)

References:

- **Khaleel Ahmed**, Analytical Solid Geometry
- **S L Loney**, Solid Geometry
- **Smith and Minton**, Calculus

B.Sc. III Year VI Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -VI)

Optional Paper (B)**: Mathematical Modeling**

(w.e.f. academic year 2021-22)

Optional Paper – (B)

Theory: 4 credits Theory: 4 hours /week

Objective: This topic is aims to provide the student with some basic modeling skills that willhave application to a wide variety of problems.

Outcome: The focus is on those mathematical techniques that are applicable to models involving differential equations, and which describe rates of change. Student realizes some beautiful problems can be modeled by using differential equations. The students also learn how to use the mathematical technique in solving differential equations.

Unit- I

Introduction to Mathematical Modeling: Mathematical Models-Modeling for decision making. **Compartmental Models:**-Exponential decay and radioactivity – Case Study: Detecting art forgeries – Lake Pollution Models - First order Linear Differential Equations – Equilibrium points and stability.

Unit- II

Models of Single Populations: Exponential growth – Density-dependent growth – Limited growth with harvesting. **Interacting Population Models:** Model for an influenza outbreak – **Case Study:** Cholera – Predators and prey – Competing Species.

Unit- III

Formulating Heat and Mass Transport Models: Some basic physical laws -Model for a hot water heater- Heat conduction and Fourier's Law - Heat conduction through a wall – Radiative heat conduction - Diffusion.

Unit- IV

Boundary Value Problems – Heat loss through a wall – Insulating a water pipe – **Introduction to Partial Differential Equations:** The heat conduction equation – Oscillating soil temperatures - **Case study:** Detecting Land Mines – Lake Pollution.

Text:

- **B.Barnes and G.R.Fulford**, Mathematical Modeling with Case Studies 3rd Edition, 2009,CRC press.

References:

- **Shepley L. Ross**, "Differential Equations".
- **I. Sneddon**, Elements of Partial Differential Equations
- **Zafar Ahsan**, "Differential Equations and their Applications"

B.Sc. III Year VI Semester (CBCS): Mathematics Syllabus

(Examination at the end of Semester -VI)

(A) Project

(w.e.f. academic year 2021-22)

Project: 4 credits Project: 4 hours /week