SR&BGNR ARTS AND SCIENCE COLLEGE(AUTONOMOUS) KHAMMAM-TELANGANA

(An autonomous institution under the jurisdiction of Kakatiya University)

B.Sc. MATHEMATICS I Yr SEMESTER – I(w.e.f. 2019-2020 batch onwards)

DSC 1A :DIFFERENTIAL AND INTEGRAL CALCULUS

Theory: 5 Credits and Tutorials 0 Credits

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

Unit- I
Partial Differentiation: Introduction - Functions of two variables - Neighbourhood 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 evolute.
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*

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B.Sc. MATHEMATICS I Yr SEMESTER – II(w.e.f. 2019-2020 batch onwards)

DSC 1B :DIFFERENTIAL EQUATIONS

Theory: 5 Credits and Tutorials 0 Credits

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

Unit- I

Differential Equations of ftrst order and ftrst 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 ftrst order but not of ftrst 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 differential equations 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.*
- S. Balachandra Rao, *Differential Equations with Applications and Programs.*
- Stuart P Hastings, J Bryce McLead; *Classical Methods in Ordinary Differential Equations.*

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DSC 1C :REAL ANALYSIS

Theory: 5 Credits and Tutorials 0 Credits

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

UNIT-I
Sequences : limits of Sequences- A Discussions about Proofs- Limit Theorems for Sequences- Monotone Sequences and Cauchy Sequences- subsequences – Limit sup's and Limit inf's – series – Alternating series 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. Malik and 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*

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B.Sc. MATHEMATICS II Yr SEMESTER – IV(w.e.f. 2019-2020 batch onwards)

DSC 1D :ALGEBRA

Theory: 5 Credits and Tutorials 0 Credits

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

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 D_5. 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*

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B.Sc. II Yr SEMESTER – III(w.e.f. 2019-2020 batch onwards)

SEC I – THEORY OF EQUATIONS

Theory : 2 Credits

Theory : 2 hours/week

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 negative roots.

Unit- II

Relations between the roots and coefficients-Theorem-Applications of the theorem-Depression of an 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*

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B.Sc. II Yr SEMESTER – III(w.e.f. 2019-2020 batch onwards)

SEC II – LOGIC AND SETS

Theory : 2 Credits

Theory : 2 hours/week

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* (5*e*)

References:

· P R Halmos, *Naive Set Theory*

· E Kamke , *Theory of Sets*

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B.Sc. II Yr SEMESTER – IV(w.e.f. 2019-2020 batch onwards)

SEC III – NUMBER THEORY

Theory : 2 Credits

Theory : 2 hours/week

Unit- I

The Goldbach conjecture - Basic properties of congruences- Binary and Decimal Representation of lntegers - 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 SomeProperties of the Euler's Phi function.

Text:

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

References:

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

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B.Sc. II Yr SEMESTER – IV(w.e.f. 2019-2020 batch onwards)

SEC IV – VECTOR CALCULUS

Theory : 2 Credits

Theory : 2 hours/week

Unit- I
Line Integrals: Introductory Example - Work done against a Force-Evaluation of Line Integrals Conservative Vector Fields.
Surface Integrals: Introductory Example : Flow Through a PipeEvaluation 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*

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B.Sc. MATHEMATICS III Yr SEMESTER – V(w.e.f. 2019-2020 batch onwards)

DSC 1E :LINEAR ALGEBRA

Theory: 5 Credits and Tutorials 0 Credits

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

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 - Eigenvalues 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 - Orthogonal Sets -Orthogonal Projections - The Gram-Schmidt Process.

Text:

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

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*

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B.Sc. MATHEMATICS III Yr SEMESTER – VIw.e.f. 2019-2020 batch onwards)

DSC 1F/1 :NUMERICAL ANALYSIS

Theory: 5 Credits and Tutorials 0 Credits

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

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's Method - Euler's Methods - Runge Kutta Methods.

Text:

- Richard L. Burden and J. Douglas Faires,*Numerical Analysis* (9*e*)

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

References:

- 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*

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B.Sc. MATHEMATICS III Yr SEMESTER – VIw.e.f. 2019-2020 batch onwards)

DSC 1F/2 :INTEGRAL TRANSFORMS

Theory: 5 Credits and Tutorials 0 Credits

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

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* (2*e*)

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B.Sc. MATHEMATICS III Yr SEMESTER – VIw.e.f. 2019-2020 batch onwards)

DSC 1F/3 :ANALYTICAL SOLID GEOMETRY

Theory: 5 Credits and Tutorials 0 Credits

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

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* (17*e*)

References:

· Khaleel Ahmed, *Analytical Solid Geometry*

· S L Loney , *Solid Geometry*

· Smith and Minton, *Calculus*