AKKINENI NAGESWARA RAO COLLEGE (AUTONOMOUS)GUDIVADA-521301

(Affiliated to Krishna University Machilipatnam-Re-Accredited by NAAC with 'A' Grade)

Department of Mathematics

2020 (Regulation Syllabus)

AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA
(An Autonomous college under the jurisdiction of Krishna University, Machilipatnam)

SEMESTER-I	IB.Sc	Mathematics	CODE:20MAT1	2020-2021
No. Teaching Hours per week-6		No. of Credits-5		Paper – I

Differential Equations

UNIT – I (12 hrs)   Differential Equations of first order and first degree :
Linear Differential Equations; Differential Equations Reducible to Linear Form; Exact Differential Equations; Integrating Factors; change of Variables.

UNIT –II (12 hrs)   Orthogonal Trajectories
Differential Equations of first order but not of the first degree
Equations solvable for p; Equations solvable for y; Equations solvable for x, Equations of the first degree in x and y – Clairaut's Equation

UNIT –III (12 hrs)   Higher order linear differential equations-I
Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.
General Solution of f(D)y=0
General Solution of f(D)y=Q when Q is a function of x
P.I. of f(D)y=Q when Q=b e^{ax}
P.I. of f(D)y = Q when Q is b sin ax(or) b cosa x.

UNIT –IV (12 hrs)   Higher order linear differential equations-II
Solution of the non-homogeneous linear differential equations with constant coefficients.
P.I. of f(D)y=Q when Q=bx^k
P.I. of f(D)y=Q when Q=e^{ax}V, where V= sin b x(or)cosb x (or) x ^{k}
P.I. of f(D)y=xV, where V= sin bx (or)cosbx.
P.I.of f(D)y=x^n V, where V= sin b x (or)cosbx .

UNIT –V (12 hrs)   Higher order linear differential equations-III :
Method of variation of parameters; The Cauchy-Euler Equation; Legendre's Equation

Reference Books :
1. Differential Equations and Their Applications by ZafarAhsan, published by Prentice-Hall of India Learning Pvt. Ltd. New Delhi-Second edition.
2. A text book of mathematics for BA/BSc Vol 1 by N. Krishna Murthy & others, published by S. Chand & Company, New Delhi.
3. Ordinary and Partial Differential Equations Raisinghania, published by S. Chand & Company, New Delhi.
4. Differential Equations with applications and programs – S. BalachandraRao& HR Anuradha-universities press.

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SEMESTER-II	IB.Sc	Mathematics	CODE:20MAT2	2020-2021
No. Teaching Hours per week-6		No. of Credits-5		Paper – II

Three Dimensional Analytical Solid Geometry

UNIT – I (12 hrs)   **The Plane**

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes,orthogonal projection on a plane.

UNIT –II (12 hrs)   **The Line**

Equation of a line, Angle between a line and a plane, The condition that a given line may lie in a given plane, The condition that two given lines are coplanar, The shortest distance between two lines,The length and equations of the line of shortest distance between two straight lines, Length of the perpendicular from a given point to a given line.

UNIT –III (12 hrs)   **The Sphere**

Definition and equation of the sphere, Equation of the sphere through four given points, Plane sections of a sphere, Intersection of two spheres, Equation of a circle, Sphere through a given circle, Intersection of a sphere and a line , power of a point,Tangent plane, Polar plane, Pole of a Plane,Conjugate points, Conjugate planes.

UNIT –IV (12 hrs)   **The Sphere and Cones**

Angle of intersection of two spheres, Conditions for two spheres to be orthogonal, Radical plane, Coaxial system of spheres,simplified from the equation of two spheres, limiting points.Definitions of a cone, vertex, guiding curve, generators, Equation of the cone with a given vertex and guiding curve, equations of cones with vertex at origin are homogeneous, condition that the general equation of the second degree should represent a cone.

UNIT –V (12 hrs)   **Cones**

Enveloping cone of a sphere, Right circular cone, Equation of the right circular cone with a given vertex, axis and semi-vertical angle, Condition that a cone may have three mutually perpendicular generators, Intersection of a line and a quadric cone, Tangent lines and tangent plane at a point, Condition that a plane may touch a cone,Reciprocal cones, intersection of two cones with a common vertex.

Reference Books :

Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, Published by S. Chand & Company Ltd. 7th Edition.

2. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, Published by S. Chand & Company, New Delhi.

3. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, Published by Wiley Eastern Ltd., 1999.

4. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.

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SEMESTER-III	II B.Sc	Mathematics	CODE:20MAT3	2021-2022
No. Teaching Hours per week-6		No. of Credits-5		Paper – III

Abstract Algebra

UNIT-I (12 Hours)   GROUPS

Binary Operation – Algebraic structure – semi-group-monoid – Group definition and elementary properties Finite and Infinite groups – examples – order of a group, Composition tables with examples.

UNIT– II (12 Hours)   SUBGROUPS

Complex Definition -Multiplication of two complexes- Inverse of a complex-Subgroup definition- examples-criterion for a complex to be a subgroups- Criterion for the product of two subgroups to be a subgroup-union and Intersection of subgroups. Co-sets and Lagrange's Theorem:Cosets Definition – properties of Cosets –Index of a subgroups of a finite groups– Lagrange's Theorem.

UNIT-III (12Hours)

NORMAL SUBGROUPS: Definition of normal subgroup – proper and improper normal subgroup– Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group –quotient group – criteria for the existence of a quotient group.

HOMOMORPHISM : Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties– kernel of a homomorphism–fundamental theorem on Homomorphism and applications.

UNIT-IV(12-HOURS)

PERMUTATIONS: Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations– transposition – even and odd permutations – Cayley's theorem.
CYCLIC GROUPS: Definition of cyclic group – elementary properties – classification of cyclic groups.
UNIT – V (12 Hours)

RINGS: Definition of Ring and basic properties- Boolean Rings-divisors of zero and cancellation laws Rings-Integral Domains, Division Ring and Fields- The characteristic of a ring - The characteristic of an Integral Domain- The characteristic of a Field- Sub Rings-Ideals.

Reference Books :

1. SA text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published by S.Chand & Company, New Delhi.
2. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
3. Modern Algebra by M.L.Khanna.Rings and Linear Algebra by Pundir & Pundir, published by PragathiPrakasha

SEMESTER-III	IIB.Sc	Mathematics	CODE:20ASK4	2021-2022

Analytical Skills

Common forB.A/B.com/B.sc Programmes

Semester-III(Total 30 Hours)

Unit-I

Arithmetic ability:

Algebric operations ,BODMAS,Fractions, Divisibility Rules,LCM and HCF

Verbal reasoning:

Number series,Coding and Decoding,Calendars.

Unit-II
Quantitative Aptitude:

Averages ,Ratio and Proportions,Time,Distance and speed.

Business Computation:

Percentages, Profit & loss, Partnership, simple interest and compound interest.

UNIT – III

Data Interpretation:

Tabulation, Bar Graphs, Pie Charts, Line Graphs, Venn diagrams.

Reference Books:

1. Analytical Skills by KSR Publishers.

2. Analytical Skills by Kalyani Publishers

SEMESTER-IV	IIB.Sc	Mathematics	CODE:20MAT4-A	2021-2022
No. Teaching Hours per week-6		No. of Credits-5		Paper – IV

Real Analysis

UNIT – 1 : (12 Hrs) SEQUENCES

Sequences ,limit of a sequence and convergent sequence, monotonic sequence, necessary and sufficient condition for convergence of monotonic sequence, cauchy sequences, Cauchey's general principle of convergence theorem, Cauchy's first theorem on limits,Cauchey's second theorem on limits.

UNIT – 2 : (12Hrs) INFINITE SERIES

Introduction to series, convergence series, geometric series, limit comparison test, P-test, Cauchey's n^{th} root test, D'Alembert's ratio test, Alternating series, Leibnitz test, Absolute and conditional convergence.

UNIT –3 : (12 Hrs) CONTINUITY

Continuous functions, continuous functions on intervals, Uniform continuity.

UNIT – 4 : (12 Hrs) DERIVABILITY

Derivability of a function at a point and on an interval, Derivability and continuity of a function, Rolle's , Lagrange's , Cauchey's mean value theorems.

UNIT – 5 : (12 Hrs) RIEMANN INTEGRAL

Riemann Integral, Riemann integral functions, Darboux theorem, necessary and sufficient condition for Riemann Integrability, properties of integral functions, Fundamental theorem of Integral calculus, First and second mean value theorems on Riemann integrals, Integral as a limit of a sum.

Reference Books :
1. Real Analysis by Rabert&Bartely and D.R.Sherbart published by John Wiley.
2.A text book of B.Sc. Mathematics published by S.Chand& Company Pvt. Ltd., New Delhi.
3. Element of Real Analysis by Shanthi Narayana and Dr.M.D.Raisingkaniapublished by S.Chand& Company Pvt. Ltd., New Delhi.

SEMESTER-IV	IIB.Sc	Mathematics	CODE:20MAT4-B	2021-2022
No. Teaching Hours per week-6		No. of Credits-5		Paper – V

Linear Algebra

UNIT – I (12 hrs)   Vector Spaces-I

Vector Spaces;General properties of vector spaces; n-dimensional Vectors; addition and scalar multiplication of Vectors;internal and external composition; Null space;Vector subspaces;Algebra of subspaces; Linear Sum of two subspaces; linear combination of Vectors; Linear span; Linear independence and Linear dependence of Vectors.

UNIT –II (12 hrs)   Vector Spaces-II

Basis of Vector space; Finite dimensional Vector spaces; basis extension;co-ordinates; Dimension of a Vector space;Dimension of a subspace;Quotient space and Dimension of Quotientspace.

UNIT –III (12 hrs)   Linear Transformations

Linear transformations; linear operators; Properties of Linear transformations; Range and null space of linear transformations; Rank and Nullity of linear transformations; Rank – Nullity Theorem.

UNIT –IV (12 hrs)   Matrix

Matrices; Elementary Properties of Matrices;Rank of Matrix by Echelon form and Normal form; Inverse Matrices; Linear Equations;Characteristic Roots & Vectors of square Matrix;Cayley – Hamilton Theorem.

UNIT –V (12 hrs)   Inner product space

Inner product spaces; Euclidean and unitary spaces; Norm or length of a Vector; Schwartz inequality;Triangle in Inequality; Parallelogram law;Orthogonality; Orthonormal set;complete orthonormal set; Gram – Schmidt orthogonalisation process;Bessel's inequality and Parseval's Identity.

Reference Books :

1. Linear Algebra by J.N.Sharma and A.R.Vasista, Published by Krishna Prakashan Mandir,Meerut-250002.
2. Matrices by Shanti Narayana Published by S. Chand & Company, New Delhi.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education , New Delhi

SEMESTER-VI	IIIB.Sc	Mathematics	CODE:20MAT6B	2022-2023
No. Teaching Hours per week-6		No. of Credits-5		Paper – VI

Multiple Integrals and Applications of Vector Calculus

UNIT – I (12 hrs)   Multiple integrals-I:

1. Introduction , Double integrals, Evaluation of double integrals, Properties of double integrals.

2. Region of integration, double integration in Polar Co-ordinates.
Change of variables in double integrals, change of order of integration

UNIT –II (12 hrs)   Multiple integrals-II:

1. Triple integral, region of integration, change of variables.
2. Plane areas by double integrals, surface area by double integral.
3. Volume as a double integral, volume as a triple integral

UNIT –III (12 hrs)   Vector differentiation:

1. Vector differentiation , Ordinary derivatives of vectors.
2. Differentiability, Gradient , Divergence, Curl Operators,
3. Formulae involving these Operators.

UNIT –IV (12 hrs)   Vector integration:

1. Line Integrals with examples.
2. Surface Integral with examples.
3. Volume integral with examples

UNIT –V (12 hrs)   Vector integration applications:

1. Gauss theorem and applications of Gauss theorem .
2. Green's theorem in plane and applications of Green's theorem.
3. Stokes's theorem and applications of Stokes theorem.

Reference Books :

1. Dr.M Anitha, Linear Algebra and Vector Calculus for Engineer, Spectrum University Press, SR Nagar, Hyderabad-500038, INDIA.
2. Dr.M.Babu Prasad, Dr.K.Krishna Rao, D.Srinivasulu, Y.AdiNarayana, Engineering Mathematics-II, Spectrum University Press, SR Nagar, Hyderabad-500038,INDIA.
3. V.Venkateswararao, N. Krishnamurthy, B.V.S.S.Sarma and S.Anjaneya Sastry, A text Book of B.Sc., Mathematics Volume-III, S. Chand & Company, Pvt. Ltd., Ram Nagar,NewDelhi-110055.
4. R.Gupta,Vector Calculus, Laxmi Publications.
5. P.C.Matthews, Vector Calculus, Springer Verlag publications

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SEMESTER-VI	IIIB.Sc	Mathematics	CODE:20MAT7B	2022-2023
No. Teaching Hours per week-6		No. of Credits-5		Paper – VII

Integral Transforms with Applications

UNIT – I (12 hrs)   Laplace Transforms -I

1. Definition of Laplace transform, linearity property-piecewise continuous function.
2. Existence of Laplace transform, functions of exponential order and of class A.
3. First shifting theorem, second shifting theorem and change of scale property.

UNIT –II (12 hrs)   Laplace Transforms -II

1. Laplace Transform of the derivatives, initial value theorem and final value theorem. Laplace transforms of integrals.
2. Laplace transform of t^n. $f(t)$, division by t, evolution of integrals by Laplace transforms.
3. Laplace transform of some special functions-namely Dirac delta function, error function, Bessel function.

UNIT –III (12 hrs)   Inverse Laplace transforms:

1. Definition of Inverse Laplace transform, linear property, first shifting theorem, second shifting theorem, change of scale property, use of partial fractions.
2. Inverse Laplace transforms of derivatives, inverse, Laplace transforms of integrals,multiplication by powers of 'p', division by 'p'.

Convolution, convolution theorem proof and applications.

UNIT –IV (12 hrs)   Fourier series:

1. Introduction, Euler's formulae for Fourier series expansion of a function f(x), Dirichlet's conditions for Fourier series, convergence of Fourier series.
2. Functions having arbitrary periods. Change of interval, Half range series.

UNIT –V (12 hrs)   Fourier transforms:

1. Integral transforms, Fourier integral theorem (without proof), Fourier sine and cosine integrals.
2. Properties of Fourier transforms, change of scale property, shifting property, modulation theorem.Convolution.
3. Convolution theorem for Fourier transform, Parseval's Identify, finite Fourier transforms.

Reference Books :

1. Dr. S.Sreenadh, S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr. V.Ramesh Babu, Fourier series and Integral Transforms, S. Chand & Company, Pvt. Ltd., Ram Nagar, New Delhi-110055.
2. A.R. Vasistha, Dr. R.K. Gupta, Laplace Transforms, Krishna Prakashan Media Pvt. Ltd.Meerut.
3. M.D.Raisinghania, H.C. Saxsena , H.K. Dass, Integral Transforms, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.Dr. J.K. Goyal, K.P. Gupta, Laplace and Fourier Transforms, Pragathi Prakashan, Meerut.
4. Shanthi Narayana , P.K. Mittal, A Course of Mathematical Analysis, S. Chand & Company Pvt.Ltd. Ram Nagar, New Delhi-110055