SEMESTER-II

COURSE 3: DIFFERENTIAL EQUATIONS

Theory Credits: 4 5 hrs./week

Course Outcomes

After successful completion of this course, the student will be able to

1. Solve first order first degree linear differential equations.
2. Convert a non-exact homogeneous equation to exact differential equation by using an integrating factor.
3. Know the methods of finding solution of a differential equation of first order but not of first degree.
4. Solve higher-order linear differential equations for both homogeneous and non-homogeneous, with constant coefficients.
5. Understand and apply the appropriate methods for solving higher order differential equations

Course Content

Unit – 1

Differential Equations of first order and first degree

Linear Differential Equations – Bernoulli's Equations - Exact Differential Equations –Integrating factors - Equations reducible to Exact Equations by Integrating Factors -

i) Inspection Method ii) $\frac{1}{Mx+Ny}$ iii) $\frac{1}{Mx-Ny}$

Unit – 2

Differential Equations of first order but not of first degree

Equations solvable for p, Equations solvable for y, Equations solvable for x – Clairaut's equation - Orthogonal Trajectories: Cartesian and Polar forms.

Unit – 3

Higher order linear differential equations

Solutions of homogeneous linear differential equations of order n with constant coefficients - Solutions of non-homogeneous linear differential equations with constant coefficients by means of polynomial operators

(i) $Q(x)=e^{ax}$ (ii) $Q(x)=\sin ax$ or $Q(x)=\cos ax$

Unit – 4

Higher order linear differential equations (continued.)

Solution to a non-homogeneous linear differential equation with constant coefficients

P.I. of $f(D)=Q$ where $Q=bx^k$

P.I. of $f(D)=Q$ when $Q=e^{ax}V$, where V is a function of x

P.I. of $f(D)=Q$ when $Q=xV$, where V is a function of x

Unit – 5

Higher order linear differential equations with non-constant coefficients

Linear differential Equations with non-constant coefficients; Cauchy-Euler Equation; Legendre Equation; Method of variation of parameters

Activities

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving Sessions.

Text Book

Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

Reference Books

1. Ordinary and Partial Differential Equations by Dr. M.D. Raisinghania, published by S. Chand & Company, New Delhi.
2. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-Universities Press.
3. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press.

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SEMESTER-II
COURSE 4: ANALYTICAL SOLID GEOMETRY
Theory Credits: 4 5 hrs./week

Course Outcomes

After successful completion of this course, the student will be able to
1. Understand planes and system of planes
2. Know the detailed idea of lines
3. Understand spheres and their properties
4. Know system of spheres and coaxial system of spheres
5. Understand various types of cones

Course Content

Unit – 1
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 – 2
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 - Number of arbitrary constants in the equations of straight line - Sets of conditions which determine a line - 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 – 3
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 - Plane of contact; Polar plane - Pole of a Plane - Conjugate points - Conjugate planes.

Unit – 4
Spheres (continued)

Angle of intersection of two spheres - Conditions for two spheres to be orthogonal - Radical plane; Coaxial system of spheres - Simplified from of the equation of two spheres.

Unit – 5
Cones

Definitions of a cone – vertex, guiding curve and generators - Equation of the cone with a given vertex and guiding curve - Equations of cones with vertex at origin are homogenous - Condition that the general equation of the second degree should represent a cone - Enveloping cone of a sphere - Right circular cone - Equation of the right circular cone with a given vertex, axis and semi vertical angle.

Activities

Seminar/ Quiz/ Assignments/Three-dimensional analytical Solid geometry and its applications/ Problem Solving Sessions.

Text Book

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

Reference Books

1. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, published by Wiley Eastern Ltd., 1999.
2. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata McGraw -Hill Publishers.
3. Solid Geometry by B. Rama Bhupal Reddy, published by Spectrum University Press.

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COURSE-III

CBCS/ SEMESTER SYSTEM

(w.e.f. 2020-21 Admitted Batch)

B.A./B.Sc. MATHEMATICS

ABSTRACT ALGEBRA

SYLLABUS (75 Hours)

Course Outcomes:

After successful completion of this course, the student will be able to;

1. acquire the basic knowledge and structure of groups, subgroups and cyclic groups.
2. get the significance of the notation of a normal subgroups.
3. get the behavior of permutations and operations on them.
4. study the homomorphisms and isomorphisms with applications.
5. understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.
6. understand the applications of ring theory in various fields.

Course Syllabus:

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 (12 Hours)

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 AND CYCLIC GROUPS :

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

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Group theory and its applications / Problem Solving.

Text Book :

A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, published by S.Chand & Company, New Delhi.

Reference Books :

1. Abstract Algebra by J.B. Fraleigh, Published by Narosa publishing house.
2. Modern Algebra by M.L. Khanna.
3. Rings and Linear Algebra by Pundir & Pundir, published by Pragathi Prakashan.

COURSE-IV

CBCS/ SEMESTER SYSTEM

(w.e.f. 2020-21 Admitted Batch)

B.A./B.Sc. MATHEMATICS

REAL ANALYSIS

SYLLABUS (75 Hours)

Course Outcomes:

After successful completion of this course, the student will be able to

1. get clear idea about the real numbers and real valued functions.
2. obtain the skills of analyzing the concepts and applying appropriate methods for testing convergence of a sequence/ series.
3. test the continuity and differentiability and Riemann integration of a function.
4. know the geometrical interpretation of mean value theorems.

Course Syllabus:

UNIT – I (12 Hours)

REAL NUMBERS :

The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supremum property; intervals. (No question is to be set from this portion).

Real Sequences:

Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence. The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchy's general principle of convergence theorem.

UNIT –II (12 Hours)

INFINITIE SERIES :

Series : Introduction to series, convergence of series. Cauchy's general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test

2. Cauchy's n^{th} root test or Root Test.

3. D'-Alemberts' Test or Ratio Test.

4. Alternating Series – Leibnitz Test.

Absolute convergence and conditional convergence.

UNIT – III (12 Hours)

CONTINUITY :

Limits : Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. (No question is to be set from this portion).

Continuous functions : Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity.

UNIT – IV (12 Hours)

DIFFERENTIATION AND MEAN VALUE THEORMS :

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Rolle's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem

UNIT – V (12 Hours)

RIEMANN INTEGRATION :

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/ Real Analysis and its applications / Problem Solving.

Text Book:

Introduction to Real Analysis by Robert G.Bartle and Donlad R. Sherbert, published by John Wiley.

Reference Books:

1.A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.

2.Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisinghania, published by S. Chand & Company Pvt. Ltd., New Delhi.

COURSE-V

CBCS/ SEMESTER SYSTEM

(w.e.f. 2020-21 Admitted Batch)

B.A./B.Sc. MATHEMATICS

LINEAR ALGEBRA

SYLLABUS (75 Hours)

Course Outcomes:

After successful completion of this course, the student will be able to;

1. understand the concepts of vector spaces, subspaces, basises, dimension and their properties
2. understand the concepts of linear transformations and their properties
3. apply Cayley- Hamilton theorem to problems for finding the inverse of a matrix and higher powers of matrices without using routine methods
4. learn the properties of inner product spaces and determine orthogonality in inner product spaces.

Course Syllabus:

UNIT – I (12 Hours)

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 Hours)

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 Quotient space.

UNIT –III (12 Hours)

Linear Transformations:

Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

SRI VENKATESWARA UNIVERSITY: TIRUPATI

Semester-wise Revised Syllabus under CBCS, 2020-21

Four-year B.A. /B.Sc. (Hons)

Subject: **MATHEMATICS**

IV Year B.A./B.Sc.(Hons)– Semester – V Max Marks:100

Course-6B: Multiple integrals and applications of Vector calculus

(Skill Enhancement Course (Elective), 5 credits)

I. Learning Outcomes:

Students after successful completion of the course will be able to

1. Learn multiple integrals as a natural extension of definite integral to a function of two variables in the case of double integral / three variables in the case of triple integral.
2. Learn applications in terms of finding surface area by double integral and volume by triple integral.
3. Evaluate line, surface and volume integrals.
4. understand relation between surface and volume integrals (Gauss divergence theorem), relation between line integral and volume integral (Green's theorem), relation between line and surface integral (Stokes theorem)

II. Syllabus: (Hours: Teaching: 75 (incl. unit tests etc.05), Training: 15)

Unit – 1: Multiple integrals-I (15h)

1. Introduction, Double integrals, Evaluation of double integrals, Properties of double integrals.
2. Region of integration, double integration in Polar Co-ordinates,
3. Change of variables in double integrals.

Unit – 2: Multiple integrals-II (15h)

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

Unit – 3: Vector differentiation (15h)

1. Vector differentiation, ordinary derivatives of vectors.
2. Differentiability, Gradient, Divergence, Curl operators,
3. Formulae involving the separators.

Unit – 4: Vector integration (15h)

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

Unit – 5: Vector integration applications (15h)

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.

III. Reference Books:

1.Dr.M Anitha, Linear Algebra and Vector Calculus for Engineer, Spectrum University

K.SUBBARAYUDU
M.Sc., M.Ph.,
Lecturer in Mathamatics
Govt Degree College for Women
MADANAPALLE-517 325

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.

6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) Mandatory:

1. **For Teacher:** Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Field/Web).

   1. The methods of evaluating double integrals and triple integrals in the class room and train to evaluate These integrals of different functions over different regions.
   2. Applications of line integral, surface integral and volume integral.
   3. Applications of Gauss divergence theorem, Green's theorem and Stokes's theorem.

2. **For Student: Fieldwork/Project work** Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following, by choosing any one of the following aspects.

   1. Going through the web sources like Open Educational Resources to find the values of double and triple integrals of specific functions in a given region and make conclusions. (or)

   2. Going through the web sources like Open Educational Resources to evaluate line integral, surface integral and volume integral and apply Gauss divergence theorem, Green's theorem and Stokes theorem and make conclusions.

3. **Max. Marks for Fieldwork/Project work Report: 05.**

4. **Suggested Format for Fieldwork/Project work Report**: Title page, Student Details, Index page,Stepwise work-done, Findings, Conclusions and Acknowledgements.

4. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified are

V. Model Question Paper: Multiple Integrals And Vector Calculus

Max.Marks:75 **Time:3 hrs**

SECTION - A (Total: 5 X 5=25Marks)

(Answer any **five questions**. Each answer carries **5 Marks**)

1. Evaluate $\int_0^3 \int_1^2 xy(x+y)dy\,dx$.
2. Evaluate $\iiint (x^2+y^2+z^2)dx\,dy\,dz$ taken over the volume enclosed by the sphere $x^2+y^2+z^2=1$.

K.SUBBARAYUDU
M.Sc., M.F
Lecturer in Mathamatics
Govt Degree College for Women
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3. Find the smaller area bounded by $y^2 = 4x, x + y = 3$ $and\ x - axis$.

4. If $a = x + y + z; b = x^2 + y^2 + z^2; c = xy + yz + zx$. prove that $[\nabla a\ \ \nabla b\ \ \nabla c] = 0$.

5. Find $divf$ & $curlf$ where $f = grad(x^3 + y^3 + z^3 - 3xyz)$.

6. If $\bar{F} = 3xy\,\bar{\imath} - 5z\bar{\jmath} + 10x\bar{k}$, evaluate $\int \bar{F}.d\bar{r}$ $along\ the\ curve\ x = t^2, y = 2t^2, z = t^3$ from $t = 1\ to\ t = 2$.

7. If $\frac{d^2\bar{r}}{dt^2} = 6t\,i - 24t^2 j + 4sint\,k$ find $\bar{r}$ given that $\bar{r} = 2\,i + j$ and $\frac{d\bar{r}}{dt} = -i - 3\,k$ $at\ t = 0$.

8. Show that $\int_S (ax\,i + by\,j + cz\,k).Nds = \frac{4\pi}{3}(a + b + c)$. where S is the surface of the sphere $x^2 + y^2 + z^2 = 1$.

SECTION - B (Total: 5 X 10 = 50 Marks)

(Answer One question from each unit. Each question carries **10 Marks)**

9. (a) Evaluate $\int_R \int \sqrt{xy - y^2}\,dx\,dy$ where R is the triangle with vertices (0,0), (10,1), (1,1).

(Or)

(b) By changing into polar coordinates evaluate $\iint \frac{x^2y^2}{x^2+y^2}\,dx\,dy$ over the angular region between the circles $x^2 + y^2 = a^2, x^2 + y^2 = b^2$ $(b > a)$.

10. (a) Find the area of the sphere $x^2 + y^2 + z^2 = 16\,a^2$ cut off by the cylinder $x^2 + y^2 = 4ax$.

(Or)

(b) Find the volume of the cylinder $x^2 + y^2 = 4$ bounded by the planes z=0 and the surface $z = x^2 + y^2 + 2$.

11. (a) If $\bar{r} = a\cot i + a\ sint\ j + at\ tan\theta\ k$ find $\left|\frac{d\bar{r}}{dt} \times \frac{d^2\bar{r}}{dt^2}\right|$ and $\left[\frac{d\bar{r}}{dt}\,\frac{d^2\bar{r}}{dt^2}\,\frac{d^3\bar{r}}{dt^3}\right]$.

(Or)

(b) Find the directional derivative of $\phi = xy + yz + zx$ at A in the direction of $\overline{AB}$

where $A = (1,2,-1); B = (-1,2,3)$.

12. (a) Evaluate $\int \bar{F}.Nds$ where $\bar{F} = 18z\hat{\imath} - 12\hat{\jmath} + 3y\hat{k}$ and 'S' is the part of the surface of $2x + 3y + 6z = 12$ located in the first octant.

(Or)

(b) If $F = 2xz\,i - x\,j + y^2\,k$ Evaluate $\int_V FdV$ where V is the region bounded by the surface $x = 0; y = 2; y = 0; y = 6; z = x^2; z = 4$.

13. (a) State and prove Gauss divergence theorem.

(Or)

(b) Verify Green's theorem in the plane for $\oint(3x^2 - 8y^2)dx + (14x - 6yx)dy$ where 'C' is boundary of the region bounded by $y = \sqrt{x}$ and $y = x^2$.

K.Subbarayudu, BOS Chairman
Mathematics, GDC for Women, Madanapalle

SRI VENKATESWARA UNIVERSITY: TIRUPATI

Semester-wise Revised Syllabus under CBCS, 2020-21

Three year/Four-year B.A. /B.Sc. (Hons)

Subject: **MATHEMATICS**

IV Year B.A./B.Sc.(Hons)– **Semester – V** Max Marks: 100

Course-7B: Integral transforms with applications

(Skill Enhancement Course (Elective), 5 credits)

I. Learning Outcomes:

Students after successful completion of the course will be able to

1. Evaluate Laplace transforms of certain functions, find Laplace transforms of derivatives and of integrals.
2. Determine properties of Laplace transform which may be solved by application of special functions namely Dirac delta function, error function, Bessel function and periodic function.
3. Understand properties of inverse Laplace transforms, find inverse Laplace transforms of derivatives and of integrals.
4. Solve ordinary differential equations with constant/ variable coefficients by using Laplace transform method.
5. Comprehend the properties of Fourier transforms and solve problems related to finite Fourier transforms.

II. Syllabus :(Hours: Teaching: 75 (incl. unit tests etc.05), Training: 15)

Unit – 1: Laplace transforms- I (15h)

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 – 2: Laplace transforms- II (15h)

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 Error function and Bessel function.

Unit – 3: Inverse Laplace transforms (15h)

1. Definitions of Inverse Laplace transform linear property, first shifting theorem, second shifting theorem, change of scale property.
2. Inverse Laplace Transform using partial fractions, Inverse Laplace transforms of derivatives, Inverse Laplace transforms of integrals.
3. Multiplication by powers of 'p', division by 'p'.

Unit – 4: Applications of Laplace transforms (15h)

1. Convolution, convolution theorem proof and applications.
2. Solutions of differential equations with constants coefficients.
3. Solutions of differential equations with variable coefficient.

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M.Sc., M.F
Lecturer in Mathamatics
Govt Degree College for Women
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Unit – 5: Fourier transforms (15h)

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 transforms, Parseval's Identify.

III. 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.
3. M.D.Raisinghania, H.C. Saxsena , H.K. Dass, Integral Transforms, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
4. Dr. J.K. Goyal, K.P. Gupta, Laplace and Fourier Transforms, Pragathi Prakashan, Meerut.
5. Shanthi Narayana , P.K. Mittal, A Course of Mathematical Analysis, S. Chand & Company Pvt.Ltd. Ram Nagar, New Delhi-110055.
6. Web resources suggested by the teacher and college librarian including reading material.

IV. Co-Curricular Activities:

A) Mandatory:

1. For Teacher: Teacher shall train students in the following skills for 15 hours, by taking Relevant outside data (Field/Web).

1. Demonstrate on sufficient conditions for the existence of the Laplace transform of a function.
2. Evaluation of Laplace transforms and methods of finding Laplace transforms.
3. Evaluations of Inverse Laplace transforms and methods of finding Inverse Laplace transforms.
4. Fourier transforms and solutions of integral equations.

2. For Student: Fieldwork/Project work; Each student individually shall undertake Fieldwork/Project work and submit a report not exceeding 10 pages in the given format on the work-done in the areas like the following, by choosing any one of the aspects.

1. Going through the web sources like Open Educational Resources on Applications of Laplace transforms and Inverse Laplace transforms to find solutions of ordinary differential equations with constant /variable coefficients and make conclusions. (or)
2. Going through the web sources like Open Educational Resources on Applications of convolution theorem to solve integral equations and make conclusions. (or)
3. Going through the web source like Open Educational Resources on Applications of Fourier transforms to solve integral equations and make conclusions.
4. **Max. Marks for Fieldwork/Project work Report: 05.**

4. **Suggested Format for Fieldwork/Project work Report**: Title page, Student Details, Index page,Stepwise work-done, Findings, Conclusions and Acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Assignments/collection of data, Seminar, Quiz, Group discussions/Debates
2. Visits to research organizations, Statistical Cells, Universities, ISI etc.
3. Invited lectures and presentations on related topics by experts in the specified area.

K.SUBBARAYUDU
M.Sc., M.P
Lecturer in Mathamatics
Govt Degree College for Women
MADANAPALLE-517 325

V. Model Question Paper: Integral Transforms With Applications
Max.Marks:75

Time:3 hrs

SECTION - A (Total: 5 X 5=25Marks)

(Answer any **Five questions.** Each question carries **5 Marks)**

1). Find $L\{te^{-2t}sin3t\}$.

2) Find the Laplace transform of the function f defined by $f(t) = \begin{cases} (t-1)^2 & if \quad t>1 \\ 0 & if \quad 0<t<1 \end{cases}$

3) Find $L\left\{\left(\sqrt{t}+\frac{1}{\sqrt{t}}\right)^3\right\}$

4) Find $L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\}$

5) Find $L^{-1}\left\{\frac{1+e^{-\pi s}}{s^2+1}\right\}$

6) Using Laplace transform, solve $(D^2+4D+5)y = 5$, given that $y(0) = 0, y^1(0) = 0$.

7) Find the Fourier cosine transform of e^{-x^2}

8) State and prove Modulation Theorem.

SECTION - B (Total: 5 X 10 = 50 Marks)

(Answer **One** question from each unit. Each question carries **10 Marks)**

Unit - I

9) a) State and prove Second shifting theorem. **(OR)** b) Find L{Sinhat cos at}

Unit - II

10) a) Using Laplace transform, evaluate $\int_0^\infty \frac{e^{-t}sin^2t}{t}\,dt$

(OR)

b) State and prove initial value theorem

Unit – III

11) a) Find $L^{-1}\left\{\frac{s+2}{s^2(s+1)(s-2)}\right\}$. **(OR)** b) Find $L^{-1}\left\{\tan^{-1}\left(\frac{a}{s}\right)+\cot^{-1}\left(\frac{s}{b}\right)\right\}$.

Unit - IV

12) a) Using convolution theorem, find $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$.

(OR)

b) Using Laplace transform, solve $y^{11}+2y^1+5y = e^{-t}sint$, given that y(o) = 0 , $y^1(0) = 1$.

Unit - V

13) a) State and prove Parseval's Identity.

(OR)

b) Find the Fourier transform of f(x) defined by $f(x) = \begin{cases} 1 & if \quad |x|<a \\ 0 & if \quad |x|>a \end{cases}$

and hence evaluate $\int_0^\infty \frac{sinp}{p}dp$ and $\int_{-\infty}^\infty \frac{sinap\ cospx}{p}dp$

K.Subbarayudu, BOS Chairman
Mathematics, GDC for Women, Madanapalle