

LESSON PLAN
ENGINEERING MATHEMATICS-III

PREPARED BY
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LECTURER IN MATHEMATICS



DEPARTMENT OF ELECTRICAL ENGINEERING
GOVERNMENT POLYTECHNIC BARGARH

GOVERNMENT POLYTECHNIC BARGARH

VISION OF THE INSTITUTE

To be a reputed polytechnic institute imparting quality technical education to produce diploma engineers with dynamic personalities and innovative competencies in the state of Odisha.

MISSION OF THE INSTITUTE

- To offer the best and advanced lab facilities adhering to the curriculum to make future engineers.
- To engage highly qualified and competent faculties to make the student acquire the skillful knowledge required.
- To develop an excellent teaching learning environment leading to create the best institute.

VISION OF THE DEPARTMENT

To produce Electrical Engineering professionals who can contribute for Socio-economic and technological development to meet global needs.

MISSION OF THE DEPARTMENT

- M1:-** To strengthen academic infrastructure leading to quality professional by using modern technical tools and technologies.
- M2:-** To impart innovative knowledge among the students and make more Industry- institution programs to make them successful professionals for serving the society.
- M3:-** To provide a learning environment to improve problem solving abilities, leadership abilities, ethical responsibilities and lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVE (PEO)

- PEO1:-** To obtain basic and advanced knowledge in Electrical Engineering for employment in public/private sector organizations.
- PEO2:-** To encourage the students for higher studies by acquiring knowledge in the basic and emerging areas of Electrical Engineering.
- PEO3:-** To become entrepreneurs to showcase Innovative Ideas.
- PEO4:-** To have a well-rounded education that includes excellent communication skills, working effectively on team-based projects, ethical and social responsibilities.

NAME OF THE COURSE: EE
COURSE CODE
TOTAL PERIOD
THEORY PERIOD
MAXIMUM MARKS

RATIONALE:
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OBJECTIVE
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SYLLABUS

NAME OF THE COURSE: ENGINEERING MATHEMATICS-III			
COURSE CODE	TH-1	SEMESTER	3 RD
TOTAL PERIOD	60	EXAMINATION	3 Hrs
THEORY PERIOD	4P/Week	CLASS TEST	20
MAXIMUM MARKS	100	END SEMESTER EXAMINATION	80

RATIONALE:

The subject engineering mathematics-III is a common paper for engineering branches. This subject includes complex numbers, Matrices, Laplace Transforms, Fourier series, Differential equations and Numerical Methods etc for solution of engineering problems.

OBJECTIVE:

On completion of study of Engineering Mathematics-III, the students will be able to:

1. Apply complex number concept in electricity , Quadratic equation , Imaginary numbers in signal processing, Radar & even biology (Brain Waves)
2. Apply Matrices in Engineering fields such as Electrical Circuits and Linear programming.
3. Transform Engineering problems to mathematical models with the help of differential equations and familiarize with the methods of solving by Analytical methods, Transform method and operator method and Numerical methods.
4. Solve algebraic equations by iterative Methods easily programmable in computers.
5. Analysis data and develop interpolating polynomials through method of differences

C. Topic wise distribution of periods:		
Sl. No.	Topics	Period
1	Complex Numbers	06
2	Matrices	04
3	Differential Equations	10
4	Laplace transforms	12
5	Fourier Series	12
6	Numerical Methods	04
7	Finite difference & interpolation	12
	Total:	60

COURSE CONTENTS:

1. Complex Numbers

- 1.1. Real and Imaginary numbers.
- 1.2. Complex numbers, conjugate of a complex numbers, Modulus and complex number.
- 1.3. Geometrical Representation of Complex Numbers.
- 1.4. Properties of Complex Numbers.
- 1.5. Determination of three cube roots of unity and their properties.
- 1.6. De Moivre's theorem.
- 1.7. Solve problems on 1.1 - 1.6.

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2. Matrices

- 2.1. Define rank of a matrix.
- 2.2. Perform elementary row transformations to determine the rank of a matrix.
- 2.3. State Rouche's theorem for consistency of a system of linear equations in unknowns.
- 2.4. Solve equations in three unknowns testing consistency.
- 2.5. Solve problems on 2.1 - 2.4.

3. Linear Differential Equations

- 3.1. Define Homogeneous and Non -Homogeneous Linear Differential Equations with constant coefficients with examples.
- 3.2. Find general solution of linear Differential Equations in terms of C.F. and P.I.
- 3.3. Derive rules for finding C.F. And P.I. in terms of operator D , excluding $\frac{1}{f(D)} x^n$.
- 3.4. Define partial differential equation (P.D.E) .
- 3.5. Form partial differential equations by eliminating arbitrary constants and arbitrary functions.
- 3.6. Solve partial differential equations of the form $Pp + Qq = R$
- 3.7. Solve problems on 3.1- 3.6

4. Laplace Transforms:

- 4.1. Define Gamma function and $\Gamma(n+1)=n!$ and find $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.
- 4.2. Define Laplace Transform of a function $f(t)$ and Inverse Laplace Transform .
- 4.3. Derive L.T. of standard functions and explain existence conditions of L.T.
- 4.4. Explain linear, shifting property of L.T.
- 4.5. Formulate L.T. of derivatives, integrals, multiplication by t^n and division by t .
- 4.6. Derive formulae of inverse L.T. and explain method of partial fractions .
- 4.7. solve problem on 4.1- 4.6

5. FOURIER SERIES:

- 5.1. Define periodic functions.
- 5.2. State Dirichlet's condition for the Fourier expansion of a function and it's convergence
- 5.3. Express periodic function $f(x)$ satisfying Dirichlet's conditions as a Fourier series.
- 5.4. State Euler's formulae.
- 5.5. Define Even and Odd functions and find Fourier Series in $(0 \leq x \leq 2\pi)$ and $(-\pi \leq x \leq \pi)$.
- 5.6. Obtain F.S of continuous functions and functions having points of discontinuity in $(0 \leq x \leq 2\pi)$ and $(-\pi \leq x \leq \pi)$.

5.7. Solve problems on 5.1 – 5.6

6. NUMERICAL METHODS:

6.1. Appraise limitation of analytical methods of solution of Algebraic Equations.

6.2. Derive iterative formula for finding the solutions of Algebraic Equations by :

6.2.1. Bisection method

6.2.2. Newton- Raphson method

6.3. solve problems on 6.2.

7. FINITE DIFFERENCE AND INTERPOLATION:

7.1. Explain finite difference and form table of forward and backward difference.

7.2. Define shift Operator (E) and establish relation between shift operator E difference operator (Δ).

7.3. Derive Newton's forward and backward interpolation formula for equal intervals.

7.4. State Lagrange's interpolation formula for unequal intervals.

7.5. Explain numerical integration and state:

7.5.1. Newton's Cote's formula.

7.5.2. Trapezoidal rule.

7.5.3. Simpson's $1/3^{\text{rd}}$ rule

7.6. Solve problems on 7.1- 7.5

Syllabus to be covered up to I.A.

Chapter: 1,2,3 and 4

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Higher engineering mathematics	Dr B.S. Grewal	khanna publishers
2.	Elements of mathematics Vol-1	Odisha state bureau of text book preparation and production	
3.	Text Book of Engineering Mathematics-I	C.R Mallick	Kalayani publication
4.	Text Book of engineering mathematics-III	C.R Mallick	Kalayani publication

ENGINEERING MATHEMATICS-III **(3RD SEMESTER)**

COURSE OUT COME:-

AFTER COMPLETION OF THE COURSE, THE STUDENTS WILL BE ABLE TO:

1. Apply the concept of complex number to solve different types of engineering Problems.
2. Apply matrices in engineering field to solve systems of linear equations using multiple methods.
3. Understand the various principles of getting solution of ordinary differential equation and partial differential equations.
4. Analyze and solve engineering problems using Laplace transform and inverse Laplace transform.
5. Apply the analytical technique to express periodic function as a Fourier sine and Fourier cosine series.
6. Perform data analysis and develop interpolating polynomials through method of differences and solve algebraic and transcendental equations by iterative methods.

Discipline: ELECTRICAL ENGG.	Semester: 3 RD	DATE: 15-09-2022 to 21-01-2023 Session-2022-23(Winter) Name of the Teaching faculty: Jitendra Kumar Malik, Lecturer in Mathematics
Sub: Engineering Mathematics-III	No of Days/weeks-04 Total Class allotted-60	
Period	Class Day	Theory Topics to be covered.
1	16-09-2022	Definition of complex numbers, conjugate of a complex numbers.
2	19-09-2022	Problems
3	20-09-2022	Modules and amplitude of complex numbers, polar form of a complex number.
4	21-09-2022	Problems
5	23-09-2022	Square root of a complex number and examples of it.
6	26-09-2022	Cube root of complex numbers.
7	27-09-2022	Problems
8	28-09-2022	Problems
9	30-09-2022	Types of matrices with examples.
10	10-10-2022	Definition of rank of a matrix with examples.
11	11-10-2022	Rouche's Theorem and consistency of system of linear equations.
12	12-10-2022	Problems
13	14-10-2022	Definition Higher order differential equations with example, homogeneous and non homogeneous differential equations
14	17-10-2022	Solution of Higher order differential equations in term of C.F. & P.I.
15	18-10-2022	Problems
16	19-10-2022	Problems
17	21-10-2022	Problems
18	25-10-2022	Definition of partial differential equations, Form partial differential equations by eliminating arbitrary constant and arbitrary functions.
19	26-10-2022	Solution of partial differential equations of the form $Pp+Qq=R$
20	28-10-2022	Problems
21	31-10-2022	Problems
22	01-11-2022	Definition of Gamma function, problems related to gamma functions.
23	02-11-2022	Definitions of Laplace Transformations of functions, some basics formulae.
24	04-11-2022	Shifting theorem and its related Problems.
25	07-11-2022	Problems
26	09-11-2022	Problems
27	11-11-2022	Laplace transformations of derivatives, integrations, multiplications by t^n and division by t .
28	14-11-2022	Problems
29	15-11-2022	Problems
30	16	Formulae for inverse Laplace Transformations, partial fractions
31	18-11-2022	Problems
32	21-11-2022	Problems
33	22-11-2022	Definition of Fourier series, periodic Functions, examples.

34	23-11-2022	Definitions of Dirichlet's conditions, Euler's formulae for Fourier series.
35	25-11-2022	Definition of odd and even function, some basic formulae.
36	28-11-2022	Problems
37	29-11-2022	Problems
38	30-11-2022	Problems
39	02-12-2022	Problems
40	05-12-2022	Problems
41	06-12-2022	Significant digit, rounding of decimal numbers
42	07-12-2022	Iterative formula for finding the solution of Algebraic equations.1.Bisection methods
43	09-12-2022	Problems
44	12-12-2022	2.Newton-Raphon's Methods
45	13-12-2022	Problems
46	14-12-2022	Definition of finite difference and interpolation methods.
47	16-12-2022	Shift, forward and backward operator formula.
48	19-12-2022	Problems
49	20-12-2022	Relation between shift, forward and back ward operator.
50	21-12-2022	Lagrange interpolation formula & its related problems
51	23-12-2022	Newton's forward and backward interpolation formula & its related problems.
52	26-12-2022	Problems
53	27-12-2022	Newton's cotes formula, Trapezoidal rule, Simpsons $1/3^{\text{rd}}$ rule
54	28-12-2022	Problems
55	30-12-2022	Problems
56	02-01-2023	Problems
57	03-01-2023	Discussion of Probable questions and answers.
58	04-01-2023	Discussion of Probable questions and answers.
59	06-01-2023	Discussion of Probable questions and answers.
60	09-01-2023	Discussion of Probable questions and answers.
61	10-01-2023	Discussion of Probable questions and answers.
62	11-01-2023	Discussion of Probable questions and answers.
63	13-01-2023	Discussion of Probable questions and answers.
64	16-01-2023	Discussion of Probable questions and answers.
65	17-01-2023	Discussion of Probable questions and answers.
66	18-01-2023	Discussion of Probable questions and answers.
67	20-01-2023	Discussion of Probable questions and answers.

J. Jendaa
12/09/22
Signature of the faculty

P. J. J.
29/9/22
Signature of the HOD