Lesson Plan

Branch: Artificial Intelligence and Data Science
Semester: I Year: 2022-23

Course Title: Engineering Mathematics I	SEE: 3 Hours – Theory
Total Contact Hours: 35 Hours	Duration of SEE: 3 Hours
SEE Marks: 80 (Theory) + 20 (IA)	
Lesson Plan Author: Prasad Lalit	Date: 30/11/2022
Checked By:	Date:

Prerequisites: Review of complex numbers – Algebra of complex numbers, Cartesian, Polar, and Exponential form of a complex number

Syllabus:

1. **Complex Numbers**
   - Statement of D'Moivre's theorem
   - Expansion of sine and cosine function from power to multiple and from multiple
   - to power
   - Powers and roots of complex numbers
2. **Hyperbolic functions and Logarithm of a complex number**
   - Circular and hyperbolic functions, inverse circular and inverse hyperbolic functions, separation into real and imaginary parts
   - Logarithm of a complex number, separation of real and imaginary parts of logarithmic functions
3. **Partial Differentiation**
   - Functions of several variables, partial derivatives of first and higher order, differentiation of composite functions
   - Euler's theorem (with proof) and its deductions for homogeneous functions of two Variables
4. **Applications of partial differentiation and successive differentiation**
   - Maxima and minima of functions of two variables and Lagrange multiplier of functions of two variables
   - nth derivative, Leibnitz theorem without proof and problems
5. **Matrices**
   - Types of matrices (symmetric, skew-symmetric, hermitian, skew-hermitian, orthogonal, and unitary), Rank of a matrix using a row-echelon form, normal form, and PAQ form
   - Non-homogeneous and homogeneous system of linear equations and their solutions
6. **Numerical solutions of transcendental equations, system of equations, and expansion of functions**
   - Numerical solutions of transcendental equations: Regula-Falsi and Newton, Raphson methods
   - Numerical solutions of the system of equations: Jacobi method, Gauss-Seidal method
   - Expansion of functions: Taylor's series, Maclaurin's series, expansions of exponential, logarithmic functions, circular trigonometric and hyperbolic functions

Course Outcomes (CO):

On successful completion of the course learner will be able to:

FEC101.1. Demonstrate the basics of complex numbers, and obtain the roots of a complex number using De Movire’s theorem and separate the complex number into real and imaginary parts.
FEC101.2. Obtain the nth derivative of a function using successive differentiation.
FEC101.3. Apply partial differentiation technique to obtain the extremum of the given function
FEC101.4. Apply the concepts of matrices to solve the system of linear equations.
FEC101.5. Apply the concept of Numerical Methods for solving engineering problems with the help of SCILAB software

CO-PO Mapping: (BL – Blooms Taxonomy, C – Competency, PI – Performance Indicator)

CO	BL	C	PI	PO	Mapping
FEC101.1. Demonstrate the basics of complex numbers, obtain the roots of a complex number using De Movire’s theorem and separate the complex number into real and imaginary parts.	2	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC101.2. Obtain the nth derivative of a function using successive differentiation.	3	1.1 1.3	1.1.1 1.3.1	PO1	3
FEC101.3. Apply partial differentiation technique to obtain the extremum of the given function	3	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC101.4. Apply the concepts of matrices to solve the system of linear equations.	3	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC101.5. Apply the concept of Numerical Methods for solving engineering problems with the help of SCILAB software.	2	5.3	5.3.1	PO5	1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
FEC101.1	3				1							
FEC101.2	3											
FEC101.3	3				1							
FEC101.4	3				1							
FEC101.5					1							

Justification: PO1: The course provides the essential mathematical knowledge required in the fields of engineering and technology.
PO5: The course provides hands-on experience using SCILAB software to handle real-life problems.

CO Measurement Weightages for Tools:

	Test	Lab	Assignment	SEE (O)	SEE (T)	Course Exit Survey
FEC101.1	30%	---	10%	---	60%	100%
FEC101.2	30%	---	10%	---	60%	100%
FEC101.3	20%	---	20%	---	60%	100%
FEC101.4	30%	---	10%	---	60%	100%
FEC101.5	---	100%	---	---	---	100%

Attainment:

CO FEC101.1:

Direct Method

$$A_{FEC101.1D} = 0.3 * Test + 0.1 * Tutorial + 0.6 * SEE\_Theory$$

Final Attainment:

$$A_{FEC101.1} = 0.8 * A_{FEC101D} + 0.2 * A_{FEC101.1I}$$

CO FEC101.2:

Direct Method

$$A_{FEC101.2D} = 0.3 * Test + 0.1 * Tutorial + 0.6 * SEE\_Theory$$

Final Attainment:

$$A_{FEC101.2} = 0.8 * A_{FEC101.2D} + 0.2 * A_{FEC101..2I}$$

CO FEC103.3:

Direct Method

$$A_{FEC101.3} = 0.2 * Test + 0.1 * Tutorial + 0.1 * Tutorial + 0.6 * SEE\_Theory$$

Final Attainment:

$$A_{FEC101.3} = 0.8 * A_{FEC101.3D} + 0.2 * A_{FEC101.3I}$$

CO FEC104.4:

Direct Method

$$A_{FEC101.4D} = 0.3 * Test + 0.1 * Tutorial + 0.6 * SEE\_Theory$$

Final Attainment:

$$A_{FEC101.4} = 0.8 * A_{FEC101.4D} + 0.2 * A_{FEC101.4I}$$

CO FEC101.5:

Direct Method

$$A_{FEC101.5D} = 1 * \Pr actical$$

Final Attainment:

$$A_{FEC101.5} = 0.8 * A_{FEC101.5D} + 0.2 * A_{FEC101.5I}$$

Course Level Gap (if any): No
Content beyond Syllabus: No

Lecture Plan (Theory):

Module	Contents	Hours	Planned Date	Actual Date	Content Delivery Method	Remark
01	D' Moivre's theorem	06	16/11/2022	14/11/2022	Traditional	Exchanged with SP
	D'Moivre's theorem		17/11/2022	16/11/2022	Traditional	
	Roots of a complex number		18/11/2022	16/11/2022	Traditional	
	Roots of a complex number		23/11/2022	17/11/2022	Traditional	
	Power to multiple and multiple to power of trigonometric functions		24/11/2022	21/11/2022	Traditional	
	Power to multiple and multiple to power of trigonometric functions		25/11/2022	23/11/2022	Traditional	
02	Hyperbolic functions	11	30/11/2022	24/11/2022	Traditional	
	Hyperbolic functions		01/12/2022	25/11/2022	Traditional	
	Inverse Hyperbolic function		02/12/2022	30/11/2022	Traditional	
	Inverse Hyperbolic function		07/12/2022	30/11/2022	Traditional	Extra class of DB
	Inverse Hyperbolic function		08/12/2022	01/12/2022	Traditional	
	Separation into real and imaginary parts		09/12/2022	02/12/2022	Traditional	
	Separation into real and imaginary parts		14/12/2022	06/12/2022	Traditional	
	Separation into real and imaginary parts		15/12/2022	07/12/2022	Traditional	
	The logarithm of a complex number		16/12/2022	08/12/2022	Traditional	

	The logarithm of a complex number		28/12/2022	09/12/2022	Traditional	21-23 Dec UT 1
	The Logarithm of a complex number		29/12/2022	14/12/2022	Traditional	
03	Partial differentiation	10	11/01/2023	27/12/2022	Traditional	Extra class of SP
	Partial differentiation		12/01/2023	28/12/2022	Traditional	
	Composite functions		13/01/2023	29/12/2022	Traditional	
	Composite functions		18/01/2023	29/12/2022	Traditional	Extra class of BP
	Examples based on Euler’s theorem		19/01/2023	30/12/2022	Traditional	
	Examples based on Euler’s theorem		20/01/2023	30/12/2022	Traditional	Extra class of DB
	Deductions from Euler’s theorem		25/01/2023	04/01/2023	Traditional	
	Deductions from Euler’s theorem		27/01/2023	05/01/2023	Traditional	
	Deductions from Euler’s theorem		01/02/2023	06/01/2023	Traditional	
	Deductions from Euler’s theorem		02/02/2023	07/01/2023	Traditional	
04	Successive differentiation	08	30/12/2022	15/12/2022	Traditional	
	Successive differentiation		04/01/2023	16/12/2022	Traditional	
	Leibnitz rule		05/01/2023	26/12/2022	Traditional	Extra class of SSR
	Leibnitz rule		06/01/2023	27/12/2022	Traditional	Extra class of DB
	Maxima and Minima		03/02/2023	10/01/2023	Traditional	
	Maxima and Minima		08/02/2023	11/01/2023	Traditional	
	Lagrange’s multiplier method		09/02/2023	13/01/2023	Traditional	
	Lagrange’s multiplier method		10/02/2023	19/02/2021	Traditional	

Lecture Plan (Tutorial):

The entire class will be divided into three batches. The common tutorial slot for all the batches is scheduled on Tuesday from 2.00 pm to 3.00 pm.

Sr. No.	Contents	Planned Date	Actual Date
01	Tutorial 1: Complex Numbers	13/12/2022	12/12/2022
02	Tutorial 2: Successive Differentiation	03/01/2023	03/01/2023
03	Tutorial 3: Partial Differentiation	10/01/2023	17/01/2023
04	Tutorial 4: Matrices	17/01/2023	24/01/2023
05	Tutorial 5: Applications of partial derivatives	24/01/2023	03/02/2023
06	SCILAB Practical	03/02/2023	10/01/2023

Rubrics for Tutorial

Indicator	Excellent	Good	Poor
Formulation of the problem (2)	Writing all formulae correctly (2)	One or two mistakes in the formulae (1)	Wrong formulae (0)
Stepwise explanation (3)	Explained all steps clearly (3)	One or two steps are left out (2)	Important steps are skipped (1)
Accuracy in solving (3)	Final answer obtained accurately (3)	Minor error in calculation (2)	Major error in calculations (1)
Overall presentation (2)	Introduce new methods of solving (2)	Systematic presentation (2)	Moderate presentation (1)

Text Books:

1. Engineering Mathematics-I by G.V. Kumbhojkar, J. Jamnadas Publication
2. Engineering Mathematics-I by Dr. N.R. Dasre, TechKnowledge Publication

Reference Books:

1. Advance Engineering Mathematics by H.K. Dass, S. Chand & Company Limited
2. Advance Engineering Mathematics by Peter O' Neil, Cengage Learning

Evaluation Scheme

CIE Scheme

Internal Assessment: 20 (Average of two tests)

Internal Assessment Scheme

Module		Lecture Hours	No. of questions in			No. of questions in SEE
			Test 1	Test 2	Test 3*	
1	Complex numbers	06	02 (10 Marks)	---	---	04 (25 Marks)
2	Hyperbolic functions and Logarithm of complex numbers	11	01 (05 Marks)	---	---	03 (17 Marks)
3	Partial differentiation	10	---	02 (07 Marks)	---	04 (25 Marks)
4	Applications of partial differentiation and successive differentiation	08	01 (05 Marks)	01 (03 Marks)	---	03 (20 marks)
5	Matrices	06	---	02 (10 Marks)	---	05 (33 Marks)

Note: Four to six questions will be set in the Test paper

Verified by:

Program Coordinator

Subject Expert: Prasad Lalit