Lesson Plan

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

Course Title: Engineering Mathematics II	SEE: 3 Hours – Theory
Total Contact Hours: 27 (Theory) + 06 (Tutorial) = 33 Hours	Duration of SEE: 3 Hours
SEE Marks: 80 (Theory) + 20 (IA)	
Lesson Plan Author: Prasad Lalit	Date: 10/04/2023
Checked By:	Date:

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

Syllabus:

Prerequisite: Theory of integration and tracing of curves

1. **Differential Equations of First Order and First Degree**
   - Exact differential Equations, Equations reducible to exact form by using integrating factors.
   - Linear differential equations (Review), equation reducible to linear form, Bernouli 's equation.
2. **Linear Differential Equations with Constant Coefficients and Variable Coefficients of Higher Order**
   - Linear Differential Equation with constant coefficient- complementary function, particular integrals of differential equation of the type f(D)y = X where X is $e^{ax}, \sin(ax+b),\ e^{ax}V, xV$
   - Method of variation of parameters.
3. **Beta and Gamma Function, Differentiation under Integral sign and Rectification**
   - Beta and Gamma functions and its properties.
   - Differentiation under integral sign with constant limits of integration.
   - Rectification of plane curves (Cartesian and polar).
4. **Multiple Integration-1**
   - Double integration-definition, Evaluation of Double Integrals. (Cartesian & Polar)
   - Evaluation of double integrals by changing the order of integration.
   - Evaluation of integrals over the given region (Cartesian & Polar).
5. **Multiple Integration-2**
   - Evaluation of double integrals by changing to polar coordinates.
   - Application of double integrals to compute Area
   - Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).

6. Numerical solution of ordinary differential equations of first order and first degree, and, Numerical Integration

- Numerical solution of ordinary differential equation using (a) Euler 's method, (b) Modified Euler method, (c) Runge-Kutta fourth order method
- Numerical integration- by (a) Trapezoidal (b) Simpson 's 1/3rd (c) Simpson 's 3/8th rule (all with proof).

Course Outcomes (CO):

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

FEC201.1. Apply the concepts of first-order and first-degree differential equations to the problems in the field of engineering
FEC201.2. Apply the concepts of higher-order linear differential equations to the engineering problems
FEC201.3. Apply concepts of Beta and Gamma functions to solve improper integrals
FEC201.4. Apply concepts of the double integral of different coordinate systems to the engineering problems like area and mass
FEC201.5 Apply concepts of the triple integral of different coordinate systems to the engineering problems and problems based on the volume of solids
FEC201.6 Solve the differential equations and integrations numerically using SCILAB software to The experimental aspect of applied mathematics.

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

CO	BL	C	PI	PO	Mapping
FEC201.1. Apply the concepts of first-order and first-degree differential equations to the problems in the field of engineering	3	1.1	1.1.1	PO1	3
		5.1	5.1.1	PO5	1
FEC201.2. Apply the concepts of higher-order linear differential equations to the engineering problems	3	1.1	1.1.1	PO1	3
		5.1	5.1.1	PO5	1
FEC201.3. Apply concepts of Beta and Gamma functions to solve improper integrals	3	1.1	1.1.1	PO1	3
		5.1	5.1.1	PO5	1
FEC201.4. Apply concepts of the double integral of different coordinate systems to the engineering problems like area and mass	3	1.1	1.1.1	PO1	3
		5.1	5.1.1	PO5	1
FEC201.5. Apply concepts of the triple integral of different coordinate systems to the engineering problems and problems based on volume of solids	3	1.1	1.1.1	PO1	3
		5.1	5.1.1	PO5	1
FEC201.6. Solve the differential equations and integrations numerically using SCILAB software to the experimental aspect of applied mathematics.	1	5.1	5.1.1	PO5	1

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
FEC201.1	3				1							
FEC201.2	3				1							
FEC201.3	3				1							
FEC201.4	3				1							
FEC201.5	3				1							
FEC201.6					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
FEC201.1	30%	---	10%	---	60%	100%
FEC201.2	30%	---	10%	---	60%	100%
FEC201.3	30%	---	10%	---	60%	100%
FEC201.4	30%	---	10%	---	60%	100%
FEC201.5	30%	---	10%	---	60%	100%
FEC201.6	---	100%	---	---	---	100%

Attainment:

CO FEC201.1:

Direct Method

$$A_{FEC201.1D} = 0.3 * Test + 0.1 * Tutorial + 0.6 * SEE\_Theory$$

Final Attainment:

$$A_{FEC201.1} = 0.8 * A_{FEC201.1D} + 0.2 * A_{FEC201.1I}$$

CO FEC201.2:

Direct Method

$$A_{FEC201.2D} = 0.3 * Test + 0.1 * Tutorial + 0.6 * SEE\_Theory$$

Final Attainment:

$$A_{FEC201.2} = 0.8 * A_{FEC201.2D} + 0.2 * A_{FEC201.2I}$$

CO FEC203.3:

Direct Method

$$A_{FEC201.3D} = 0.3 * Test + 0.1 * Tutorial + 0.6 * SEE\_Theoryy$$

Final Attainment:

$$A_{FEC201.3} = 0.8 * A_{FEC201.3D} + 0.2 * A_{FEC201.3I}$$

CO FEC204.4:

Direct Method

$$A_{FEC201.4D} = 0.3 * Test + 0.1 * Tutorial + 0.6 * SEE\_Theory$$

Final Attainment:

$$A_{FEC201.4} = 0.8 * A_{FEC201.4D} + 0.2 * A_{FEC201.4I}$$

CO FEC201.5:

Direct Method

$$A_{FEC201.5D} = 0.3*Test + 0.1*Tutorial + 0.6*SEE\_Theory$$

Final Attainment:

$$A_{FEC201.5} = 0.8*A_{FEC201.5D} + 0.2*A_{FEC201.5I}$$

CO FEC201.6:

Direct Method

$$A_{FEC201.6D} = 1*Scilab\Pr actical$$

Final Attainment:

$$A_{FEC201.6} = 0.8*A_{FEC201.6D} + 0.2*A_{FEc201.6I}$$

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	The exact differential equation (DE)	05	28/04/2023		Smartboard	
	Equations reducible to exact DE		02/05/2023		Smartboard	
	Linear DE		03/05/2023		Smartboard	
	Equations reducible to linear DE		04/05/2023		Smartboard	
	Equations reducible to linear DE		09/05/2023		Smartboard	
02	Higher order DE – Complementary function (CF)	05	10/05/2023		Smartboard	
	Higher order DE – Complementary function (CF)		11/05/2023		Smartboard	
	Particular integral (PI) – $e^{ax}, sine\ and\ cosine, x^n$		16/05/2023		Smartboard	
	Particular integral (PI) – $e^{ax}V(x)$		17/05/2023		Smartboard	
	Particular integral (PI) – $xV(x)$		18/05/2023		Smartboard	
03	Gamma function	07	08/03/2023	08/03/2023	Traditional	
	Beta function		09/03/2023	09/03/2023	Traditional	
	DUIS		13/03/2023	13/03/2023	Traditional	
	Rectification		15/03/2023	15/03/2023	Traditional	
	Rectification		16/03/2023	16/03/2023	Traditional	
	Rectification		20/03/2023	20/03/2023	Traditional	
	Rectification		22/03/2023	22/03/2023	Traditional	

04	Double integration (with limits)	05	23/03/2023	23/03/2023	Traditional	
	Double integration (without limits)		03/04/2023	03/04/2023	Traditional	28-31/03 Euphoria
	Double integration (Change of order)		05/04/2023	05/04/2023	Traditional	04/04 Bank Holiday
	Double integration (Change of order)		06/04/2023	06/04/2023	Traditional	
	Double integration (polar coordinates)		11/04/2023	11/04/2023	Smartboard	
05	Double integration (Cartesian to polar coordinates)	05	12/04/2023	12/04/2023	Smartboard	
	Double integration (Area)		13/04/2023	12/04/2023	Smartboard	Extra Class: SDP Slot
	Triple integration		25/04/2023	13/04/2023	Smartboard	17-18-19/03 UT 1
	Triple integration		26/04/2023	25/04/2023	Smartboard	
	Triple integration		27/04/2023	26/04/2023	Smartboard	

Lecture Plan (Tutorial)

The entire class will be divided into three batches. The common tutorial slot for all the bathes is scheduled on Wednesday from 2.45 pm to 3.45 pm.

Module	Contents	Hours	Planned Date	Actual Date	Remark
01	Differential equations: first order	01	24/05/2023		
02	Differential equations: higher order	01	31/05/2023		
03	Rectification, Beta and Gamma functions	01	26/04/2023	26/04/2023	
04	Multiple integration 1	01	03/05/2023		
05	Multiple integration 2		10/05/2023		
	SCILAB Practical	01	17/05/2023		

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-II by G.V. Kumbhojkar, J. Jamnadas Publication
2. Engineering Mathematics-II 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	Differential equations: first order	05	---	02 (07 marks)		05 (19 marks)
2	Differential equations: higher order	05	---	02 (07 marks)		06 (21 marks)
3	Beta and Gamma integrals, DUIS, Rectification	07	03 (10 marks)	---		05 (22 marks)
4	Multiple Integration 1	05	02 (10 marks)	---		07 (29 marks)
5	Multiple Integration 2	05		02 (06 marks)		04 (14 marks)

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

Verified by:
Subject Expert and Programme Coordinator:
Prasad Lalit