Lesson Plan

Branch: FE Computer Engineering
Semester: II Year: 2022-23

Course Title: Engineering Mathematics II	SEE: 3 Hours – Theory
Total Contact Hours: 36 (Theory) + 05 (Tutorial) = 41 Hours	Duration of SEE: 3 Hours
SEE Marks: 80 (Theory) + 20 (IA)	
Lesson Plan Author: Ms.Gauree Jagushte	Date: 04/03/2023
Checked By:	Date: 02/06/2023

Prerequisites: Review of complex numbers – Algebra of complex number, Cartesian, Polar and Exponential form of 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, Bernoulli ‘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 learner will be able to:

FEC201.1. Apply the concepts of first order and first degree differential equation to the problems in the field of engineering
FEC201.2. Apply the concepts of higher order linear differential equation to the engineering problems
FEC201.3. Apply concepts of Beta and Gamma function to solve improper integrals
FEC201.4. Apply concepts of double integral of different coordinate systems to the engineering problems like area and mass
FEC201.5 Apply concepts of triple integral of different coordinate systems to the engineering problems and problems based on volume of solids
FEC201.6 Solve the differential equations and integrations numerically using SCILAB software to 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 equation to the problems in the field of engineering	3	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC201.2. Apply the concepts of higher order linear differential equation to the engineering problems	3	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC201.3. Apply concepts of Beta and Gamma function to solve improper integrals	3	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC201.4. Apply concepts of double integral of different coordinate systems to the engineering problems like area and mass	3	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC201.5. Apply concepts of triple integral of different coordinate systems to the engineering problems and problems based on volume of solids	3	1.1 1.3	1.1.1 1.3.1	PO1	3
		5.3	5.3.1	PO5	1
FEC201.6. Solve the differential equations and integrations numerically using SCILAB software to experimental aspect of applied mathematics.	1	5.3	5.3.1	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

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

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
03	**Module 03:** Gamma Functions	08	09/03/2023	13/03/2023	Traditional	
	Gamma Functions		13/03/2023	14/03/2023	Traditional	
	Gamma Functions		14/03/2023	16/03/2023	Traditional	
	Beta Gamma Functions		16/03/2023	20/03/2023	Traditional	
	Beta, Gamma Functions		20/03/2023	20/03/2023	Traditional	Lecture conducted in SDP slot
	Differentiation under integral sign and Rectification		21/03/2023	21/03/2023	Traditional	
	Differentiation under integral sign and Rectification		23/03/2023	23/03/2023	Traditional	
	Differentiation under integral sign and Rectification		27/03/2023	27/03/2023	Traditional	
04	**Multiple Integration-1** Double integration-definition, Evaluation of Double Integrals. (Cartesian & Polar)	7	28/03/2023	03/04/2023	Traditional	
	Double integration-definition, Evaluation of Double Integrals. (Cartesian & Polar)		03/04/2023	05/04/2023	Traditional	Lecture exchange
	Evaluation of double integrals by changing the order of integration.		06/04/2023	11/04/2023	Traditional	

	Evaluation of double integrals by changing the order of integration.		11/04/2023	11/04/2023	Traditional	sdp
	Evaluation of integrals over the given region (Cartesian & Polar).		12/04/2023	12/04/2023	Traditional	
	Evaluation of integrals over the given region (Cartesian & Polar).		18/04/2023	-	Traditional	UT1
	Evaluation of integrals over the given region (Cartesian & Polar).		19/04/2023	-	Traditional	UT1
03	**Multiple Integration-2** Evaluation of double integrals by changing to polar coordinates	06	21/04/2023	21/04/2023	Traditional	
	Evaluation of double integrals by changing to polar coordinates		25/04/2023	25/04/2023	Traditional	
	Application of double integrals to compute Area		26/04/2023	26/04/2023	Traditional	EXTRA LECTURE (PHYSICS)
	Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).		28/04/2023	28/04/2023	Traditional	
	Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).		02/05/2023	02/05/2023	Traditional	SDP
	Triple integration definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).		03/05/2023	03/05/2023	Traditional	
01	**Differential Equations of First Order and First Degree** Exact differential Equations, Equations reducible to exact form by using integrating factors.	06	09/05/2023	09/05/2023	Traditional	

	Exact differential Equations, Equations reducible to exact form by using integrating factors		10/05/2023	10/05/2023	Traditional	
	Exact differential Equations, Equations reducible to exact form by using integrating factors		12/05/2023	12/05/2023	Traditional	
	Linear differential equations (Review), equation reducible to linear form, Bernoulli‘s equation.		16/05/2023	16/05/2023	Traditional	
	Linear differential equations (Review), equation reducible to linear form, Bernoulli‘s equation.		17/05/2023	16/05/2023	Traditional	
	Linear differential equations (Review), equation reducible to linear form, Bernoulli‘s equation.		19/05/2023	17/05/2023	Traditional	
02	**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 $e^{ax}, \sin(ax+b),\ e^{ax}V, xV$	06	23/05/2023	18/05/2023	Traditional	
	Linear Differential Equation with constant coefficient-complementary function, particular integrals of differential equation of the type f(D)y = X where X is $e^{ax}, \sin(ax+b),\ e^{ax}V, xV$		24/05/2023	19/05/2023	Traditional	
	Linear Differential Equation with constant coefficient-complementary function, particular integrals of differential equation of the type f(D)y = X where X is $e^{ax}, \sin(ax+b),\ e^{ax}V, xV$		26/05/2023	23/05/2023	Traditional	

	Linear Differential Equation with constant coefficient-complementary function, particular integrals of differential equation of the type f(D)y = X where X is $e^{ax}, \sin(ax+b),\ e^{ax}V, xV$			25/05/2023	Traditional	
	Method of variation of parameters.			26/05/2023	Traditional	
	Method of variation of parameters.			26/05/2023	Traditional	

Lecture Plan (Tutorial):

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

Module	Contents	Hours	Planned Date	Actual Date	Remark
01	Rectification, Beta and Gamma functions	01	25/04/2023	25/04/2023	
02	Multiple integration 1	01	02/05/2023	02/05/2023	
03	Multiple integration 2	01	16/05/2023	16/05/2023	
04	Differential equations: first order	01	23/05/2023	23/05/2023	
05	Differential equations: higher order	01	23/05/2023	23/05/2023	
06	SCILAB Practical	02	23/05/2023	23/05/2023	

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	06	---	02 (10 marks)	---	04 (25 marks)
2	Differential equations: higher order	06	---	01 (05 marks)	---	04 (25 marks)
3	Beta and Gamma integrals, Rectification	08	03 (10 marks)		---	04 (25 marks)
4	Multiple Integration 1	07	02 (10 marks)		---	04 (25 marks)
5	Multiple Integration 2	06	---	01 (05 marks)	---	03 (20 marks)

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

Verified by:

Programme Coordinator

Subject Expert: Gauree Jagushte