



COURSE MODULES OF THE SUBJECT TAUGHT FOR THE SESSION MARCH-JUNE (2024)

Course Syllabi with CO's

Faculty Name :				Academic Year: 2023-2024 (EVEN SEMESTER)			
Department: Mathematics							
Course Code	Course Title	Core/ Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BMATE201	Mathematics-II for EEE streams	Core	Partial Differentiation, Integration, Vectors, Differentiation	2	2	2	40
Course Objectives	<p>Course objectives: The goal of the course Mathematics-II for EEE streams (BMATE201) is to</p> <ul style="list-style-type: none"> • Familiarize the importance of Integral calculus and Vector calculus essential for electronics and electrical engineering. • Analyze electronics and electrical engineering problems applying Partial Differential Equations. • Develop the knowledge of solving electronics and electrical engineering problems numerically 						
Topics Covered as per Syllabus							
<p>Module-1: Vector Calculus Introduction to Vector Calculus in EC & EE engineering applications. Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems. Vector Integration: Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems. Self-Study: Volume integral and Gauss divergence theorem. Applications: Conservation of laws, Electrostatics, Analysis of stream lines and electric potentials (RBT Levels: L1, L2 and L3)</p> <p>Module-2 : Vector Space and Linear Transformations Importance of Vector Space and Linear Transformations in the field of EC & EE engineering applications. Vector spaces: Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension. Linear transformations: Definition and examples, Algebra of transformations, Matrix of a linear transformation. Change of coordinates, Rank and nullity of a linear operator, Rank-Nullity theorem. Inner product spaces and orthogonality. Self-study: Angles and Projections. Rotation, reflection, contraction and expansion. Applications: Image processing, AI & ML, Graphs and networks, computer graphics. (RBT Levels: L1, L2 and L3)</p> <p>Module-3: Laplace Transform Importance of Laplace Transform for EC & EE engineering applications. Existence and Uniqueness of Laplace transform (LT), transform of elementary functions, region of convergence, Properties–Linearity, Scaling, t-shift property, s-domain shift, differentiation in the s domain, division by t, differentiation and integration in the time domain, LT of special functions periodic functions (square wave, saw-tooth wave, triangular wave, full & half wave rectifier), Heaviside Unit step function, Unit impulse</p>							



function.

Inverse Laplace Transforms:

Definition, properties, evaluation using different methods, convolution theorem (without proof), problems, and Applications to solve ordinary differential equations.

Self-Study: Verification of convolution theorem.

Applications: Signals and systems, Control systems, LR, CR & LCR circuits.

(RBT Levels: L1, L2 and L3)

Module-4: Numerical methods -1

Importance of numerical methods for discrete data in the field of EC & EE engineering applications.

Solution of polynomial and transcendental equations: Regula-Falsi method and Newton-Raphson method (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and

Lagrange's interpolation formula (All formulae without proof). Problems.

Numerical integration: Trapezoidal, Simpson's (1/3)rd and (3/8)th rules (without proof). Problems.

Self-Study: Bisection method, Lagrange's inverse Interpolation, Weddle's rule.

Applications: Estimating the approximate roots, extremum values, Area, volume, surface area.

(RBT Levels: L1, L2 and L3)

Module-5: Numerical methods -2

Introduction to various numerical techniques for handling EC & EE applications.

Numerical Solution of Ordinary Differential Equations (ODE's):

Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor corrector formula (No derivations of formulae). Problems.

Self-Study: Adam-Bashforth method.

Applications: Estimating the approximate solutions of ODE for electric circuits.

(RBT Levels: L1, L2 and L3)

List of Laboratory experiments (2 hours/week per batch/ batch strength 15)

10 lab sessions + 1 repetition class + 1 Lab Assessment

1 Finding gradient, divergent, curl and their geometrical interpretation and Verification of Green's theorem

2 Computation of basis and dimension for a vector space and Graphical representation of linear transformation

3 Visualization in time and frequency domain of standard functions

4 Computing inverse Laplace transform of standard functions

5 Laplace transform of convolution of two functions

6 Computing the approximate roots for algebraic and transcendental equation

7 Interpolation/Extrapolation using Newton's forward and backward difference formula

8 Computation of area under the curve using Trapezoidal, Simpson's (1/3)rd and (3/8)th rule

9 Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method

10 Solution of ODE of first order and first degree by Runge-Kutta 4th order and Milne's predictor-corrector method

Suggested software's : Mathematica/MatLab/Python/Scilab



List of Text Books

1. B. S. Grewal: “Higher Engineering Mathematics”, Khanna publishers, 44th Ed.2021
2. E. Kreyszig: “Advanced Engineering Mathematics”, John Wiley & Sons, 10th Ed.,2018.

List of Reference Books

1. **V. Ramana**: “Higher Engineering Mathematics” McGraw-Hill Education, 11th Ed.,2017
2. **Srimanta Pal & Subodh C. Bhunia**: “Engineering Mathematics” Oxford University Press, 3rd Ed., 2016.
3. **N.P Bali and Manish Goyal**: “A textbook of Engineering Mathematics” Laxmi Publications, 10th Ed.,2022
4. **C. Ray Wylie, Louis C. Barrett**: “Advanced Engineering Mathematics” McGraw – Hill Book Co.Newyork, 6th Ed.,,2017
5. **Gupta C.B, Sing S.R and Mukesh Kumar**: “Engineering Mathematic for Semester I and II”, Mc-Graw Hill Education(India) Pvt. Ltd 2015.
6. **H.K.Dass and Er. Rajnish Verma**: “Higher Engineering Mathematics” S.Chand Publication, 3rd Ed.,2014
7. **James Stewart**: “Calculus” Cengage Publications, 7th Ed., 2019.
8. **David C Lay**: “Linear Algebra and its Applications”, Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams**: “Linear Algebra with applications”,Jones Bartlett Publishers Inc., 6th Ed., 2017.

List of URLs, Text Books, Notes, Multimedia Content, etc

- <http://.ac.in/courses.php?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicearth.org/>
- VTU e-Shikshana Program
- VTU EDUSAT Program

Course Outcomes	<p>Course Outcomes: At the end of the course the student will be able to:</p> <p>CO1: Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.</p> <p>CO2: Demonstrate the idea of Linear dependence and independence of sets in the vector space, and linear transformation</p> <p>CO3: To understand the concept of Laplace transform and to solve initial value problems.</p> <p>CO4: Apply the knowledge numerical methods in solving physical and engineering phenomena.</p> <p>CO5: Get familiarize with modern mathematical tools namely Mathematica/MatLab/Python/Scilab</p>
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Internal Assessment Marks: 50 (Two Unit Tests each of 20 Marks and two assignments of 10Marks each. Total 60M is scaled down to 30Marks and Practical component 20Marks).



The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

List of Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	0	0	-	0	0	0	0	0	0	2
CO-2	3	2	0	0	-	0	0	0	0	0	0	3
CO-3	3	3	0	0	-	0	0	0	0	0	0	2
CO-4	3	3	0	0	-	0	0	0	0	0	0	3
CO-5	-	-	0	0	3	0	0	0	0	0	0	2

Note: Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped