ATME College of Engineering

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	
BMATS201	**Mathematics-II for Computer Science Engineering Stream**	**Core**	Partial Differentiation, Integration, Vectors, Trigonometric, Differentiation	**2**	**2**	**2**	**40**
Course Objectives	The goal of the course **Mathematics-II for Computer Science Engineering Stream** (**BMATS201**) is to • **Familiarize** the importance of Integral calculus and Vector calculus. • **Learn** vector spaces and linear transformations**.** • **Develop** the knowledge of numerical method and apply to solve transcendental and differential equations.						

Topics Covered as per Syllabus

Module-1: Integral Calculus

Introduction to Integral Calculus in Computer Science Engineering applications.

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find: Area and Volume by double integral. Problems.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems.

Self-Study: Center of gravity, Duplication formula.

Applications: Antenna and wave propagation, Calculation of optimum value in various geometries. Analysis of probabilistic models.. **(RBT Levels: L1, L2 and L3)**

Module-2 : Vector Calculus

Introduction to Vector Calculus in Computer Science & Engineering

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.

Curvilinear coordinates: Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality. Problems.

Self-Study: Volume integral.

Applications: Conservation of laws, Electrostatics, Analysis of stream lines.

(RBT Levels: L1, L2 and L3)

Module-3: Vector Space and Linear Transformations

Importance of Vector Space and Linear Transformations in the field of Computer Science & Engineering.

Vector spaces: Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension. Problems.

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. Problems.

Self-study: Angles and Projections. Rotation, reflection, contraction and expansion.

Applications: Image processing, AI & ML, Graphs and networks, computer graphics.

Module-4: Numerical methods -1

Importance of numerical methods for discrete data in the field of Computer science & engineering.

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (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.

N**umerical integration**: Trapezoidal, Simpson's $(1/3)_{rd}$ and $(3/8)_{th}$ rules (without proof). Problems.

S**elf-Study:** Ramanujan′s method, Bisection method, Lagrange′s inverse Interpolation, Weddle's rule.

Applications: Estimating the approximate roots, extremum values, Area, volume, surface area. Errors in finite precision. (**RBT Levels: L1, L2 and L3)**

Module-5: Numerical methods -2

Introduction to various numerical techniques for handling Computer Science Engineering 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.

(RBT Levels: L1, L2 and L3)

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

10 ab sessions + 1 repetition class + 1 Lab Assessment

1.Program to compute area, surface area, volume and centre of gravity

2 Evaluation of improper integrals

3 Finding gradient, divergent, curl and their geometrical interpretation

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

5 Computing the inner product and orthogonality

6 Solution of algebraic and transcendental equation by Ramanujan′s, Regula-Falsi and Newton-Raphson method

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 4_{th} 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://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program

Course Outcomes	**Course Outcomes:** At the end of the course the student will be able to: CO1 Apply the concept of change of order of integration and variables to evaluate multiple integral and their usage in computing area and volume. CO2 Understand the applications of vector calculus refer to solenoidal, irrotational vectors, orthogonal curvilinear coordinates. CO3 Demonstrate the idea of Linear dependence and independence of sets in the vector space, and linear transformation **CO4:** Apply the knowledge of numerical methods in analysing the discrete data and for solving the physical and engineering problems. **CO5:** Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

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	2	2	-	-	-	-	-	-	-	-	-	2
CO-2	2	3	-	-	-	-	-	-	-	-	-	2
CO-3	3	2	-	-	-	-	-	-	-	-	-	3
CO-4	3	3	-	-	-	-	-	-	-	-	-	3
CO-5	-	-	-	-	3	-	-	-	-	-	-	2

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