ENGINEERING MATHEMATICS-I

(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-19)

Course Code : 18MAT11
Contact Hours/Week : 04
Total Hours:50
Semester : I

CIE Marks : 50
SEE Marks: 50
Exam Hours:03
Credits: 04

Course Learning Objectives:

This course Calculus and Linear Algebra (18MAT11) will enable students:

- To familiarize the important tools of calculus and differential equations that are essential in all branches of engineering.
- To develop the knowledge of matrices and linear algebra in a comprehensive manner.

MODULE-I

Differential Calculus-1:

Successive Differentiation: Standard Forms of nth derivative(with proof), examples on standard functions, Leibnitz Theorem (without proof) examples, Taylor's and Maclaurin's series expansions for one variable (statements only), Indeterminate forms.

10 - Hours

MODULE-II

Differential Calculus-2:

Polar Curves: Expression for Angle between radius vector and tangent, length of perpendicular from pole to the tangent, angle between two polar curves, Pedal Equation of polar curves and problems.

Derivative of arc length: Cartesian, parametric and polar form(without proof),problems.
Radius of Curvature: Radius of Curvature for Cartesian, parametric, polar form and pedal form (Without proof) and problems.

10 - Hours

MODULE-III

Differential Calculus-3:

Definitions of Partial Differentiation, Direct and Indirect partial derivatives, Symmetric functions, Homogeneous function and Euler's theorem on homogeneous function.

Differential Equation : preamble to differential equations, Exact and Reducible to exact differential equation, Bernoulli's linear differential equation. Applications of first order first degree differential equations:Newton's law of cooling, Law of decay and growth. Orthogonal trajectories.

10 - Hours

MODULE-IV

Integral Calculus:

Reduction Formulae of $\int_0^{\pi/2} Sin^n x\, dx$, $\int_0^{\pi/2} Cos^n x\, dx$, and $\int_0^{\pi/2} Sin^m x\, Cos^n x\, dx$ and problems.

Double and Triple integral examples, Evaluation of double integral over a specific region, changing the order of integration , changing into polar form. Application of double and triple integrals to find area and volume.

10 - Hours

MODULE-V

Matrices:

Preamble to matrices , Rank of matrix, Test of consistency of homogeneous and non-homogeneous system of equations by rank, trivial and non trivial solutions, solution of linear equations by Gauss Elimination method, Gauss-Seidal method, Eigen values and Eigen vector, Quadratic form, Reduce the quadratic form into diagonalization by congruent method, Cayley-Hamilton theorem, Rayleigh's Power method to find largest Eigen value and corresponding Eigen vector.

10 - Hours

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.

2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition.

2. McGraw-Hill Book Co., New York, 1995.

2. James Stewart : "Calculus –Early Transcendentals", Cengage Learning India Private Ltd., 2017.

3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.

4. Srimanta Pal & Subobh C Bhunia: "Engineering Mathematics", Oxford University Press,3rd Reprint, 2016.

5. Gupta C.B., Singh S.R. and Mukesh Kumar: "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org.

Course Outcomes:

On completion of this course, students are able to:

1: Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.

2: Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.

3: Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.

4: Solve first order linear/nonlinear differential equation analytically using standard methods

5: Make use of matrix theory for solving system of linear equations and compute eigenvalues and Eigenvectors required for matrix diagonalization process.

Question Paper Pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

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G.J. Reddy

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