VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B.E.SYLLABUS FOR 2018-2022

Calculus and Linear Algebra

(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 : 05(3L+2T)
Total Hours:50 (8L+2T per module)
Semester : I

CIE Marks : 40
SEE Marks: 60
Exam Hours:03
Credits: 04 (3:2:0)

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: Review of elementary differential calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature- Cartesian and polar forms; Centre and circle of curvature (All without proof-formulae only) –applications to evolutes and involutes. (RBT Levels: L1 & L2)

MODULE-II

Differential Calculus-2: Taylor's and Maclaurin's series expansions for one variable (statements only), indeterminate forms - L'Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions. Maxima and minima for a function of two variables; Method of Lagrange multipliers with one subsidiary condition. Applications of maxima and minima with illustrative examples. Jacobians-simple problems.
(RBT Levels: L1 & L2)

MODULE-III

Integral Calculus: Review of elementary integral calculus.
Multiple integrals: Evaluation of double and triple integrals. Evaluation of double integrals-change of order of integration and changing into polar co-ordinates. Applications to find area volume and centre of gravity
Beta and Gamma functions: Definitions, Relation between beta and gamma functions and simple problems.(RBT Levels: L1 & L2)

MODULE-IV

Ordinary differential equations(ODE's)of first order:
Exact and reducible to exact differential equations. Bernoulli's equation. Applications of ODE's-orthogonal trajectories, Newton's law of cooling and L-R circuits. Nonlinear differential equations: Introduction to general and singular solutions ; Solvable for p only; Clairaut's and reducible to Clairaut's equations only.(RBT Levels: L1,L2 and L3)

MODULE-V

Linear Algebra: Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss –Jordan method and Approximate solution by Gauss-Seidel method. Eigen values and eigenvectors-Rayleigh's power method. Diagonalization of a square matrix of order two. (RBT Levels: L1,L2 and L3)

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/
4. VTU EDUSAT PROGRAMME - 20

Course Outcomes: On completion of this course, students are able to:

CO1: Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.

CO2: Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.

CO3: Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.

CO4 : Solve first order linear/nonlinear differential equation analytically using standard methods

CO5 : 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 60.**
- 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.

H. O. D.
Dept. Of Chemistry
Alva's Institute of Engg. & Technology
Mijar, MOODBIDRI - 574 225