**College of Engineering, Pune-5**

**Department of Mathematics**

**( MA ) Linear Algebra and Univariate Calculus**

S.Y. B. Tech. (for Students Directly admitted to S.Y. after their Diploma)

Semester III (All Branches)

Teaching Scheme Examination Scheme

Lectures : 4 hrs / week Internal Test 1: 20 marks

Tutorial: 1 hr / week Internal Test 2: 20 marks

End Sem. Exam: 60 marks

**Objectives :** Basic necessity for the foundation of Engineering and Technology being mathematics, the main aim is, to teach mathematical methodologies and models, develop mathematical skills and enhance thinking power of students.

**Unit I :** Matrices and linear equations: basic properties of matrices, row operations and Gauss elimination, Determinants and their basic properties. Basic concepts in linear algebra: vector spaces, subspaces, linear independence and dependence of vectors, bases, dimensions. Row and Column spaces, rank. Applications to systems of linear equations. **[14 Hrs]**

**Unit II :** Linear mappings, representation by matrices, rank-nullity theorem, Eigen values, Eigen vectors and their basic properties, diagonalization. **[12 Hrs]**

**Unit III :** Review of limits, continuity and differentiability, Mean value theorems, Taylor's theorem, local extrema, increasing and decreasing functions, concavity, points of inflection. **[10 Hrs]**

**Unit IV :** Integrals as limits of Riemann sums, fundamental theorem of calculus, surface area, integrals by special techniques: reduction formulae, arc length, solids of revolution, improper integrals, tests for convergence, Gamma and Beta functions. **[12 Hrs]**

**Text Books** **:**

* Thomas’ Calculus (12th edition) by Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education.
* Advanced Engineering Mathematics (10th edition ) by Erwin Kreyszig, Wiley eastern Ltd.

**Reference Books** **:**

* Introduction to Linear Algebra (2nd edition) by Serge Lang, Springer.
* Elementary Linear Algebra (10th edition) by Howard Anton and Chris Rorres, John Wiley and sons.
* Calculus for Scientists and Engineers by K.D Joshi, CRC Press.
* A Course in Calculus and Real Analysis (1st edition) by Sudhir Ghorpade and Balmohan Limaye, Springer-Verlag, New York.
* Advanced Engineering Mathematics by C.R. Wylie, McGraw Hill Publications, New Delhi.
* Advanced Engineering Mathematics (7th edition ) by Peter V. O’ Neil, Thomson.Brooks / Cole, Singapore.
* Differential Calculus by Shanti Narayan, S. Chand and company, New Delhi.
* Applied Mathematics Vol. I (Reprint July 2014) by P.N. Wartikar and J.N. Wartikar, Pune Vidyarthi Griha Prakashan Pune.

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**Outcomes :** Students will be able to

1. know and recall core knowledge of the syllabus. ( To measure this outcome, questions may be of the type- define, identify, state, match, list, name etc.)
2. understand basic concepts. ( To measure this outcome, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.)
3. analyze the problem and apply the appropriate concept. ( To measure this outcome, questions will be based on applications of core concepts)
4. give reasoning. ( To measure this outcome, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.)
5. apply core concepts to new situations. ( To measure this outcome, some questions will be based on self-study topics and also comprehension of unseen passages.)

Note:

Some topics from the syllabus will be taught from the notes prepared by Prof. K.D. Joshi (Emeritus Professor, COEP).

All the Course outcomes 1 to 3 will be judged by 75% of the questions and outcomes 4 and 5

will be judged by 25 % of questions.