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| **Scheme Version 2020-21** | **CALCULUS & VECTOR SPACES** | **L** | **T** | **P** | **C** |
| **Applicable to branches(CSE/IT/CSE Hons) (2nd semester)** | **3** | **2** | **0** | **5** |
| **Course Code: 20SMT175** |  | **Total hours =45** | | | |
| **Objectives** | | | | |
|  | * The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. * It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards solving more advanced level of mathematics and applications that they would find useful in their respective disciplines. | | | | |
| **Course Outcome** | | | | | |
|  | Students will be able to understand | | | | |
| CO 1 | The concept of partial derivatives and its application in real life situations | | | | |
| CO 2 | The concept of Group theory and its application of analysis to Engineering problems. | | | | |
| CO 3 | The concept of vector spaces in a comprehensive manner. | | | | |

**Course description**

The course begins with the theoretical study of partial differentiation which is widely utilized in all engineering applications.The students are then introduced to group theory and their classification. The course further emphasizes on the concept of vector spaces and composition of linear mapping.

**TEXT BOOKS:**

1. E. Kreyszig , Advanced Engineering Mathematics, John Wiley,10th Ed.2011.,New Delhi
2. H.K. Dass., Higher Engineering Mathematics, S Chand Publishers, 3rd revised edition, 2014.
3. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th ed.2013, New Delhi.

**Reference Material:**

1. R.K. Jain, and S.R.K. lyengar, Advanced Engineering Mathematics, 3rd Edition, Narosa Publishing House, 2004, New Delhi.

2. B.V. Ramana Advanced Engineering Mathematics, McGraw Hill**,** July 2006, New Delhi.

3. B. Thomas and , R.L., Finney ,Calculus and Analytic Geometry, Pearson Education, 11thEdition..

4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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| **Content of the Syllabus** |

**Unit-I**

**Calculus**: Partial Differentiation, Euler’s Theorem, Composite functions, Jacobian.Taylors and Maclaurine Series for one and two variables. Multiple Integrals, Change of order and Change of Variable. Area and volume using double and triple integrals. [15H]

**Unit-II**

**Calculus**: Indeterminate forms and L'Hospital's rule

**Algebraic structures**: Definition, elementary properties of algebraic structures, semigroup monoid, group, homomorphism, isomorphism and automorphism, congruence relations, subgroups, normal subgroups, cosets, Lagrange's theorem, cyclic groups. [15H]

**Unit-III**

**Vector spaces :** Vector Space, linear dependence of vectors, Basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank- nullity theorem(Without Proof) , composition of linear maps, Matrix associated with a linear map. Inner product spaces, Gram-Schmidt orthogonalization. [15H]

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|  | **Theory** | |
| **Components** | **Continuous Internal Assesment** | **Semester End Examination** |
| **Marks** | **40** | **60** |
| **Total Marks** | **100** | |

**Relationship between the Course Outcomes (COs) and Program Outcomes (POs)**

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| --- | --- | --- |
| Mapping between COs and POs | | |
| Sr. No. | Course outcome | Mapped Programme Outcome (PO) |
| 1 | The concept of partial derivatives and its application in real life situations | 1,2,3 |
| 2 | The concept of Group theory and its application of analysis to Engineering problems. | 1,2 |
| 3 | The concept of vector spaces in a comprehensive manner. | 1,2,3 |

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|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual and teamwork | Communication | Project management and finance | Life-long learning |
|  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **20SMT175** | **Calculus and Vector Spaces** | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**1=addressed to small extent**

**2=addressed significantly**

**3=major part of course**