**23A54101-LINEAR ALGEBRA & CALCULUS**

**(Common to All Branches of Engineering)**

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| CourseCategory: | Basic Sciences & Humanities | | Credits: | 3 |
| CourseType: | Theory | | Lecture-Tutorial-Practical: | 3-0-0 |
| Pre-requisite: | Intermediate Mathematics | | Sessional Evaluation:  ExternalEvaluation:  TotalMarks: | 30  70  100 |
| CourseObjectives: | Tomakethestudentslearnabout  To equip the students with standard concepts and tools at anintermediatetoadvancedlevelmathematicstodeveloptheconfidenceandabilityamongthestudentstohandle variousreal-worldproblems andtheirapplications. | | | |
| CourseOutcomes: | Aftercompletingthecourse,studentwillbeableto | | | |
| CO1 | Developanduseofmatrixalgebratechniquesthatareneededbyengineersforpractical applications. | | |
| CO2 | Utilizemeanvaluetheoremstoreal-lifeproblems. | | |
| CO3 | Familiarize with functions of several variables which is useful in optimization. | | |
| CO4 | Learnimportanttoolsofcalculusinhigherdimensions. | | |
| CO5 | Familiarize with double and triple integrals of functions of severalvariables in two dimensions using Cartesian and polar coordinatesandinthreedimensionsusingcylindricalandsphericalcoordinates. | | |
| CourseContent: | **UNITI**  **MATRICES:**  Rank of a matrix by echelon form, normal form. Inverse ofNon- singular matrices by Gauss-Jordan method, System oflinear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gausse limination method,Jacobi and Gauss Seidel Iteration Methods.  **UNIT II**  **EIGEN VALUES, EIGEN VECTORS AND ORTHOGONAL TRANSFORMATION:**  Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix,Cayley-Hamilton Theorem (without proof),finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms,Reduction of Quadratic form to canonical forms by Orthogona Transformation.  **UNIT III**  **CALCULUS:**  Mean Value Theorems: Rolle’s Theorem, Lagrange’s mean value theorem with their geometrical interpretation (without proof), Cauchy’s mean value theorem (without proof), Taylor’s and Maclaurin’s theorems with remainders (without proof), Problems and applications on the above theorems.  **UNIT IV**  **PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS):**  Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor’s and Maclaurin’s series expansion of functions of two variables. Jacobians, Functional dependence, Maxima and minima of functions of two variables, Method of Lagrange multipliers.  **UNIT V**  **MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS):**  Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double  integrals) and volumes (by double integrals and triple integrals). | | | |
| **Text Books:** | 1.Higher Engineering Mathematics, B. S. Grewal, Khanna  Publishers,2017, 44th Edition  2.Advanced Engineering Mathematics, Erwin Kreyszig, John  Wiley& Sons, 2018, 10thEdition. | | | |
| **Reference**  **Books:** | 1.Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel   Hass, Pearson Publishers, 2018, 14th Edition.  2. Advanced Engineering Mathematics, R. K. Jain and  S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).   3. Advanced Modern Engineering Mathematics, Glyn James,  Pearson publishers, 2018,5th Edition.  4. Advanced Engineering Mathematics, Michael–Green burg, Pearson Publishers 9th Edition   5. Higher  Engineering  Mathematics,  H. K. Dass, Er. Rajnish Verma,  S. Chand    Pearson    Publishers, 2014,third addition (reprint 2021). | | | |

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| Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low) | | | | | | | | | | | | | | |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | - | 2 | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 3 | - | - |
| CO3 | 3 | 2 | 2 | 3 | 1 | - | - | - | - | - | 2 | 2 | - | - |
| CO4 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | 2 | 2 | - | - |
| CO5 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | 1 | 2 | - | - |