Course Number: EP 301
Course Name: Engineering Mathematics-2
Credits   **:** 3-1-0-4
Prerequisites   **:** IC110, IC111 and/or faculty consent. Out of PH511 and EP301, a student is allowed to take only one course.
Intended for   **:** B.Tech.
Distribution   **:** Core course for B.Tech. in Engineering Physics and elective for others.

Preamble **:** Mathematics for Physicists provides solid foundation in various mathematical methods developed and used for understanding different physical phenomena.

Course Outline **:** The course starts with introduction to the concept of linear vectors space. The course continues to introduce differential equations and special function that are used to understand physical phenomena in different geometries with focus on application to physical problems. This followed by complex analysis and finally end s with the introduction to the partial differential equations and green functions.

Modules
1. Linear vector spaces, Gram-Schmidt orthogonalization, Self-adjoint, Unitary, Hermitian, Non-Hemitian Operators, transformation of operators, eigenvalue equation, Hermitian matrix diagonalization; with focus on application to physical problems   **(8 hours)**

2. Second order Linear ODE, Series Solution- Frobenius Method, Inhomogeneous linear ODE. Sturm Liouville equation Hermition operators-eigenvalue problem; with focus on application to physical problems   **(7 hours)**

3. Special functions: Bessel, Neumann, Henkel, Hermite, Legendre, Spherical Harmonics, Laguerre, Gamma, Beta, Delta functions, with focus on application of these functions to physical problems.   **(10 hours)**

4. Complex analysis, Cauchy- Riemann conditions, Cauchy's Integral theorem, Laurent expansion, Singularities, Calculus of residues, evaluation of definite integrals, Method of steepest descent, saddle point.   **(11 hours)**

5. Partial differential equations and introduction to Green's functions.   **(6 hours)**

Text books

1. Mathematical methods for physicists by Arfken and Weber (Elsevier Academic Press, 6th edition, 2015)
2. Mathematical Methods in Physical Sciences by Mary L Boas (Willey 3rd edition, 2011)

References

1. Mathematical Methods for Physics and Engineering: A Comprehensive Guide by K. F. Riley and M. P. Hobson (Cambridge India South Asian Edition, 2009)
2. Mathematical Methods for Physicists by J. Mathews and R. L. Walker (Imprint, New edition 1973)

3. Mathematics of Classical and Quantum Physics by F. W. Byron and R. W. Fuller (Dover Publication, New edition, 1992)

4. Methods of theoretical Physics Vol. I and II by P. M. Morse and H. Freshbach (McGraw-Hill, 1953)

5. Advanced Engineering Mathematics by E. Kreyszing (Wiley India Private Limited, 10th edition, 2003)

6. Mathematics for Physicists by Philippe Dennery and Andre Krzywicki (Dover Publications Inc. 1996).