

### **IT-780 : Proforma for course plan**

- Course Name : **Mathematical concept and methods for Biological Systems**
- Course Code: IT-780
- Credit: 3 Credits
- Course offered to: Optional
  
- Course description: This course will fulfill the need of mathematics application as well as advance so that the students can learn to apply mathematics for real world problems. The aim of this course is enhance the knowledge and understanding of the students for developing new mathematical real world problems and their solutions.
- Pm-requisite (Mandatory): Student should be able to understand mathematics at the +2 level.
- Pre-requisite (Desirable): Nil
- Course Outcome (CO):  
Students should be able to understand:
  1. Differential Equation and its applications in biological systems
  2. Partial Differential equations: This topic will introduce the formulation of partial differential equation ant its solution as well as its application to biological problem.
  3. Numerical Analysis: Numerical methods are more accurate in comparison to analytical methods. And In research work numerical techniques have become indispensable tools in all the fields.
  4. Analytic functions: The Solution of differential equation using analytical techniques.
  5. Linear Programming: Optimization techniques to solve the maximization and minimization problem and its application in biological problems.

Tentative teaching plan:

Week Number	Lecture topic	CO met
1-3	First order equations (linear and nonlinear); Higher order linear differential equations with constant coefficients; Second order linear differential equations with variable coefficients; Method of variation of parameters; Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties (Applications).	CO1
4-6	Linear and quasilinear first order partial differential equations, method of characteristics; second order linear equations in two variables and their classification; Cauchy, Dirichlet and Neumann problems; solutions of Laplace, wave in two dimensional Cartesian coordinates, Separation of variables method for solving wave and diffusion equations in one space variable; Fourier series and Fourier transform and Laplace transform methods of solutions for the above equations(Applications).	CO2

7-9	Gauss elimination and Gauss-Seidel methods; Lagrange and Nev. ton's interpolations. Solution of polynomial and transcendental equations by Newton-Raphson method, Method of False Position; Numerical integration by trapezoidal rule, Simpson's rule and Gaussian quadrature rule; Numerical Differentiation: solutions of first order differential equations by Euler's method and 4th order Runge-Kuria method (Applications).	CO3
10-12	Analytic functions; Cauchy-Riemann equations; Line integral, Cauchy's integral theorem and Cauchy's integral formula; Taylor's series and Laurent series; Residue theorem (Applications).	CO4
12-14	Linear programming problem and its formulation, convex sets and their properties, graphical method, basic feasible solution, simplex method, big-M and two phase methods; infeasible and unbounded LPP's. Dual problem and duality theorems, dual simplex method and its application in post optimality analysis; Balanced and unbalanced transportation problems, Vogel's approximation method for solving transportation problems; Hungarian method for solving assignment problems (Applications).	CO5

1. Advanced Engineering Mathematics - by Kreyazig. E
2. Higher Engineering Mathematics - by 13. S. Grewal.
3. Engineering Mathematics - by Lazpath Roy.
4. I. M. J. Strauss. G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
5. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and Sons (Asia) Pte. Ltd., Singapore. 2002.
6. Numerical Methods -by R.K. Jain,S.R.K. Iyengar, 2002
7. Integral Transform and their applications- B. Davies
8. Numerical Analysis- Doron Levy, 2010
9. Optimization Techniques- Godfrey C. On wubolu, B. V. Babu and
10. Engineering Optimization: Theory and Practice- S. S. Rao