

1T411

Course: Mathematics-II

Objective: To introduce differential equations and other techniques to the students which will be necessary for the academic programme.

Prerequisite: Knowledge of basic calculus.

Course overview:

- ✓ Ordinary Differential Equations (Linear and Non Linear, Linear stability analysis, Stability criteria)
- ✓ Higher Order Linear Equations and linear Systems (Wronskian, variation of constants, matrix exponential solution, behaviour of solutions)
- ✓ Partial Differential Equations (Reaction diffusion, Reaction-advection, reaction-advection-diffusion equation, spatio-temporal patterns, Turing wave and instability)

Stochastic Differential Equations (General SDE, Langevin equation, Master equation, Chemical Langevin equation)

Special Functions (Power Series methods: Bessel functions, Legendre polynomials and Laguerre polynomials, Applications)

Mathematical Modeling: Reaction network, Modeling biological systems, Modeling large networks (biological, social, ecological).

Reference Books:

1. V.I. Arnold, Ordinary Differential Equation, MIT Press.
2. J.D. Murray, Mathematical Biology-I, II, 3rd Edition, Springer.
3. C.H. Taubes, Modeling Differential Equations in Biology, Cambridge University Press, Prentice Hall, Second Edition, 2008.
4. J. Arfken, Weber and Harris, Mathematical methods for Physicists, Elsevier, Seventh Edition, 2013.
5. Bernt Oksendal, Stochastic differential equations, Springer-Verlag Heidelberg New York, Fifth Edition 2003.