Modern water purification system, Water quality parameters like hardness, Water softening process (permutit), WHO guidelines for drinking water.

Soil Pollution and Solid Waste Management
Soil pollution: Sources of pollutants and mitigation measures. Types of solid wastes: Heavy metal, bio-medical and radioactive wastes, Toxic and biochemical effects of solid wastes, Solid waste management (landfilling, incineration, and composting).

Green Chemistry and EIA
Basic principles of green chemistry with examples, Matrices to explain greenness, R^4M^4 model, life cycle analysis. Importance, scope and principles of EIA with a case study.

Text Book

1. A. K. De, Environmental Chemistry, New Age International Publishers, 9th Edition.

Reference Books

1. S. Chakroborty, D. Dave, and S. S. Katewa, Environmental Chemistry-, Cengage Learning India Pvt. Ltd., 1st Edition.
2. Aloka Debi, Environment Science and Engineering, Universities Press,2nd Edition.
3. Erach Bharucha, Textbook of Environment studies for undergraduate courses, Universities Press, 2nd Edition.
4. D. De and D. De, Fundamentals of Environment and Ecology, S. Chand &Co, 2013.
5. Jain and Jain, Engineering Chemistry, Dhanpat Rai,Publishing Company.
6. S.C. Santra, Environmental Science,New Central Book Agency, ISBN: 9788173814044.

DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA

Subject Code: MA11001
Credit: 3-1-0 4
Prerequisite: Nil

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equations and linear algebra. It aims to equip the students to tackle advanced level of mathematics and applications that they would find useful in their disciplines.
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Course Outcomes

At the end of the course, the students will be able to

CO1   : Understand the concept of modelling and formulation of Differential equation of physical problems,
CO2   : Apply different methods to solve ODE problems involving growth-decay, cooling effects and electrical circuits etc,

CO3   : Develop an ability to solve 2ndand higher order ODEs,

CO3   : Develop an ability to solve 2nd and higher order ODEs,
CO4   : Apply the knowledge of special function in engineering problems,
CO5   : Use the essential tool of matrices and linear algebra in a comprehensive manner, and
CO6   : Apply the knowledge of Eigen value and Eigen vector in the field of engineering and also get the concept of complex matrices.

Ordinary Differential Equations of First Order

Introduction and formation of differential equations, Overview: Variable separable, homogeneous, equations reducible to homogeneous form.Exact differential equations, equations reducible to exact form, linear differential equations, equations reducible to linear form (Bernoulli's equation). Applications of differential equations: Growth-Decay Problem, Newton's Law of Cooling, Mixing problem, Orthogonal trajectories.

Linear Differential Equations of second order

Second order linear homogeneous equations with constant coefficients; differential operators; solutions of homogeneous equations; Euler-Cauchy equation; linear dependence and independence; Wronskian; Solutions of non-homogeneous equations: general solution, complementary function, particular integral; solution by variation of parameters; undetermined coefficients. Applications of 2nd order differential equations in Electric circuit.

Special Functions

Improper Integrals for one variable, some test for convergence of improper integrals, Gamma function, Properties, Beta function, Relation between Gamma and Beta functions. Radius of convergence of power series, Legendre equation. Legendre polynomial. Recurrence relations and Orthogonality property of Legendre polynomial. Bessel's equation, Bessel's function, Recurrence relation.

System of Linear Equations and Vector Space

Linear system of equations; rank of matrix; consistency of linear systems; Solution of system of linear equations: Gauss elimination, inverse of a matrix by Gauss Jordan method, Vector Space, Sub-space, Basis and dimension, linear dependence and independence, Linear transformation.

Matrix-Eigen value problems

Eigen values, Eigen vectors, Eigen basis, quadratic form; Hermitian, Skew-Hermitian forms; similar matrices; Diagonalization of matrices.

Text Book

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley INC, 10th Edition,2011.

Reference Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition.
2. H.K. Das, Introduction to Engineering Mathematics, S.Chand & Co Ltd, 11th Edition.
3. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publications 2007.
4. J. Sinha Roy and S. Padhy, A course on ordinary & partial differential Equation, Kalyani Publication, 3rd Edition.