First Semester Syllabus

Advanced Engineering Mathematics

SCE101

L-T-P: 3-1-0

Credits: 4

Pre-requisite: Fundamental ideas of Engineering Mathematics.
Introduction: The objective of this course is to provide knowledge on how mathematics is applied to solve fundamental engineering problems.
Course Outcomes (CO): Upon successful completion of this course, students will develop a clear understanding of:
CO1: Differentiation and integration of Complex functions and mappings in the complex plane.
CO2: Fourier Transforms to prepare them for follow up courses in these areas
CO3: Theory of probability and random variables and get motivated to use of statistical inference in practical data analysis.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓	✓	✓	✓		
CO2	✓	✓	✓	✓		
CO3	✓	✓				

Course Contents:
Module 1: Statistic: Elements of statistic, frequency distribution; Concept of mean, median, mode and different types of distribution; Standard deviation and variance; Curve fitting by least square method; Correlation and Regression, Testing of Hypothesis; Basic type of factorial design and Analysis of Variance.
Module 2: Matrix operation: Matrix operation Eigen value and Eigen vector by iterative methods. Diagonalisation and square matrix.
Module 3: Laplace transform, Fourier transform Fourier integral and their applications.
Module 4: Numerical method: Interpolation by Polynomial, Error analysis, Solution of system of linear equation by Gauss Seidal iterative method, Newton Raphson method Numerical Integration by Gauss quadrature, Solution of ordinary differential equation by Rayligh-Ritz method.
Module 5: Differential Equation: Ordinary Differential Equation 2nd order homogeneous equation, Euler Cauchy's equation, Non homogeneous linear equation. **Partial differential equation**: Wave equation – one and two dimension, Heat equation- one dimension and two dimension.

Text Book:

1) Introductory Methods of Numerical Analysis by S. S. Sastry (PHI)
2) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Lyengar, R. K. Jain (NewAge)
3) An Outline of Statistical Theory, Vol. I, II by A. M. Goon, M. K. Gupta, B. Dasgupta (The World Press Pvt. Ltd.)
4) The Design of Experiments to Find Optimal Conditions by Yu. P. Adler, E. V. Markova, Ylu V. Granovsky (MIR,1975, Moscow)
5) Advanced Engineering Mathematics by Erwin Kreyszig (John Wiley & Sons, Inc)
6) Advanced Engineering Mathematics by Stanley Grossman & William R. Derrick (Harper & Row Publishers).

Industrial Management

SCE102

L-T-P: 4-0-0

Credits: 4

Pre-requisite: Fundamental ideas of Engineering Mathematics.

Introduction: Engineering and Management is complementary to each other. This is necessary to learn management for an engineering student.

Course Outcomes (CO):

CO1: Choose, prepare, interpret and use cost estimates as a basis for the different situations in an industrial company.

CO2: Explain how strategic planning, management, management control, entrepreneurship, organisation, production and learning works in an industrial company.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1					✓	✓
CO2					✓	✓

Course Contents:

Module 1: Classification and Importance of Operations Management: Operations Management in corporate profitability & competitiveness; Operations strategy; Types & characteristics of manufacturing systems & service systems.

Module 2: Operations Planning and Control: Forecasting for operations; Inventory planning & control; Materials requirement planning; Planning production in aggregate terms; Operations scheduling

Module 3: Quality Assurance: The quality assurance system; choice of process and reliability; control of quality.

Module 4: Maintenance Function: Preventive maintenance; Overhaul and replacement.

Module 5: Management Information System: Need & structure of MIS; Data Processing Systems; Data Sources & Management.

Module 6: Human resource management: Concept and evolution; Manpower planning; recruitment and selection; Motivating personnel; Leadership

Module 7: Marketing Management Functions of Marketing, Product Planning & Development, Marketing Organization, Sales Organization, Sales Promotion, Consumer Behavior, Marketing Research and Information.

Text Books

1. Robbins & Caulter, Management, Prentice Hall of India.
2. John R.Schermerhorn, Introduction Management, Wiley-India Edition.
3. Koontz, Principles of Management, Tata-McGrewHill.
4. RichardL.Daft, New Era of Management, Engage Learning.

Advanced Structural Analysis

SCE103

L-T-P: 4-0-0

Credits: 4

Pre-requisite: Fundamental ideas of Solid mechanics, Basic knowledge of Engineering Mechanics, Structural Analysis.

Introduction: This course examines the matrix analysis of structures and the computational approach of the structural analysis. The topics which are covered includes: Matrix Algebra, Formulation of Force and Displacement Methods and Weighted Residual Methods.

Course Outcomes (CO): Upon successful completion of this course, students will develop a clear understanding of:

CO1 Formulation of force and displacement methods – member approach.

CO2: Finite element concept in Engineering Analysis – Displacement model shape functions and element properties.

CO3: Analysis of plane stress/strain – axi-symmetric stress analysis.

CO4: Weighted residual methods and variational formulation of Finite Element Analysis.

CO5: Isoperimetric element: Numerical integration: assemblage of elements.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	
CO3	✓	✓				✓
CO4	✓			✓		✓
CO5	✓		✓		✓	

Course Contents:

Module 1: Matrix Algebra – methods for matrix inversion and solution of simultaneous equations – band and sparse matrix technique stiffness and flexibility matrices of structural elements – various co-ordinate
system and their transformation and synthesis matrix.

Module 2: Formulation of force and displacement methods – member approach. Finite element concept in Engineering Analysis– Displacement model shape functions and element properties. Analysis of plane stress/strain – axi-symmetric stress analysis.

Module 3: Weighted residual methods and variational formulation of Finite Element Analysis. Isoparametric element —Numerical integration – assemblage of elements. Solution techniques – Finite element programming – use of package programmes.

Text Books

1. Numerical Methods for Engineers by Chopra.
2. Finite element procedure-- K.J.Bathe.
3. Matrix analysis of frame structure-- wever/gere.
4. Structural analysis – A matrix approach by G.S.Pandit and Gupta.

Soil Structure Interaction

SCE104

L-T-P: 4-0-0

Credits: 4

Pre-requisite: Soil mechanics, Foundation Engineering Basic knowledge of Structural Analysis and Structural Dynamics.

Introduction: This course examines the details of soil structure interaction, the various processes that determines the structural stability of the foundations. The topics broadly covered under this subject includes general soil structure interaction problems, beam on elastic foundation and the concept of laterally loaded piles.

Course Outcomes (CO): Upon successful completion of this course, students will develop a clear understanding of:

CO1: Able to model structure, soil and boundary.

CO2: Able to solve problem on wave propagation for SSI.

CO3: 3 Able to solve dynamic stiffness matrix for out of plane and in-plane motion.

CO4: Able to analyze soil and structure considering nonlinearity in material of soil and structure

CO5: Able to analyze SSI for engineering application like nuclear power plant, bridges, dams, multi storey buildings etc.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓	✓	✓			

CO2	✓	✓	✓		✓	
CO3	✓	✓		✓		✓
CO4	✓	✓	✓			✓
CO5	✓		✓		✓	✓

Course Contents:

Module 1: General soil-structure interaction problems: Contact pressures and soil-structure interaction for shallow foundations, concept of sub grade modulus, effects/parameters influencing subgrade modulus. Soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models.

Module 2: Beam on Elastic Foundation: Soil Models: Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness. Plate on Elastic Medium: Thin and thick plates, Analysis of finite plates, Numerical analysis of finite plates, simple solutions.

Module 3: Laterally Loaded Pile: Load deflection prediction for laterally loaded piles, Sub-grade reaction and elastic analysis, Interaction analysis.

Text Books

1. Selvadurai, A. P. S, Elastic Analysis of Soil-Foundation Interaction, Elsevier,1979.
2. Poulos, H. G., and Davis, E. H.,Pile Foundation Analysis and Design, John Wiley,1980.
3. Scott, R. F., Foundation Analysis, Prentice Hall, 1981.
4. Structure Soil Interaction - State of Art Report, Institution of Structural Engineers, 1978.

Bridge Engineering

SCE105A

L-T-P: 4-0-0

Credits: 4

Pre-requisite: Fundamental ideas of Solid mechanics, Basic knowledge of Engineering Mechanics, Structural Analysis.

Introduction: The subject introduces the concept of bridge engineering to the young civil engineering minds. The subject broadly covers the following topics: Reinforced Concrete Solid Slab Bridge, Beam and Slab Bridges, Steel Bridges, Composite Bridges and Cable Stayed Bridges.

Course Outcomes (CO): Upon successful completion of this course, students will develop a clear understanding of:

CO1: The students are exposed to fundamentals of bridge engineering design.

CO2: They will have a clear idea of general design features, design of interior panel of slab.

CO3: The students will have a clear concept of components of bridges and basic classification of bridges.

CO4: They will also have a clear idea of the cable stayed bridges and plate girder bridges. They will have a clear idea of elements and design of plate girder bridges.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓					
CO2	✓			✓	✓	
CO3	✓		✓	✓		
CO4	✓	✓		✓	✓	

Course Contents:

Module 1: Introduction: Definition and Basic Forms, Component of bridge, classification of bridge, short history of bridge development. I.R.C Loads. Analysis of IRC Loads, Impact factors, other loads to be considered, Importance of Hydraulic factors in Bridge Design.

Module 2: Reinforced concrete solid slab bridge: Introduction, General design features, Effective-width method. Simply supported and cantilever Slab Bridge, analysis and design Box Culvert: Introduction, Design method and Design example.

Module 3: Beam and Slab Bridges Introduction, Design of interior panel of slab. Pigeauds method, Design of longitudinal girder, Calculation of longitudinal moment, design example. Balanced Cantilever Bridges: General Features, Arrangement of supports, design features Articulation, Design example.

Module 4: Steel Bridges: General features, types of stress, Design example. Plate Girder Bridge: Elements, design, lateral bracing, Box- girder Bridges.

Module 5: Composite Bridges: General aspects, method of construction, analysis of composite section, shear connectors, design of composite beam. Cable Stayed Bridge: General features, Philosophy of design.

Text Books

1. Principle & Practice of Bridge Engineering S.P. Bindra– DhanpatRai Pub.

2. Essentials of bridge engineering D.J. Victor.

3. Bridge engineering Ponnuswamy.

References

1. Design of Bridge Structures T.R. Jagadesh, M.A. Jayaram.
2. Bridge engineering by Krishnaraju.
3. Design of concrete bridges by Aswani, Vizirani , Ratwani.

Structural Optimization

SCE105B

L-T-P: 4-0-0

Credits: 4

Pre-requisite: Solid Mechanics, Computational/Programming Tool Software
Introduction: The course examines the basic concepts of structural optimization including the linear and non-linear programming fundamentals.
Course Outcomes (CO): Upon successful completion of this course, students will develop a clear understanding of:
CO1: Able to develop optimization techniques, linear optimization, algorithm.

CO2: Able to solve problem of nonlinear optimization-I, non-linear optimization-II and one-dimensional minimization methods (by different methods).

CO3: Able to use optimization techniques for simple structures.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓		✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓
CO3	✓		✓	✓	✓	✓

Course Contents:
Module 1: **Classical methods:** Theory of layout, Differential calculus, simultaneous modes of failure, Fully stressed design –optimality criterial methods.
Module 2: Mathematical programming and computer techniques: linear programming, Revised simplex method, non-linear programming fundamentals.
Module 3: Methods for one dimensional minimization: Direct search and gradient methods for unconstrained problems, use of penalty functions and sequential L.P. for constrained optimisation problems, Geometric programming and dynamic programming, application to structural engineering problem.
Text Books

1) Engineering Optimization: Theory and Practice by Rao, Singireshel S.
2) Advances in Structural Optimization by J. Herskovits (Springer-Verlag New York, LLC).
3) Elements of Structural Optimization by Raphael T. Haftka (Springer-Verlag New York, LLC).

Repair & Rehabilitation of Structures

SCE105C

L-T-P: 4-0-0

Credits: 4

Pre-requisite: Fundamental ideas of building and construction materials. Basic knowledge of RCC and steel structure design.

Introduction: The subject explores the concept of Repair and strengthening techniques for different structures including bridge, building, towers etc. structural components, load bearing wall, panel walls; Strengthening of foundation; Grouting; Grout material, guniting, shotcreting, under pinning etc.

Course Outcomes (CO): Upon successful completion of this course, students should be able to:

CO1: Understand concept of repair and rehabilitation of structures.

CO2: Understand the procedure of Repair and strengthening of RCC and steel superstructure and foundation.

CO3: Know about techniques for Grouting; Grout material, guniting, shotcreting, under pinning.

CO4: Understand the methods for under-water repair; Durability of repairing material; Case histories.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓		✓		✓	
CO2	✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	

Course Contents:

Module 1: Appraisal of damage and deterioration of structures by non-destructive and other techniques; Cause of deterioration.

Module 2: Environmental aspects and earthquake effects; Repair and strengthening of superstructure – structural components, load bearing wall, panel walls; Strengthening of foundation; Grouting; Grout material, guniting, shotcreting, under pinning.

Module 3: Repair of steel structures – bridge, building, towers etc., monuments and historical structures. Prevention of water leakage instructures; Under-water repair; Durability of repairing material; Case histories.

Textbook

1. Woodson, R. D. (2009). Concrete structures: protection, repair and rehabilitation. Butterworth-Heinemann.
2. Radomski, W. (2002). Bridge rehabilitation.

Structural Laboratory I

SCE191

L-T-P: 0-0-3

Credits: 2

Pre-requisite: Concrete Technology

Introduction: The students will develop a clear understanding of the various tests conducted on construction material focussing on the properties.

Course Outcomes (CO): Upon successful completion of this course, students should be able to:

CO1: Discuss about concrete ingredients and its influence on gaining strength

CO2: Determine the properties of construction materials, fresh and hardened of concrete

CO3: Design the concrete mix using IS code methods.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓				✓	
CO2	✓			✓	✓	
CO3	✓				✓	

Course Contents:

Lists of Experiments:

1. Tests on cement – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes.
2. Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modules, moisture content, bulk density and deleterious materials.
3. Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
4. Tests on Fresh Concrete: Workability: Slump, Vee-Bee, Compaction factor tests.
5. Tests on Hardened Concrete: Compressive strength on Cubes, Split tensile strength, Static modulus of elasticity, Flexure tests ,Non-destructive testing (Rebound hammer & Ultrasonic pulse velocity).
6. Mix Design of Concrete.

Text Book:

1. Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009), SP23].

2. Laboratory manual of concrete testing by V.V. Sastry and M. L. Gambhir.

CAD LAB

SCE192

L-T-P: 0-2-0

Credits: 2

Pre-requisite: Fundamental ideas of building planning, Design of RC Structures, Design of Steel Structures, Basic knowledge of computer.

Introduction: The concepts developed in this course will aid in interpretation of typical drawings, planning drawings to show information concisely and comprehensively; optimal layout of drawings and scales; commands including initial settings, drawing aids, drawing basic entities, modify commands, layers, text and dimensioning, blocks and principles of isometrics and perspective drawing etc.

Course Outcomes (CO): Upon successful completion of this course, students should be able to:

CO1: Interpret typical drawings, planning drawings to show information concisely and comprehensively; optimal layout of drawings of different structural elements including ductility detailing RCC Slab, beam, column and footing design.

CO2: Understand and draw structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards.

CO3: Understand methods of making line drawing and detailed drawing, site plan, floor plan, elevation and section drawing of buildings.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1				✓	✓	
CO2				✓	✓	
CO3				✓	✓	

Course Contents:

Exercises that must be done in this course are listed below:

1. Introduction and important features of a software dealing with analysis and design of structures.
2. Analysis and design of a multi-storeyed building using software, Preparation of detailed drawings different structural elements including ductility detailing RCC Slab, beam, column and footing design.

Text Book:

1. CAD CAM Standard Manual.

Seminar I

SCE181

L-T-P: 0-2-0

Credits: 1

Introduction:

The overall aim of the seminar series is to help develop an emerging field at the intersection of multi-disciplinary understandings of culture and education. It will build on the existing body of
work on education and culture, but its aim is explore and develop new perspectives in this area.

Course Objectives

- To explore new research from a range of academic disciplines which sheds light on the questions outlined above
- To showcase cutting edge research on education and culture from outstanding academic researchers.
- To get introductory idea of future research problem.