UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

Title of Course: Advanced Engineering Mathematics
Course Code: SCE101
L-T Scheme: 3-1 **Course Credits: 4**

Introduction:

The goal of this mathematics course is to provide high school students and college freshmen an introduction to basic mathematics and especially show how mathematics is applied to solve fundamental engineering problems. The Topics to be covered (tentatively) include:

Statistic

Matrix Operation

Numerical Methods

Laplace and Fourier Transform

Ordinary differential Equation and Partial Differential equation

Course Objectives:

In this course, the students will learn differentiation and integration of Complex functions and mappings in the complex plane. They are introduced to Fourier Transforms to stimulate interest in communications, control and signal processing to prepare them for follow up courses in these areas. They also learn to extend and formalize knowledge of the theory of probability and random variables and get motivated to use of statistical inference in practical data analysis.

Course Contents:

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.

Matrix operation: Matrix operation Eigen value and Eigen vector by iterative methods. Diagonalisation and square matrix.

Laplace transform, Fourier transform Fourier integral and their applications.

Numerical method: Interpolation by Polynomial, Error analysis, Solution of system of linear equation by Gauss Seidaliterative method, Newton Raphson method Numerical Integration by Gauss quadrature, Solution of ordinary differentialequation by Rayligh-Ritz method.

Ordinary Differential Equation:

i) 2nd order homogeneous equation
ii) Euler Cauchy's equation
iii) Non homogeneouslinear equation.

Partial differential equation:

i) Wave equation – one and two dimension
ii) Heat equation- one dimensionand two dimension.

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Course Description

REFERENCE 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).

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Course Description

Title of Course: Advanced Structural Analysis
Course Code: SCE-103
L-T Scheme: 4-0 **Course Credits: 4**

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.

Objectives: In this course the students will have a clear idea of the advanced structural engineering concepts like the matrix methods. They will have a clear idea of the computational approach of the matrix analysis of structures.

Learning Outcomes: The students will have a clear idea of the following concepts:
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.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.

Course Contents:

Unit 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.

Unit 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 stressanalysis.

Unit 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 packageprogrammes.

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.

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Course Description

Title of Course: Soil Structure Interaction
Course Code: SCE 104
L-T Scheme: 4-0 **Course Credits: 4**

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.

Objectives: In this course the students will have a clear idea of the various soil structure phenomena. For the structural integrity of the buildings, the concept of soil structure interaction is very essential. For the construction of foundations, the concept of soil structure interaction plays a very important role.

Learning Outcomes: The students will have a clear idea of the following concepts: Beam on Elastic Foundation: Soil Models: Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams offinite 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, simplesolutions.Laterally Loaded Pile: Load deflection prediction for laterally loaded piles, Sub-grade reaction and elastic analysis,Interaction analysis.

Course Contents:

Unit 1:General soil-structure interaction problems: Contact pressures and soil-structure interaction for shallow foundations, conceptof sub grade modulus, effects/parameters influencing subgrade modulus. Soil behavior, Foundation behavior, Interfacebehavior, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameterelastic models.

Unit 2: Beam on Elastic Foundation: Soil Models: Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams offinite 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, simplesolutions.

Unit 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.

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Course Description

Title of Course: Bridge Engineering
Course Code: SCE 105A
L-T Scheme: 4-0 **Course Credits: 4**

Introduction:

This course examines the concepts of bridge engineering. The topics broadly covered under this subject includes: Introduction, historical review, Engineering and aesthetic requirements in bridge design,Girder bridges - types, load distribution, design. Introduction to long span bridges cantilever,arch, cable stayed and suspension bridges.

Objectives:

The students will have a clear understanding of the various concepts of bridge engineering. The various types of bridges will be taken into account. The load distribution and the long span bridges design are explained in details.

Learning Outcomes: The students will have a clear idea of the following concepts: Bridge foundations - open, pile, well and caisson. Piers, abutments and approach structures; Superstructure - analysis and design of right, skew and curved slabs.Girder bridges - types, load distribution, design. Introduction to long span bridges cantilever,arch, cable stayed and suspension bridges.

Course Contents:

Unit 1: Introduction, historical review, Engineering and aesthetic requirements in bridge design, Introduction to bridge codes.Economic evaluation of a bridge project. Site investigation and planning.

Unit 2: Factors affecting scour and its evaluation. Bridge foundations - open, pile, well and caisson. Piers, abutments and approach structures; Superstructure - analysis and design of right, skew and curved slabs.

Unit 3: Girder bridges - types, load distribution, design. Introduction to long span bridges cantilever,arch, cable stayed and suspension bridges.

Text Books

1) Principle & Practice of Bridge Engineering by S.P. Bindra- DhanpatRai.
2) Bridge Engineering by Demetrios E. Tonias, Jim J. Zhao.
3) Design of Bridge Structures – Jagadish&Jayaram – Prentice Hall.
4) Bridge Engineering by S. Ponnuswamy (Manohar Publishers & Distributor).

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Course Description

Title of Course: Structural Optimization
Course Code: SCE 105B
L-T Scheme: 4-0 **Course Credits: 4**

Introduction: The course examines the basic concepts of structural optimization including the linear and non-linear programming fundamentals. The topics broadly covered under the subject includes Classical methods: theory of layout: Differential calculus, Mathematical programming and computer techniques: linear programming: Revised simplex method, non-linear programming fundamentals.

Objectives:
The students will have a clear understanding of the mathematical programming and computer techniques, linear programming and non-linear programming fundamentals.

Learning Outcomes: The students will have a clear understanding of the following concepts: Mathematical programming and computer techniques: linear programming: Revised simplex method, non-linear programming fundamentals. 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: Geometricprogramming and dynamic programming: application to structural engineering problem.

Course Contents:

Unit 1: Classical methods: theory of layout: Differential calculus: simultaneous modes of failure: Fully stressed design –optimality criterial methods.

Unit 2: Mathematical programming and computer techniques: linear programming: Revised simplex method, non-linear programming fundamentals.

Unit 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: Geometricprogramming 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).

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Course Description

Title of Course: Repair and rehabilitation of structures
Course Code: SCE 105C
L-T Scheme: 4-0 **Course Credits: 4**

Introduction:

This course examines the basic concepts of the repair and rehabilitation of structures. The topics broadly covered under this subject includes Appraisal of damage and deterioration of structures by non-destructive and other techniques; Cause of deterioration, Environmental aspects and earthquake effects; Repair and strengthening of superstructure – structural components, loadbearing wall, panel walls; Strengthening of foundation.

Objectives:

In this course, the students will have a clear idea of the repair and rehabilitation of structures and the various methods of the repair and rehabilitation process. The students will have a clear idea of the Repair and strengthening of superstructure – structural components, loadbearing wall, panel walls; Strengthening of foundation; Grouting; Grout material, under pinning. Repair of steel structures – bridge, building, towers etc.

Learning Outcomes: The students will have a clear idea of the following concepts:Environmental aspects and earthquake effects; Repair and strengthening of superstructure – structural components, loadbearing wall, panel walls; Strengthening of foundation; Grouting; Grout material, guniting, shotcreting, under pinning.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.

Course Contents:

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

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

Unit 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.

Text Books

1) Testing of Concrete in Structure by Bungey (Surrey University Press).
2) Non Destructive Testing by Malhotra &Carino (CRC Press).
3) Corrosion of Steel in Concrete by Broomfield John P. (Taylor & Francis).

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Course Description

Title of Course: Structural Laboratory I
Course Code: SCE 191
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:
1. The students will develop a clear understanding of the various tests conducted on concrete in both fresh and hardened states.
2. They will develop the concepts of workability, slump test, Vee-bee compacting test and compaction factor tests which are conducted on fresh concrete to determine the fresh concrete properties.
3. The students will be able to perform mix design of concrete and as per the proportion develop concrete mixes of different compressive strengths.
4. The students will be able to perform and analyze the various properties of concrete in hardened state like compressive strength, Split Tensile Strength, Flexure Tests.
5. The students will be exposed to non-destructive testing like Rebound Hammer and Ultrasonic Pulse Velocity test.

Learning Outcomes: The students will be able to understand the various tests which are performed on cement like specific gravity, normal consistency, setting time. The students will also develop a clear understanding of the compressive strength on cement mortar cubes. The students will also develop a clear understanding of the various tests on fine aggregates like sieve analysis, fineness modulus, moisture content, bulk density. The students will also develop concepts on various tests conducted on coarse aggregate like fineness modulus, bulk density.

Course Contents:
Practicals that must be done in this course are listed below:

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. 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.

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Course Description

Title of Course: CAD Lab
Course Code: SCE 192
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:
1. The students will be able to develop the concepts of Computer Aided Design Of Structures.
2. They will be exposed to latest CAD CAM software environment and will be able to develop efficiently the detailed design and drawings including the floor plans of different kinds of structures.
3. The students will be able to prepare the detailed drawings of different structural elements including the ductility detailing of RCC slab, beam, column and footing design.

Learning Outcomes: The students will be able to develop the understanding of CAD software and develop a clear understanding of the analysis and design of a multistoried buildings using softwares. The students will be able to prepare the detailed drawings of different structural elements including the ductility detailing of RCC slab, beam, column and footing design.

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

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

Text Book:
1. CAD CAM Standard Manual.

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Course Description

Title of Course: Seminar
Course Code: SCE181
L-T-P scheme: 0-2-0 **Course Credit: 1**

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.
The objectives of the six exploratory seminars are:

- **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 from the UK and internationally**
- **to bring together seminar participants from different disciplines such as Sociology, Philosophy, Psychology, Human Geography, Media Studies as well as Education and Cultural Studies**
- **to encourage and financially support the participation of PhD students**
- **to actively involve practitioners and users from each venue**
- **to engage a core group of policy makers**
- **to use the seminars to develop links between academics and stakeholders in the arts, library, media, community and educational sectors**