

VIII SEMESTER, B.Tech.-Civil

Sr.No	Course Code	Subject	L-T-P	Credits
1	CE 406	Ground Improvement Techniques	3-0-0	3
2	CE 407	Computer Aided Design	3-1-0	4
3	CE 408	Earthquake Engineering	3-0-0	3
4	CE XXX	Elective-III	3-0-0	3
5	CE XXX	Elective-IV	3-0-0	3
6	CE 400 B	Major Project	0-0-5	5
Total Contact Hrs=15 hrs. Lectures+1 Hr. Tutorial+10 hrs. Lab= 26Hrs			TOTAL	21

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE 404

Course Name: **Ground Improvement Techniques**

Objective: This course discusses the latest techniques and field methods used in compaction, stabilization, grouting and soil reinforcement.

Soil compaction: laboratory methods, field methods, compaction control; Soil stabilization: using additives, sand drains, stone columns, lime columns; Grouting: types of grouts, methods of grouting; Soil reinforcement: using strips, geogrids, geotextiles, geomembranes; Dewatering methods; Soil nailing; Underpinning; Tunnelling.

References:

- 1. T.W. Lambe & R.V. Whitman, "Soil Mechanics", John Wiley & Sons, 1969.**
- 2. Terzaghi, Peck & Mesri, "Soil Mechanics in Engineering Practice", John Wiley & Sons, 1996 .**
- 3. M. R. Hausmann, "Engineering Principles of Ground Modification", McGraw Hill, 1990.**

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 1 0 4

Course Code: CE 405

Course Name: Computer Aided Design

Objective: This course helps the students to use of software like C , C++,Staad-Pro for solving the engineering design problem.

Essential features in a design software, User-machine interface, Computer graphics - coordinate systems and transformations, automatic generation of input-mapping techniques, Display of response quickness, Use of object oriented programming.

Software for various design tasks, Heuristic approaches in Civil Engineering. Tools for developing programmes involving heuristic search Expert system shells and object oriented languages, Rule based systems, Neural networks.

Texts/References

Newman W.M., and Sproull, R.F. Principles of Interactive Computer Graphics, McGraw Hill, N.Y. 1988.

Adeli H., Interactive Microcomputer-aided structural steel design, A New Generation, Prentice Hall, N.J., 1990.

Adeli H., and Balasubramanyam, K.V., Expert Systems for Structural Design, Prentice Hall, N.J., 1991.

Schildt H., Using C++, Borland-Osborne/ McGraw Hill, 1991.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE 406

Course Name: **Earthquake Engineering**

Objective: This course discusses the effects of earthquake on high rise buildings and other tall structures and how to make them earthquake resistant.

UNIT – I Introduction to Structural Dynamics : – Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Concept of response spectrum.

UNIT – II Multi-Degree of Freedom (MDOF) Systems : - Formulation of equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

UNIT – III Earthquake Analysis : - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and multi-storyed buildings – Use of response spectra.

UNIT – IV Codal Design Provisions : - Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion.

UNIT – V Earthquake Engineering : - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source,

Focus, Epicenter etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes – Seismic waves – Seismic zones – Seismic Zoning Map of India – Seismograms and Accelegrams.

UNIT – VI Codal Detailing Provisions : - Review of the latest Indian Seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings – Beam, column and joints

UNIT – VII Aseismic Planning : - Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems – Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities – Vertical Geometric Irregularity – Proximity of Adjacent Buildings.

UNIT – VIII Shear walls : - Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements.

TEXT BOOKS:

1. Dynamics of Structures – Clough & Penzien, McGraw Hill – International Edition.
2. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Printice Hall of India, New Delhi

REFERENCES:

1. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch, Delhi.
2. Earthquake Tips by C.V.R.Murty, I.I.T. Kanpur.
3. Structural Dynamics by Mario Paaz.

IS Codes: IS:1893, IS:4326 and IS:13920.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE-420 (Elective-III)

Course Name: ADVANCED STRUCTURAL ANALYSIS

Objective: This course discusses advanced techniques used in analyzing indeterminate structures.

UNIT - I

Moment Distribution method: Application to the analysis of portal frames with inclined legs, gable frames

UNIT – II

Strain energy method: Application to the analysis of continuous beams and simple portal frames.

UNIT - III

Influence lines: Influence line diagrams for Reaction, Shearing force and Bending moment in case of determinate beams and Influence line diagrams for member forces in determinate trusses – application of influence line diagrams.

UNIT - IV

Analysis Two hinged and Three hinged arches using influence lines.

UNIT - V

Flexibility Method: Introduction to the structural analysis by flexibility concept using Matrix approach and application to continuous beams and plane trusses.

UNIT - VI

Stiffness method: Introduction to the structural analysis by stiffness concept using Matrix approach and application to continuous beams and plane trusses.

UNIT - VII

Analysis of portal frames by flexibility and stiffness methods. Drawing of bending moment diagram.

UNIT - VIII

Plastic Analysis: Introduction – Idealized stress – Strain diagram – shape factors for various sections – Moment curvature relationship – ultimate moment – Plastic hinge – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

TEXT BOOKS:

1. Matrix methods of Structural Analysis by Pandit and Gupta – Tata Mc.Graw Hill
2. Analysis of structures Vol. I & II by Vazrani and Ratwani. Khanna publications.
3. Comprehensive Structural Analysis [Vol.1 & 2](#) by Dr. Vaidyanathan and Dr. P.Perumal - by Laxmi, publications Pvt. Ltd., New Delhi

REFERENCES:

1. Structural Analysis by D.S.Prakash Rao - Sagar books
2. Structural Analysis Vol. I & II by Bhavi Katti Vikas Publications.
3. Matrix structural analysis by T.N.Gayl; Tata Mc.Graw Hill company

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE-421(Elective-III)

Course Name: PAVEMENT ANALYSIS AND DESIGN

Objective: This course discusses various topics related to pavements such as types of pavements, materials used in pavement construction, different methods of designing flexible and rigid pavements and maintenance of pavements.

UNIT – I

Types of pavement – Factors affecting design of pavements – wheel loads – ESWL Concept- tyre pressure – contact pressure, Material characteristics – Environmental and other factors.

UNIT – II

Stresses in flexible pavement – layered systems concept – one layer system – Boussinesq Two layer system – Burmister Theory for Pavement Design.

UNIT – III

Stresses in rigid pavements – relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction.

UNIT – IV

Pavement design: CBR Method of Flexible Pavement Design- IRC method of flexible pavement design.- AASHO Method of Flexible Pavement design

UNIT – V

IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars.

UNIT – VI

Highway Materials – Soil, Aggregate and Bitumen- Tests on aggregates – Aggregate Properties and their Importance- Tests on Bitumen – Bituminous Concrete- Requirements of Design Mix- Marshall’s Method of Bituminous Mix design.

UNIT – VII

Highway construction – Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads- Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Objectives- Soil-cement Stabilization and Soil-lime Stabilization.

UNIT – VIII

Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements-Types and Causes-Rigid Pavement Failures- Types and causes- Pavement Evaluation- Benkleman Beam method- Strengthening of Existing Pavements- Overlays.

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna & C.J.Justo, Nemchand & Bros., 7th Edition (2000).
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003).

REFERENCES:

1. Principles of pavement design – Yoder & wit zorac – Jhonwilley & Sons.

CODES:

1. IRC Code for flexible pavement – IRC – 37 -2001.
2. IRC Code for Rigid pavement – IRC – 58 – 2002.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE-422 (Elective-III)

Course Name: INDUSTRIAL WASTE AND WASTE WATER MANAGEMENT

Objective: This course discusses the basic theories of industrial waste water management, the problems arising from the discharge of industrial waste in oceans and lakes, recirculation and treatment of industrial waste and waste water.

UNIT – I

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT – II

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems.

UNIT – III

Industrial waste water discharges into streams. Lakes and oceans and problems.

UNIT – IV

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries.

UNIT – V

Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods.

UNIT – VI

Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT – VII

Manufacturing Process and design origin of liquid waste from Suger Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT – VIII

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

TEXT BOOK:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

REFERENCES:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE-423 (Elective-III)

Course Name: Watershed Management

Objective: This course discusses the characteristics of watershed, and watershed management considering various aspects such as forestation, agriculture, land management and administrative requirements.

History of Watershed Management and its relevance to India: Characteristics of watersheds, base hydraulic considerations for different land use. Role of different types of vegetation in watershed management, Role of ecosystem, Foresting, Agriculture, Grassland and Wild land management techniques, Mountain terrains, administrative requirements, Evaluation of control measures, Command Area Development. On-farm management.

References:

- 1. J.V.S. Murthy, "Watershed Management", New Age International, II Ed., 1998.**
- 2. Wurbs, R.A., and James, W.P., "Water Resources Engineering", Prentice-Hall, NJ, 2002.**

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE 424 (Elective-III)

Course Name: Rock Mechanics and Tunnelling

Objective: This course discusses the various properties of rocks, methods of testing, investigating rocks and modern techniques for designing and constructing tunnels.

Engineering properties of rocks, Surface and sub-surface investigation in rock including geophysical studies, Weathering of rocks, Discontinuities, Field and laboratory testing of rocks and rock masses, Stress-strain characteristics, Deformability of rocks, Friction and Shear strength, Slope stability, effect of water, analysis and design of tunnels, Blasting, Bolting, Tunnelling techniques, Application numerical techniques.

Texts/References

R.E. Goodman, Introduction to Rock Mechanics, John Wiley and Sons, New York, 1989.

JACGER, Charles, Rock Mechanics and Engineering, Cambridge University Press, London, 1972.

Megaw, T.M. and J.V. Bartlett, Tunnels : Planning, Design, Construction, International Edition, Ellis Horwood Limited, John Wiley and sons, New York, 1983.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: ME-422 (Elective-III)

Course Name: Basics of Wind Engineering

Objective: This course discusses various aspects of wind engineering and its application in designing different structures.

Introduction: state of the art in wind engineering.

Bluff body aerodynamics: boundary layer separation; wake and vortex formations; pressure, lift, drag and moment effect.

Structural dynamics: single degree of freedom linear system; multi-degree of freedom linear system; example of along-wind response.

Aero elastic phenomena; vortex shedding and lock-in phenomena; models of vortex-induced response; across wind galloping; wake galloping; flutter; torsion divergence.

Wind tunnel simulation of aerodynamic and aero-elastic behaviour of bluff bodies.

Application to design of tall buildings, slender towers and stacks.

Effects of wind on low-rise buildings under general and extreme conditions.

Codes of practices on analysis and design of wind sensitive structures.

References:

1. Wind Effects on Structures – E. Simiu & R. Scanlan.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE 425 (Elective-IV)

Course Name: OPTIMIZATION TECHNIQUES

Objectives: This course discusses various optimization techniques necessary for designing various engineering structures and models.

Unit 1 :Introduction:

Engineering application of optimization, statement of an optimization problem with example for minimum weight and optimum cost consideration, classification of optimization problems and techniques, Single variable optimisation , multivariable optimization with equality and inequality constraints and without constraints.

Unit 2 : Linear Programming

Introduction,standard form of the problem, Geometry,basic terminology
Techniques of linear programming: Simplex method, Revised simplex method:Duality in linear programming,decomposition principle, post-optimality analysis, applications to engineering design

Unit 3: Non Linear Programming

Introduction,elimination methods:various search methods-Fibonacci method and golden section method Interpolation method-Quadratic and cubic interpolation methods, Direct root method.

Unit 4: Unconstrained optimization Techniques:

Introduction; Standard form of the problem and basic terminology; Direct search method- Simplex method, Random search method, Univariate and pattern search method Indirect search method-Steepest Descent (Cauchy) method, Conjugate gradient method, Newton's method, Application to engineering problems

Unit 5: Constrained Optimization Introduction; Standard form of the problem and

basic terminology; Direct method: Sequential Linear Programming; Generalised Reduced gradient method, Methods of feasible direction Indirect method: Penalty

function method Interior and exterior penalty function method, Convex programming problem, Check for convergence Application to engineering problems

Unit 6 : Introduction to non-traditional methods:

Genetic Algorithm: Introduction, Representation of design variables, objective function and constraints, Genetic operators and numerical results.

Introduction to Neural network based optimisation

References

1. S.S.Rao, 'Engineering Optimisation- Theory and Practice', New Age International.
2. Deb K., 'Optimisation for Engineering Design-Algorithms and Example', Prentice Hall
3. Gallagher and O.C Zeinkiewicz, 'Optimum Structural Design – Theory & Applications', John Wiley and Sons, London
4. Jozsef Farkas, 'Optimum Design of Metal structures', Ellis Horwood Limited, Chichester
5. U.Kirsch, 'Optimum structural design', McGraw –Hill, New York

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 0

Course Code: CE 426 (Elective-IV)

Course Name: **Bridge Engineering**

Objective: This course discusses how to design short and long span bridges, pre stressed concrete bridges and plate girder bridges.

INTRODUCTION

Classification, investigations and planning, choice of type, I.R.C.specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

SHORT SPAN BRIDGES

Load distribution theories, analysis and design of slab culverts, tee beam and slab bridges.

LONG SPAN GIRDER BRIDGES

Design principles of continuous bridges, box girder bridges, balanced cantilever bridges.

DESIGN OF PRESTRESSED CONCRETE BRIDGES

DESIGN OF PLATE GRIDER BRIDGES

BEARINGS, SUBSTRUCTURES AND FOOTINGS FOR BRIDGES

References:

1. Raina V.K. "Concrete Bridge Practice" , Tata McGraw Hill Publishing Company, New Delhi, 1991.
2. Krishnaraju, N., "Design of Bridges" Oxford and IBH Publishing Co., Bombay, Calcutta, New Delhi, 1988
3. Bakht, B. and Jaegar, L.G., "Bridge Analysis simplified", McGraw Hill, 1985.
4. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 1989
5. Derrick Beckett, "An introduction to Structural Design of Concrete Bridges", Surrey University Press, Henley Thames, Oxford Shire, 1973.

6. Taylor, F.W., Thomson, S.E., and Smulski E., "Reinforced Concrete Bridges", John Wiley and Sons, New York, 1955.
7. Edwin H.Gaylord Jr., Charles N.Gaylord, James, E.,Stallmeyer "Design of Steel Structures"
McGraw Hill International Editions, 1992.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE-427 (Elective-IV)

Course Name: **Environmental Impact, Risk Assessment and Auditing**

Objective: This course discusses methods of performing environmental assessments including environmental monitoring, environmental management and administration, both in public and private sectors.

UNIT – I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT – II

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT – III

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives.

UNIT-IV

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment,

Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT – V

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT – VI

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT-VII

Post Audit activities, The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.), Mota Act, Wild life Act.

UNIT-VIII

Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

- 1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.**
- 2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers**
- 2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi**

REFERENCES:

- 1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi.**

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE 428 (Elective-IV)

Course Name: **River Engineering**

Objective: This course helps the students to understand the river structures and their design practices with impact of river modification.

Multipurpose river use, natural and physical process in alluvial rivers, Channel modification and practices, river structures, design practices, impact of river modification, problem analysis.

Text or References:

Petersen 1986, River engineering, Prentice Hall.

Yang 1996, Sediment transport, Mc Graw Hill.

French 1985, Open Channel Hydraulics. Mc Graw Hill.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

3 0 0 3

Course Code: CE 429 (Elective-IV)

Course Name: **Offshore engineering** \

Objective: This course discusses the characteristics of offshore structures like marine jetty and the designing process of offshore structures.

Linear theory of waves, brief description of higher order wave theories, random waves, probability theories. Morison's equation, wave forces on fixed and floating structures and fluid structure interaction. Soil exploration beneath seabed, criteria of foundation design in offshore environment, pile behaviour under cyclic lateral loading, development of p-y curves. Analysis of piles and foundations of gravity platforms, soil liquefaction under cyclic stresses. Various types of offshore structures and evaluation of their environmental loads. Structural idealization and analysis of forces due to wind, waves and for linear static behaviour. Wave force on inclined members, analysis of joints in offshore structures, stress concentration and fatigue life prediction. Elementary aspects of dynamic analysis and response.

Texts/References

T. Sarapkaya and M. Isaacson, Mechanics of Wave Forces on Offshore Structures, Van Nostrand, Reinhold Co., N.Y., 1981.

C.A. Brebbla and S. Walker, Dynamic analysis of Offshore Structures, Newnes Butterworth, London, 1979.

SIR PADAMPAT SINGHANIA UNIVERSITY, UDAIPUR

COURSE CONTENTS

Fourth Year (II semester) Batch:2008-2012

L T P C

0 0 5 5

Course Code: CE 400 B

Course Name:**Major Projects**

Objective: Students will select a topic in line with their elective subject. They are expected to work independently on the project under faculty guidance and make a presentation at the end of the semester.