

Kerala Technological University

Cluster 4: Kottayam

**M. Tech Program in
Civil Engineering**
(Structural Engineering & Construction Management)

Scheme of Instruction & Syllabus: 2015 Admissions



Compiled By

Rajiv Gandhi Institute of Technology, Kottayam

July 2015



**Kerala Technological University
(Kottayam Cluster)**

M. Tech Program in STRUCTURAL ENGINEERING AND CONSTRUCTION MANAGEMENT

Scheme

Credit requirements : 67 credits (22+19+14+12)

Normal Duration : Regular: 4 semesters; External Registration: 6 semesters;

Maximum duration : Regular: 6 semesters; External Registration: 7 semesters.

Courses: Core Courses: Either 4 or 3 credit courses; Elective courses: All of 3 credits

Allotment of credits and examination scheme:-

Semester 1 (Credits: 22)

| Exam Slot | Course No: | Name | L- T - P | Internal Marks | End Semester Exam | | Credits |
|-----------|-------------|--|----------|----------------|-------------------|----------------|---------|
| | | | | | Marks | Duration (hrs) | |
| A | 04 CE 6401 | Analytical methods in Engineering | 3-1-0 | 40 | 60 | 3 | 4 |
| B | 04 CE 6403 | Theory of Elasticity | 3-1-0 | 40 | 60 | 3 | 4 |
| C | 04 CE 6405 | Construction Management | 3-0-0 | 40 | 60 | 3 | 3 |
| D | 04 CE 6407 | Advanced Design of Concrete Structures | 3-0-0 | 40 | 60 | 3 | 3 |
| E | 04 CE 6XXX* | Elective - I | 3-0-0 | 40 | 60 | 3 | 3 |
| | 04 GN 6001 | Research Methodology | 0-2-0 | 100 | 0 | 0 | 2 |
| | 04 CE 6491 | Seminar - I | 0-0-2 | 100 | 0 | 0 | 2 |
| | 04 CE 6493 | Computer Application Lab | 0-0-2 | 100 | 0 | 0 | 1 |
| | | Total | 23 | | | | 22 |

**See List of Electives-I for slot E*

List of Elective - I Courses

| Exam Slot | Course No. | Course Name |
|-----------|------------|---|
| E | 04 CE 6409 | Construction and Contracts Management |
| E | 04 CE 6411 | Structural Dynamics |
| E | 04 CE 6413 | Construction Planning, Scheduling and Control |
| E | 04 CE 6415 | Prestressed Concrete Structures |

**Semester 2 (Credits: 19)**

| Exam Slot | Course No: | Name | L- T - P | Internal Marks | End Semester Exam | | Credits |
|-----------|-------------|-------------------------------------|----------|----------------|-------------------|----------------|---------|
| | | | | | Marks | Duration (hrs) | |
| A | 04 CE 6402 | Project Planning and Implementation | 3-1-0 | 40 | 60 | 3 | 4 |
| B | 04 CE 6404 | Finite Element Analysis | 3-0-0 | 40 | 60 | 3 | 3 |
| C | 04 CE 6406 | Theory of Plates & Shells | 3-0-0 | 40 | 60 | 3 | 3 |
| D | 04 CE 6XXX* | Elective - II | 3-0-0 | 40 | 60 | 3 | 3 |
| E | 04 CE 6XXX^ | Elective - III | 3-0-0 | 40 | 60 | 3 | 3 |
| | 04 CE 6492 | Mini Project | 0-0-4 | 100 | 0 | 0 | 2 |
| | 04 CE 6494 | Structural Engineering Lab | 0-0-2 | 100 | 0 | 0 | 1 |
| | | Total | 22 | | | | 19 |

*See List of Electives -II for slot D

^See List of Electives -III for slot E

List of Elective - II Courses

| Exam Slot | Course Code | Course Name |
|-----------|-------------|--|
| D | 04 CE 6408 | Advanced Analysis of Structures |
| D | 04 CE 6412 | Design of Reinforced Concrete Foundations |
| D | 04 CE 6414 | Earthquake Analysis and Design of Structures |
| D | 04 CE 6416 | Construction methods and Equipments |

List of Elective - III Courses

| Exam Slot | Course Code | Course Name |
|-----------|-------------|--------------------------------------|
| E | 04 CE 6418 | Advanced Concrete Technology |
| E | 04 CE 6422 | Advanced Steel Structures |
| E | 04 CE 6424 | Quantitative methods in Construction |
| E | 04 CE 6426 | Project Formulation and Appraisal |

Summer Break

| Exam Slot | Course No: | Name | L- T - P | Internal Marks | End Semester Exam | | Credits |
|-----------|------------|---------------------|----------|----------------|-------------------|----------------|------------|
| | | | | | Marks | Duration (hrs) | |
| NA | 04 CE 7490 | Industrial Training | 0-0-4 | NA | NA | NA | Pass /Fail |
| | | Total | 4 | | | | 0 |

Semester 3 (Credits: 14)



| Exam Slot | Course No: | Name | L- T - P | Internal Marks | End Semester Exam | | Credits |
|-----------|-------------|---------------------|----------|----------------|-------------------|----------------|---------|
| | | | | | Marks | Duration (hrs) | |
| A | 04 CE 7XXX* | Elective - IV | 3-0-0 | 40 | 60 | 3 | 3 |
| B | 04 CE 7XXX^ | Elective - V | 3-0-0 | 40 | 60 | 3 | 3 |
| | 04 CE 7491 | Seminar - II | 0-0-2 | 100 | 0 | 0 | 2 |
| | 04 CE 7493 | Project (Phase - I) | 0-0-12 | 50 | 0 | 0 | 6 |
| | | Total | 20 | | | | 14 |

*See List of Electives-IV for slot A

^See List of Electives-V for slot B

List of Elective - IV Courses

| Exam Slot | Course Code | Course Name |
|-----------|-------------|---|
| A | 04 CE 7401 | Design of Steel – Concrete Composite Structures |
| A | 04 CE 7403 | Design of Bridges |
| A | 04 CE 7405 | Construction Economics and Finance |
| A | 04 CE 7407 | Design of Tall Buildings |

List of Elective - V Courses

| Exam Slot | Course Code | Course Name |
|-----------|-------------|---|
| B | 04 CE 7409 | Design of Cylindrical shell and Folded Plates |
| B | 04 CE 7411 | Construction Project Management |
| B | 04 CE 7413 | Maintenance & Rehabilitation of Structures |
| B | 04 CE 7415 | Construction Personnel Management |

Semester 4 (Credits: 12)

| Exam Slot | Course No: | Name | L- T - P | Internal Marks | External Evaluation Marks | | Credits |
|-----------|------------|---------------------|----------|----------------|---------------------------|----|---------|
| NA | 04 CE 7494 | Project (Phase -II) | 0-0-21 | 70 | 30 | NA | 12 |
| | | Total | 21 | | | | 12 |

Total: 67



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-----------------------------------|---------|------|
| 04 CE 6401 | ANALYTICAL METHODS IN ENGINEERING | 3-1-0:4 | 2015 |

Pre-requisites: Nil

Course Objectives:

- Understanding of fundamental mathematics and to solve problems of algebraic and differential equations, simultaneous equation, partial differential equations
- To provide an overview of discovering the experimental aspect of modern applied mathematics

Syllabus

Differential equations , Partial differential equations, Charpit's method, Boundary value problems, Numerical solutions of P.D.E

Course Outcome:

- Ability to solve the model by selecting and applying a suitable mathematical method.
- Ability to interpreting the mathematical results in physical or other terms to see what it practically means and implies

Text Books:

References:

- B.S Grewal, "Numerical Methods in Engineering and Science", Khanna Publications.
- George F. Simmons, "Differential Equations with applications and historical notes", TMH Edition
- Michael D Greenberg, "Advanced Engineering Mathematics", Pearson education.
- Ian Sneddon, "Elements of Partial Differential Equations", McGraw Hill, International Editions.
- P Kandasamy, "Numerical Methods", S Chand and company.
- S.Arumugam,A. Thangapandilssac, "Numerical methods", Scitech



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|--|----------------------|----------------------------|
| 04 CE 6401 | ANALYTICAL METHODS IN ENGINEERING | 3-1-0:4 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Differential equations Linear differential equations–homogeneous equations–boundary value problems–Cauchy–Euler equations–factoring the operator–non-homogeneous equations–variation of parameters. | | 10 | 15 |
| MODULE 2: Partial differential equations Ordinary differential equations in more than two variables – first order P.D.E– integral surface passing through a given curve–surfaces orthogonal to given system–compatible systems of first order P.D.E | | 10 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Charpit's method –solution satisfying the given conditions–P.D.E second order in physics–linear P .D.E with constant coefficients. | | 8 | 15 |
| MODULE 4: Boundary value problems Elementary solutions of Laplace equations, wave equations, series solution of these equations in two dimensions–related problems in engineering | | 10 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Classification of second order equation– finite difference approximations to partial derivatives. | | 8 | 20 |
| MODULE 6: Solution of Laplace equation by finite difference method–solution of one dimensional wave equations | | 10 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|----------------------|---------|------|
| 04 CE 6403 | THEORY OF ELASTICITY | 3-1-0:4 | 2015 |

Pre-requisites:Nil

Course Objectives:

- Understanding the basic concepts of forces, stresses, strain etc
- Understanding the general concepts of plasticity, asymmetric problems

Syllabus

Elasticity, Two dimensional stress–strain problems, Airy’s stress function, Analysis of asymmetric problems and Torsion, Torsion of prismatic bar, Plasticity

Course Outcome:

- The student will be able to execute the stress state, stresses and strains analysis
- To be able to use the numerical methods for the problem of the theory of elasticity in practice

Text Books:

References:

- Timoshenko S P and Goodier J. N, “Theory of Elasticity”, Tata Mcgraw Hill International Student Edition
- Thin plates and shells, theory ,application-Edward Ventsel, Krauthammer.
- Johnson W and Mellor P. B, “Plasticity for mechanical engineers”, Van Nostrand Company Ltd.
- Sadhu Singh, “Theory of elasticity”, Khanna Publishers, Delhi.
- Srinath L. S, “Advanced mechanics of solids”, Tata McGraw– Hill Publishing Company Ltd., New Delhi.
- Arthur P Boresi& Omar M SideBottom, “Advanced Mechanics of Materials”, John Wiley & Sons.
- Sokolnikoff, “Mathematical Theory of Elasticity”.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|-----------------------------|----------------------|----------------------------|
| 04 CE 6403 | THEORY OF ELASTICITY | 3-1-0:4 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Elasticity Basic concepts– Body force–Surface traction–Stresses and strains–Three dimensional stresses and strains–analysis–transformation equations of 3D stresses & strains–principal stresses & strains–States of stresses & strain–Equilibrium equations–generalized Hooke’s Law– Compatibility Conditions–Boundary conditions. | | 10 | 15 |
| MODULE 2: Two dimensional stress–strain problems Plane stress and plain strain– Analysis–transformation equations–stress–strain relations– equilibrium equations in Cartesian and polar co ordinates. | | 10 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Airy’s stress function– Biharmonic Equilibrium–St Venant’s principle– 2D problems in Cartesian coordinate–cantilever with concentrated load at free end– Simply supported With UDL–Cantilever with moment at free end. | | 8 | 15 |
| MODULE 4: Analysis of asymmetric problems and Torsion General equations in polar co ordinates–Stress distribution symmetric about an axis–Cylinder subjected to external and internal pressures– Rotating disc as a 2D problem. Effect of circular hole in stress distribution of plates. | | 10 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Torsion of prismatic bar– General solution–Warping function approaches – St. Venant’s theory– Membrane analogy– Torsion of Non Circular sections – Torsion of multi celled thin wall open and closed sections. | | 8 | 20 |
| MODULE 6: Plasticity Introduction to plasticity – General concepts – Stress – Strain curves – Ideal plastic body – Plastic flow conditions – theories of failure – plastic work – Plastic potential – Yield criteria – Simple applications – Elasto – plastic analysis for bending and torsion of bars – Residual stresses | | 10 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-------------------------|---------|------|
| 04 CE 6405 | CONSTRUCTION MANAGEMENT | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To acquaint with the project management skills
- Ability to use CPM and PERT methods in effective project management
- Ability to do resource planning and project scheduling

Syllabus

Scientific Management, Organisation, Management information Systems , Engineering Economics, Rate of return - replacement analysis ,Network Techniques in Construction

Course Outcome:

To understand the principles associated with effective project management and application of these principles in avoiding common difficulties associated with project management

Text Books:

References:

- Robert G Murdick, Joel E Ross, James R Clagget. " Information systems for Modern Management "- PHI Learning Private Limited, New Delhi.
- B L Gupta & Amit Gupta. "Construction management and machinery " - Standard publishers Distributors, Delhi
- DinkarPagare. " principles of management " - Sultan Chand & Sons, New Delhi.
- R Paneerselvam. " Engineering Economics " - PHI Learning Private Limited, New Delhi.
- Prassanna Chandra. "PROJECTS-Planning, Analysis, Selection, Financing, Implementation and Review" -Tata McGraw-Hill Education private Limited.
- James D Stevens. "Techniques for Construction Network Scheduling" - McGraw-Hill Publishing Company



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|--------------------------------|----------------------|----------------------------|
| 04 CE 6405 | CONSTRUCTION MANAGEMENT | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Scientific Management Concept - elements - contributions of pioneers in scientific management - basic principles of management with reference to construction industry | | 7 | 15 |
| MODULE 2: Organisation Maslow's hierarchy of needs –organisation - principles –types- construction organisation setup. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Management information Systems Definition - evolution - organisational theory - systems approach - computer systems -database management - information systems for decision making - MIS effectiveness and efficiency criteria -failure of MIS. | | 7 | 15 |
| MODULE 4: Engineering Economics Definition and scope - cash flow - interest formulas and application - time value of money -bases of comparison - decision making amongst alternatives | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Rate of return - replacement analysis - break even analysis - incremental analysis - benefit cost analysis - capital budgeting - working capital management - construction accounting - long term and short term financing - problems and case studies | | 7 | 20 |
| MODULE 6: Network Techniques in Construction Introduction - planning - work scheduling -network diagram - rules for drawing network diagram - Fulkerson's rule - PERT / CPM techniques - precedence networks - least cost scheduling- resource allocation - updating - application of network techniques - related problems | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|--|---------|------|
| 04 CE 6407 | ADVANCED DESIGN OF CONCRETE STRUCTURES | 3-0-0 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To learn the fundamentals of design, analysis, and proportioning of reinforced concrete members and structures.
- Methods for analysis and design of the elements under flexure, shear, and axial loads will be examined

Syllabus

Calculation of deflection and crack width, Design of flat slabs and flat plates, Design of RC walls.

Course Outcome:

- The students will be familiar with advanced methods used for concrete structural design.
- Identify underlying concepts in modern concrete design methods

Text Books:

References:

1. Varghese, P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India, 2005.
2. Varghese P.C, "Limit State Design of Reinforced Concrete, Prentice Hall of India, 2007.
3. Purushothaman, P, "Reinforced Concrete Structural Elements : Behaviour Analysis and Design", Tata McGraw Hill, 1986
4. Arthur.H.Nilson, David Darwin& Charles W Dolan, "Design of Concrete Structures", Tata Mcgraw Hill, 2004
5. Sinha.N.C. and Roy S.K., "Fundamentals of Reinforced Concrete", S.Chand and Company Limited, New Delhi, 2003.
6. Park.R&Paulay T "Design of Concrete Structures",John Wiley & Sons, NewYork



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|---|----------------------|----------------------------|
| 04 CE 6407 | ADVANCED DESIGN OF CONCRETE STRUCTURES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Calculation of deflection and crack width Design of columns, slender column, corbels and deep-beams. | | 7 | 15 |
| MODULE 2: Design of flat slabs and flat plates- Design of spandrel beams .method of design of slabs- Yield line theory and Hillerborgs strip method. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Design of RC walls - ordinary and shear walls – Design of Grid floors- a) by IS code method-b) by plate theory. | | 7 | 15 |
| MODULE 4: Analysis of Multi-Storey Buildings with Moment resistant Joints for Lateral loads- Modified portal, Cantilever & Factor method- Analysis of Multi-Storey Buildings with Moment resistant Joints for Gravity loads(VERTICAL LOADS) | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Inelastic behaviour of concrete beams- limit state analysis of concrete beams- moment rotation curves, Moment redistribution in continuous beams. | | 7 | 20 |
| MODULE 6: Baker's method of plastic design - Design of cast-in-situ joints in frames. Detailing for ductility - Fire resistance of structural members – Quality of control of concrete. Strengthening of existing structures | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---------------------------------------|---------|------|
| 04 CE 6409 | CONSTRUCTION AND CONTRACTS MANAGEMENT | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To study the various types of construction contracts and their legal aspects and provisions.
- To study the of tenders, arbitration, legal requirement, and labour regulations

Syllabus

Construction Contracts, Tenders, Arbitration, Legal Requirements.

Course Outcome:

- The students will be able to apply knowledge and skills of modern construction practices and techniques.
- Have necessary knowledge and skills in accounting, financing, risk analysis and contracting

Text Books:

References:

- Gajaria G.T., Laws Relating to Building and Engineering Contracts in India,
- Patil. B.S, Civil Engineering Contracts and Estimates, Universities Press (India) Private Limited, 2006
- Jimmie Hinze, Construction Contracts, McGraw Hill, 2001
- Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000.
- Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., Fundamentals of Construction Management and Organisation, Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 6409 | CONSTRUCTION AND CONTRACTS MANAGEMENT | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Construction Contracts | | | |
| Indian Contracts Act–Elements of Contracts–Types of Contracts –Features – Suitability –Design of Contract Documents –International Contract Document – Standard Contract Document –Law of Torts. | | 7 | 15 |
| MODULE 2: Tenders | | | |
| Prequalification –Bidding–Accepting–Evaluation of Tender from Technical, Contractual and Commercial Points of View– | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Contract Formation and Interpretation–Potential Contractual Problems –World Bank Procedures and Guidelines | | 7 | 15 |
| MODULE 4: Arbitration | | | |
| Comparison of Actions and Laws –Agreements–Subject Matter –Violations – Appointment of Arbitrators –Conditions of Arbitration –Powers and Duties of Arbitrator –Rules of Evidence–Enforcement of Award –Costs. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Legal Requirements | | | |
| Insurance and Bonding–Laws Governing Sale, Purchase and Use of Urban and Rural Land –Land Revenue Codes –Tax Laws –Income Tax, Sales Tax. | | 7 | 20 |
| MODULE 6: Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning–Property Law–Agency Law –Local Government Laws for Approval –Statutory Regulations | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---------------------|---------|------|
| 04 CE 6411 | STRUCTURAL DYNAMICS | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- Learn how to model discrete single-degree and multiple-degree vibratory systems and calculate the free and forced response of these systems.
- Calculate the mode shapes and frequencies for the free response of continuous vibratory systems and use modal methods to calculate the forced response of these systems

Syllabus

Single Degree of Freedom System, Response to harmonic loading, Multidegree Freedom Systems and Continuous systems

Course Outcome:

- Understanding of basic principles and importance of structural dynamics structures.
- Learning the importance of structural dynamics in civil engineering in practice

Text Books:

References:

- Clough & Penzien, "Dynamics of Structures.
- Anil K Chopra, "Dynamics of structures", Pearson Education. V.P Singh, " Mechanical Vibrations
- Meirovitch.L, "Elements of Vibration Analysis".
- W.T. Thomson , "Vibration Theory and Applications".
- M.Mukhopadhyay , "Vibrations, Dynamics & Structural systems".
- Paz Mario, "Structural Dynamics–Theory and Computation".
- Denhartog, "Mechanical vibrations".
- Timoshenko, "Vibration Problems in Engineering".



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|----------------------------|----------------------|----------------------------|
| 04 CE 6411 | STRUCTURAL DYNAMICS | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Introduction Objectives - types of dynamic problems - degree of freedom - D' Alemberts Principle - principle of virtual displacement - Hamilton's principle. Types of vibration – vibration control. | | 7 | 15 |
| MODULE 2: | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Response to harmonic loading - evaluation of damping - vibration isolation - transmissibility - response to periodic forces- vibration measuring equipments. Duhamel integral for undamped system- Response to impulsive loads. | | 7 | 15 |
| MODULE 4: Multidegree Freedom Systems and Continuous systems Natural modes - orthogonality conditions - modal Analysis - free and harmonic vibration | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Free longitudinal vibration of bars - flexural vibration of beams with different end conditions - forced vibration. | | 7 | 20 |
| MODULE 6: Approximate methods Rayleigh's method - Dunkerley's method - Stodola's method - Rayleigh –Ritz method - Matrix method. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---|---------|------|
| 04 CE 6413 | CONSTRUCTION PLANNING, SCHEDULING AND CONTROL | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To introduce the concepts and techniques of project planning and scheduling
- To provide an understanding of various techniques for planning and scheduling
- To develop in students the ability to recognize and identify the activities involved in a construction project

Syllabus

Basic Concepts In the Development of Construction Plans, Relevance of Construction Schedules , Scheduling with Resource Constraints and Precedence, The Cost Control Problem , Quality and Safety Concerns in Construction .

Course Outcome:

- Determine the required level of resources and value of work complete as a function of project time
- Determine the optimum method for reducing the time required to complete a project
- Utilize a scheduling program to accelerate the scheduling process and ease the creation of complex project schedules

Text Books:

References:

- John Wiley & Sons, Halpin, D. W (1985). "Financial and Cost Concepts for Construction Management", John Wiley & sons. New York.
 - Calin M. Popescu, Chotchal Charoengam (1995), "Project Planning, Scheduling and Control in Construction : An Encyclopedia of terms and Applications", Wiley, New York,
 - Chitkara. K.K(1998) "Construction Project Management: Planning Scheduling and Control", Tata McGraw Hill Publishing Company, New Delhi.
 - Chris Hendrickson and Tung Au(2000), "Project Management for Construction - Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall Pittsburgh,
- Moder, J., C. Phillips and E. Davis (1983)"Project Management with CPM, PERT and Precedence Diagramming", Van Nostrand Reinhold Company, Third Edition, Willis, E. M., Scheduling Construction Projects.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------|---------------------|
| 04 CE 6413 | CONSTRUCTION PLANNING, SCHEDULING AND CONTROL | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Basic Concepts In the Development of Construction Plans Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships Among Activities -Estimating Activity Duration. Estimating Resource Requirements for Work Activities -Coding Systems | | 7 | 15 |
| MODULE 2: Relevance of Construction Schedules The Critical Path Method - Calculations for Critical Path Scheduling - Activity Float and Schedules -Presenting Project Schedules Critical Path Scheduling for Activity-on-Node and with Leads. Lags. and Windows . - Calculations for Scheduling with Leads, Lags and Windows | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Resource Oriented Scheduling - Scheduling with Resource Constraints and Precedences - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Duration | | 7 | 15 |
| MODULE 4: Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Scheduling In Poorly Structured Problems - Improving the Scheduling Process | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: The Cost Control Problem The Project Budget - Forecasting for Activity Cost Control - Financial Accounting Systems and Cost Accounts - Control of Project Cash Flows - Schedule Control - Schedule and Budget Updates - Relating Cost and Schedule Information. | | 7 | 20 |
| MODULE 6: Quality and Safety Concerns in Construction Organizing for Quality and Safety - Work and Material Specifications - Total Quality Control -Quality Control by Statistical Methods - Statistical Quality Control with Sampling by attributes - Statistical Quality Control with Sampling by Variables - Safety. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---------------------------------|---------|------|
| 04 CE 6415 | PRESTRESSED CONCRETE STRUCTURES | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To Explain the effects of prestress on the behaviour of concrete beams and identify situations when prestress is needed
- To determine the combined stresses induced by prestress and applied loads
- To define and determine the different types of losses of pre-stressed concrete

Syllabus

Analysis and design of simply supported (post and pre tensioned), Short term deflections and long term deflections as per IS Code, Design of tension members.

Course Outcome:

- To introduce you the concepts of pre-stressed concrete, dealing with load analysis.
- You will also be introduced to types pre stressed concrete structures

Text Books:

References:

- Krishna Raju N, "Prestressed Concrete" , 4th Edition TMH New Delhi , 2000
- Rajagopalan N, "Prestressed Concrete", Narora Publishing house, 2002
- Sinha N.C. & Roy, "Fundamentals of Prestressed Concrete", S.Chand& Co, 1985
- Lin T.Y, "Design of Prestressed Concrete Structures", John Wiley & Sons , 1960
- Pandit and Gupta, "Prestressed concrete", CBS, 2002
- F K Kong and R H Evans, " reinforced and prestressed concrete", TMH, 1999



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 6415 | PRESTRESSED CONCRETE STRUCTURES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Analysis and design of simply supported (post and pre tensioned) - PSC flexural members – Basic concepts – Stresses at transfer and service loads, ultimate strength in flexure | | 7 | 15 |
| MODULE 2: Short term deflections and long term deflections as per IS Code – Design and analysis of post and pre tensioned PSC slabs. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Design for shear , bond and torsion – Design of end blocks (IS code method)– Design of prestressed concrete cylindrical water tanks – Design of prestressed concrete pipes | | 7 | 15 |
| MODULE 4: Design of tension members - Design of compression members – compression members with and without flexure – Design of piles | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Composite construction with precast RC beams- Analysis and design – Ultimate strength – Partial prestressing – Definitions – principles and design approaches. | | 7 | 20 |
| MODULE 6: Statically indeterminate structures – Analysis and design – Continuous beams – concept linear transformation – concordant cable profile and cap cables. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
|-------------|----------------------|---------|------|
| 04 GN 6001 | RESEARCH METHODOLOGY | 0-2-0:2 | 2015 |

Pre-requisites:

Course Objectives:

To enable the students:

- To get introduced to research philosophy and processes in general.
- To formulate the research problem and prepare research plan
- To apply various numerical /quantitative techniques for data analysis
- To communicate the research findings effectively

Syllabus

Introduction to the Concepts of Research Methodology, Research Proposals, Research Design, Data Collection and Analysis, Quantitative Techniques and Mathematical Modeling, Report Writing.

Course Outcome:

Students who successfully complete this course would learn the fundamental concepts of Research Methodology, apply the basic aspects of the Research methodology to formulate a research problem and its plan. They would also be able to deploy numerical/quantitative techniques for data analysis. They would be equipped with good technical writing and presentation skills.

Text Books:

1. Research Methodology: Methods and Techniques', by Dr. C. R. Kothari, New Age International Publisher, 2004
2. Research Methodology: A Step by Step Guide for Beginners' by Ranjit Kumar, SAGE Publications Ltd; Third Edition

References:

1. Research Methodology: An Introduction for Science & Engineering Students', by Stuart Melville and Wayne Goddard, Juta and Company Ltd, 2004
2. Research Methodology: An Introduction' by Wayne Goddard and Stuart Melville, Juta and Company Ltd, 2004
3. Research Methodology, G.C. Ramamurthy, Dream Tech Press, New Delhi
4. Management Research Methodology' by K. N. Krishnaswamy et al, Pearson Education



| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|----------------------|----------------------|--|
| 04 GN 6001 | RESEARCH METHODOLOGY | 0-2-0: 2 | |
| MODULES | | Contact Hours | |
| MODULE : 1 Introduction to Research Methodology: Concepts of Research, Meaning and 2 Objectives of Research, Research Process, Types of Research, Type of research: Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, and Conceptual vs. Empirical | | 5 | |
| MODULE :2 Criteria of Good Research, Research Problem, Selection of a problem, Techniques involved in definition of a problem, Research Proposals – Types, contents, Ethical aspects, IPR issues like patenting, copyrights. | | 4 | |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE: 3 Research Design : Meaning, Need and Types of research design, Literature Survey and Review, Identifying gap areas from literature review, Research Design Process, Sampling fundamentals, Measurement and scaling techniques, Data Collection – concept, types and methods, Design of Experiments. | | 5 | |
| MODULE 4: Quantitative Techniques: Probability distributions, Fundamentals of Statistical analysis, Data Analysis with Statistical Packages, Multivariate methods, Concepts of correlation and regression - Fundamentals of time series analysis and spectral analysis. | | 5 | |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE: 5 Report Writing: Principles of Thesis Writing, Guidelines for writing reports & papers, Methods of giving references and appendices, Reproduction of published material, Plagiarism, Citation and acknowledgement. | | 5 | |
| MODULE: 6 Documentation and presentation tools – LaTeX, Office with basic presentations skills, Use of Internet and advanced search techniques. | | 4 | |



| COURSE CODE | COURSE NAME | L-T-P-C | YEAR |
|-------------|---------------------------|---------|------|
| 04 CE 6493 | COMPUTER APPLICATIONS LAB | 0-0-2:1 | 2015 |

List of experiments:

1. PRIMAVERA

- i. Practice on the GUI of the software and Input of Data.
- ii. Practice on Creating Bar Charts/Grant charts.
- iii. Practice on creating CPM/PERT charts and finding out critical path.
- iv. Practice on resource allocation and leveling of resources.
- v. Practice on Project Monitoring (Cost & Time).
- vi. Plotting and printing of various charts and project.
- vii. Filters and layouts- formatting the display- printing and reports.
- viii. Tracking progress- scheduling options and out of sequence progress.

2. STRAP / ETABS / SAP

Linear Static Analysis of Continuous Beams, Portal Frames, Truss (2D and 3D) and Multistoried Building.

Loading: Dead Load, Live Load, Wind Load (IS: 875 Part 1 / Part 2 / Part 3), Earthquake Load (IS: 1893 Part 1) and its Combinations as per Codal Provisions.

Design and Detailing: As per Indian Standards.

3. ANSYS

Linear Static Analysis of Continuous Beams, Portal Frames, Truss (2D and 3D) and Plates (Plane Stress and Plane Strain).

Note: Application of STRAP / ETABS / SAP and ANSYS in modeling, simulation, analysis, design and drafting of structural components is done using the concepts given in theory papers. The student has to practice the packages by working out different types of problems mentioned above.



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-------------------------------------|---------|------|
| 04 CE 6402 | PROJECT PLANNING AND IMPLEMENTATION | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To gather information regarding the tendering process and different types of contract and related aspects regarding construction industry and to analysis productivity in construction industry.
- To learn and understand various quality and safety parameters and its applications in construction industry.

Syllabus

Project reports, Work study, Behavioral science aspects, Evolution of Quality.

Course Outcome:

- Students will earn sufficient knowledge on various basic aspects in construction contract process and productivity analysis and will be in a position to apply various quality and safety techniques in construction industry

Text Books:

References:

- Sengupta and H. Guha (1995), "Construction Management and Planning", Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi.
- Clarkson Oglesby, Henry Parker (1989), Grogory Howell, "Productivity Improvement in Construction", McGraw Hill Book Company, Inc.
- R.P. Mohanty and R.R. Lakhe, "Total Quality Mangement", Jaico Publishing House.
- S. Seetharaman, "Construction Engineering and Management", Umesh Publications.
- K. N. Vaid, "Construction Safety Management", National Institute of Construction Management and Research





COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 6402 | PROJECT PLANNING AND IMPLEMENTATION | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Project reports – sanctions – tendering – contracts – execution of works – measurements – payment – disputes – compensation – arbitration | | 7 | 15 |
| MODULE 2: Work study – factors influencing productivity – tools to assess productivity – productivity improvement techniques | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Behavioral science aspects – motivation of individuals – management of groups – leadership – communication | | 7 | 15 |
| MODULE 4: Evolution of Quality – Quality Management – Quality Control Methods – Factors Affecting Quality of Construction – Quality Standards and Codes in Construction – Concept and Philosophy of Total Quality Management – TQM in Construction. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Importance of Safety – Safety Aspects of Construction – Causes of Accidents – Human Factors in Construction Safety Management | | 7 | 20 |
| MODULE 6: Site Safety Management – Safety in Various Construction Operations – Safety in Material Handling and Equipments – Safety Codes – Measuring of Safety – Approaches to Improve Safety in Construction. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-------------------------|----------|------|
| 04 CE 6404 | FINITE ELEMENT ANALYSIS | 3-1-0: 4 | 2015 |

Pre-requisites: Nil

Course Objectives:

To make the Student:-

- Understand the general plate bending theories
- Obtain an understanding of the fundamental theory of fea
- Develop the ability to generate the governing differential equations

Syllabus

Introduction to FEM -General procedure of FEA - Displacement approach-Variational principles-Derivation of Shape functions-Convergence criteria - Conforming & nonconforming elements-Derivation of Stiffness matrix-axisymmetric problems Isoparametric elements - Numerical Integration.- Gauss-Quadrature General plate bending elements-Plate bending theory – Kirchhoff’s theory – Mindlin’s theory – locking problems - -spurious modes.

Course Outcome:

- Students who successfully complete this course will have demonstrated an ability to understand the fundamental concepts of theory of FEA and will be able use the basic finite elements for structural applications using truss, beam, frame and plane elements

Text Books:

- **References:** C Zienkiewicz, „Finite Element Method”, fifth Edition, McGraw Hill, 2002
- 2. R.D.Cook, “Concepts and Applications of Finite Element Analysis”, John Wiley & Sons.
- C.S.Krishnamoorthy, “Finite Element Analysis”, Tata McGraw Hill .New Delhi,1987.
- S.Rajasekharan, “Finite Element Analysis in Engineering Design”, S Chand & Co. Ltd.1999.
- T.Kant, “Finite Element Methods in Computational Mechanics”, Pergamons Press.
- K.J.Bathe, “Finite Element Procedures in Engineering Analysis” ., Prentice Hall,
- Mukhopadhyay M., Matrix “Finite Element Computer and Structural Analysis”, Oxford & IBH, 1984.
- Irving H. Shames, “Energy & Finite Element Methods in Structural Mechanics”.
- Desai C.S. & Abel J.F., “Introduction to Finite Element Methods”, East West Press.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|--------------------------------|----------------------|----------------------------|
| 04 CE 6404 | FINITE ELEMENT ANALYSIS | 3-1-0:4 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Introduction to FEM Historical development - Idealization of structures-Mathematical model - General procedure of FEA - Displacement approach | | 8 | 15 |
| MODULE 2: Variational Approaches to FEM Variational principles weighted residual approach and method of virtual work. Derivation of equilibrium equations. | | 8 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Shape functions Introduction to Shape Functions-characteristics-Derivation of Shape functions using different methods- -Lagrangian and Hermitian Interpolation- Generalised coordinates-Natural coordinates | | 10 | 15 |
| MODULE 4: Stiffness matrix Derivation of Stiffness matrix of Bar element - Beam element - Plane stress and plane strain and axisymmetric problems -Triangular elements - Constant Strain Triangle - Linear Strain Triangle – using generalized coordinates-natural coordinates etc. – Fellipas method | | 10 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Convergence Criteria & Numerical Integration Compatibility- C^0 and C^1 elements - Convergence criteria - Conforming & nonconforming elements – Patch test. Lagrangian and Serendipity elements, static condensation - Isoparametric elements - Numerical Integration.- Gauss- Quadrature – Computer implementation of finite element method. | | 10 | 20 |
| MODULE 6: General plate bending elements Plate bending theory – Kirchhoff's theory – Mindlin's theory – locking problems - preventive measures – reduced integration – selective integration-spurious modes. | | 10 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-----------------------------|---------|------|
| 04 CE 6406 | THEORY OF PLATES AND SHELLS | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To provide an elementary knowledge of mechanics of materials and mathematics
- To provide a simple and comprehensive mathematical analysis of plate theories and their application to plate bending problems
- Give an insight into the behavior of the plate structure, maintaining a fine balance between analytical and numerical methods
- To provide a knowledge of the fundamentals of theory of shells and folded plates

Syllabus

Plates: Introduction; Pure bending of plates; Laterally loaded rectangular plates; Simply supported rectangular plates under sinusoidal load; Circular plates. Shells: Introduction; Classical theory of shells. Folded plates: Fundamental concepts.

Course Outcome:

- Students will be able to apply fundamental concepts of mechanics of materials and mathematics to practical engineering problems.
- Students will be able to determine the properties and behavior of plates and shells

References:

- S.P Timoshenko, S.W Krieger (2001), " Theory of plates and shells", McGraw Hill, New York
- Lloyd Hamilton Donnell (1976), "Beams, plates and shells", McGraw Hill, New York.
- Owen F Hughes (1983), "Ship structural design", John Wiley & Sons, New York
- G.S. Ramaswamy (1986), "Design and Construction of Concrete Shell Roofs", Tata McGraw Hill Book Co.Ltd
- Krishna Raju N. (1998), "Advanced Reinforced Concrete Design", CBS Publishers and distributors, New Delhi



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|-----------------------------|----------------|---------------------|
| 04 CE 6406 | THEORY OF PLATES AND SHELLS | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Plates Introduction – classification of plates – thin plates and thick plates – assumptions in the theory of thin plates – differential equation for cylindrical bending of rectangular plates | | 7 | 15 |
| MODULE 2: Pure bending of plates Slope and curvature of slightly bent plates – relation between bending moment and curvature in pure bending – stresses acting on a plate inclined to x and y-axes – particular cases of pure bending of rectangular plates. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Laterally loaded rectangular plates Small deflections of laterally loaded thin plates – differential equation of plates – derivation of fourth order differential equation – solution techniques for fourth order differential equation – boundary conditions – simply supported, built – in and free edges. | | 7 | 15 |
| MODULE 4: Simply Supported rectangular plates under sinusoidal Load Navier solution for simply supported plates subjected to uniformly distributed - Levy's solution for simply supported rectangular plates – uniformly distributed and concentrated load | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Circular plates Polar coordinates – differential equation of symmetrical bending of laterally loaded circular plates- uniformly loaded circular plates with clamped edges and simply supported edges– circular plates loaded at the center. | | 7 | 20 |
| MODULE 6: Classical theory of Shells Structural behavior of thin shells – Classification of shells – Singly and doubly curved shells with examples– Membrane theory and bending theory of doubly curved shells.-equilibrium equations. Folded plates – Introduction, Classification, Structural action and analysis | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---------------------------------|----------|------|
| 04 CE 6408 | ADVANCED ANALYSIS OF STRUCTURES | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- Ability to model loads on structures using current codes and standards
- Ability to idealize and analyze statically determinate and indeterminate structures

Syllabus

Review of work and energy principles, Stiffness method, Gauss elimination, Element Flexibility matrix

Course Outcome:

- Ability to analyze statically determinate trusses, beams, and frames and obtain internal loading.
- Ability to analyze cable and arch structures
- Ability to obtain the influence lines for statically determinate and indeterminate structures.
- Ability to determine deflections of beams and frames using classical methods

Text Books:

References:

1. Weaver & Gere, "Matrix Analysis of Structures", East West Press.
 2. Moshe F Rubinstein– "Matrix Computer Analysis of Structures"– Prentice Hall, 1969.
 3. Meek J.L., "Matrix Structural Analysis", McGraw Hill, 1971.
 4. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co.1996.
 5. Smith J.C. "Structural Analysis", Macmillian Pub.Co.1985.
 6. Rajesekharan&Sankarasubramanian,G., "Computational Structural Mechanics", Prentice Hall of India, 2001.
 7. Mukhopadhyay M., "Matrix Finite Element Computer and Structural Analysis", Oxford & IBH, 1984.
 8. Wang C.K.& Solomon C.G., "Introductory Structural Analysis", McGraw Hill.1968.
 9. Pezemieniecki, J.S, "Theory of Matrix Structural Analysis", McGraw Hill Co.,1984.
 10. Seeli F.B.& Smith J.P., "Advanced Mechanics of Materials", John Wiley & Sons, 1993.
 11. Norris & Wilbur, "Elementary Structural Analysis", McGraw Hill.
- DamodarMaity, "Computer Analysis of Framed Structures", I K International



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 6408 | ADVANCED ANALYSIS OF STRUCTURES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Review of work and energy principles- Maxwell, Betti, Castigliano theorems- principles virtual work- Classification of structures–discrete structures–elements–nodes–degrees of freedom– static& kinematic indeterminacy Stiffness method–coordinate systems–element stiffness matrix | | 7 | 15 |
| MODULE 2: Stiffness method – analysis of pin jointed frames (temperature effect, lack of fit), continuous beams (settlement of supports), rigid jointed frames and grids | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Structure stiffness matrix –assembly–equivalent joint load – incorporation of boundary conditions –solutions | | 7 | 15 |
| MODULE 4: Gauss elimination –matrix inversion–analysis of pin jointed frames, continuous beams | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Element Flexibility matrix –truss element–beam element–force transformation matrix | | 7 | 20 |
| MODULE 6: Equilibrium –compatibility–analysis of beams & frames (rigid and pin jointed), grids. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---|----------|------|
| 04 CE 6412 | DESIGN OF REINFORCED CONCRETE FOUNDATIONS | 3-1-0 :4 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To familiarise knowledge and understanding of soil behaviour, pertaining to different types of foundations.
- To introduce detailed design issues related to both deep and shallow foundations.
- Develop the understanding of the role of modern soil mechanics

Syllabus

Introduction to Limit State Design of reinforced concrete in foundation, Combined footings, Structural design of mat foundation , Analysis of flexible beams.

Course Outcome:

- To build the knowledge on soil behaviour and introduce to design issues pertaining to different types of foundations
- An ability to identify & design various types of foundations according to field conditions

References:

- Varghese P.C, "Foundation Engineering" Prentice Hall of India,2005
- Nainan P Kurien,Design of Foundation Systems:Principles& Practices, Narosa, New Delhi 1992.
- Bowles J.E., "Foundation Analysis and Design" (4Ed.), Mc.Graw –Hill, NY, 1996
- Askok K Jain , "Reinforced Concrete Limit State Design"Nem Chand & Bros ,Roorkee
- Shamsheerprakash, GopalRanjan, & Swami Saran (1979), "Analysis and design of foundations and retaining structures", SaritaPrakashan New Delhi
- Jain G.S & Dinesh Mohan " Hand Book on Under reamed and Bored compaction pile foundation ", CBRI Roorkee.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 6412 | DESIGN OF REINFORCED CONCRETE FOUNDATIONS | 3-1-0:4 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Introduction to Limit State Design of reinforced concrete in foundations ; Soil pressure for structural design; Conventional structural design of Spread footings, isolated footings, column Pedestals | | 7 | 15 |
| MODULE 2: Combined footings subjected to vertical loads, lateral loads and moments, Combined Footing, Strap footing, strip footings under several columns | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Structural design of mat foundation of various types subjected to vertical and lateral loads and moments; Design of circular rafts; Annular rafts. Soil structure interaction and 'flexible' approach to the design of foundations; Structural design of retaining walls | | 7 | 15 |
| MODULE 4: Analysis of flexible beams and grids on elastic foundations, Analysis of flexible plates on elastic foundations, ACI method of analysis of beams on elastic foundation. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Structural design of piles including pile caps, under-reamed piles, piers and caissons; infilledvirendal frame foundation- steel column basis , structural design of well foundation. | | 7 | 20 |
| MODULE 6: Special foundations ; Foundations For Towers-steel towers- foundation to water tank, chimneys- shells for foundations- hyperbolic paraboloid foundations, design of conical shell foundation. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|--|----------|------|
| 04 CE 6414 | EARTHQUAKE ANALYSIS AND DESIGN OF STRUCTURES | 3-0-0 :3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To assist in analysing the interaction between civil infrastructure and the ground, including the consequences of earthquakes on structures.
- For the proper design and construction of buildings in accordance with building codes, so as to minimize damage due to earthquakes

Syllabus

Engineering Seismology, Dynamics of Structures, Structural Systems, Earthquake Resistant Design of R.C.C. Buildings.

Course Outcome:

- Ensure proper design of buildings so they will resist damage due to earthquakes, but at the same time not be unnecessarily expensive

Text Books:

- **References:** S K Duggal, "Earthquake Resistant Design of Structures", Oxford University Press, 2007.49
- Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India, 2006
- Course Notes "Design of Reinforced Concrete Buildings", IIT Kanpur, June 1999.
- Paulay, T and Priestly, M.N.J., "A seismic Design of Reinforced Concrete and Masonry buildings", John Wiley and Sons, 1991.
- Bruce A Bolt, "Earthquakes" W H Freeman and Company, New York, 2004
- Bungale S.Taranath, "Structural Analysis and Design of Tall Buildings", McGraw Hill Book Company, New York, 1999.
- Steven C. Kramer, "A text Book on Geotechnical Earthquake Engineering", Prentice hall International series, 2004
- Das B. M., "A text Book on principles of soil Dynamics", Brooks, Cole, 1993.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|---|----------------------|----------------------------|
| 04 CE 6414 | EARTHQUAKE ANALYSIS AND DESIGN OF STRUCTURES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Engineering Seismology (Definitions, Introduction to Seismic hazard, Earthquake Phenomenon), Seismotectonics and Seismic Zoning of India, Earthquake Monitoring and Seismic Instrumentation, Characteristics of Strong Earthquake Motion, Estimation of Earthquake Parameters, Microzonation | | 7 | 15 |
| MODULE 2: Dynamics of Structures (SDOFS/ MDOFS), Response Spectra - Average Response Spectra -Design Response Spectra, Evaluation of Earthquake Forces as per codal provisions, Effect of Earthquake on Different Types of Structures, Lessons Learnt From Past Earthquakes | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Structural Systems -Types of Buildings, Causes of damage, Planning Considerations, Philosophy and Principle of Earthquake Resistant Design, Guidelines for Earthquake Resistant Design, Earthquake Resistant Earthen Buildings, Earthquake Resistant Masonry Buildings - Design consideration –Guidelines. | | 7 | 15 |
| MODULE 4: Earthquake Resistant Design of R.C.C. Buildings - Material properties -Lateral load analysis -Design and detailing –Rigid Frames –Shear wall –Coupled Shear wall | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Mathematical modeling of multistoried RC Buildings – Capacity based design. Vibration Control -Tuned Mass Dampers – Principles and application | | 7 | 20 |
| MODULE 6: Basic Concept of Seismic Base Isolation –various Systems- Case Studies, Important structures. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-------------------------------------|---------|------|
| 04 CE 6416 | CONSTRUCTION METHODS AND EQUIPMENTS | 3-0-0:3 | 2015 |

Pre-requisites: Nil

- **Course Objectives:** To study the substructure construction techniques like box jacking, sheet piling etc
- To study and understand the various types of equipments used for earthwork, tunneling, drilling, blasting, dewatering, material handling conveyors and its applications in construction projects

Syllabus

Open excavation, Supporting the excavations, Construction Method, Construction equipment and techniques.

Course Outcome:

- At the end of this course students will be able to know various types of equipments to be used in the constructions projects

Text Books:

References:

- Antil J.M., (1982) "Civil Engineering Construction", McGraw Hill Book Co.
- Peurifoy, R.L., Ledbette. W.B. (2000), "Construction Planning, Equipment and Methods", McGraw Hill Co.
- Ratay, R.T. (1984), "Hand Book of Temporary Structures in Construction", McGraw Hill.
- Koerner, R.M. (1984), "Construction & Geotechnical Methods in Foundation Engineering", McGraw Hill.
- Varma,M. (1979), "Construction Equipment and its Planning & Applications", Metropolitan Book Co.
- Smith, R.C, Andres, C.K. (1986), "Principles and Practive of Heavy Construction", Prentice Hall.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|-------------------------------------|---------------|---------------------|
| 04 CE 6416 | CONSTRUCTION METHODS AND EQUIPMENTS | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Open excavation , shafts and tunnels, pile, pier and caisson foundations. Basement construction – construction methods | | 7 | 15 |
| MODULE 2: Supporting the excavations – control of ground water - shoring and underpinning – basement waterproofing | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Construction Method for: Bridges, roads, railways, dams, harbours, river works and pipelines | | 7 | 15 |
| MODULE 4: Construction equipment and techniques for: Earth moving, excavating, drilling, blasting, tunneling and hoisting and erection | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Equipment for: Dredging , tunneling, dewatering. Equipment for Flooring-dewatering and floors finishing. | | 7 | 20 |
| MODULE 6: Crushers – feeders – screening equipment – batching and mixing equipment – hauling, pouring and pumping equipment – transporters | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|------------------------------|----------|------|
| 04 CE 6418 | ADVANCED CONCRETE TECHNOLOGY | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To study the properties of constituent elements of concrete
- To study the properties of fresh and hardened concrete
- To study properties of special types of concrete

Syllabus

Classification, Testing Aggregates, Special Cement, Methods of Concrete mix design, Methods of transportation

Course Outcome:

To study the properties of concrete and special types of concrete

Text Books:

References:

- Krishnaraju, N., "Advanced Concrete Technology", CBS Publishers.
- Neville, A. M. (1985), "Concrete Technology", Prentice Hall, New York.
- Santhakumar A.R (2006), "Concrete Technology", World Rights Publisher.
- Gambhir.M.L., Concrete Technology – Tata McGraw Hill Book Co. Ltd.,Delhi,2004
- MethaP.K.andMontreio P.J.M., Concrete Structure Properties and Materials, Prentice Hall, 1998.
- Gupta.B.L. and Amit Gupta, Concrete Technology, Standard Publishers Distributer, New Delhi, 2004.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|-------------------------------------|----------------------|----------------------------|
| 04 CE 6418 | ADVANCED CONCRETE TECHNOLOGY | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Classification, Testing Aggregates , Fibres. Cement, grade of Cement, chemical composition, Hydration of Cement, Structure of hydrated Cement | | 7 | 15 |
| MODULE 2: Special Cement , Water, Chemical and Mineral Admixtures | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Methods of Concrete mix design , Design of high strength and high performance concrete. Rheological behaviour of fresh Concrete, Properties of fresh and hardened concrete, Strength, Elastic properties, Creep and Shrinkage | | 7 | 15 |
| MODULE 4: Variability of concrete strength. Non destructive testing and quality control, Durability, corrosion protection and fire resistance | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Methods of transportataion , Placing and curing–extreme whether concreting, Special concreting methods, Vaccum dewatering of concrete– Under water concreting | | 7 | 20 |
| MODULE 6: Fly–ash Concrete , Fibre reinforced Concrete, Polymer Concrete, Epoxy resins and screeds for rehabilitation – properties and application – Emerging trends in replacement of fine aggregates. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---------------------------|---------|------|
| 04 CE 6422 | ADVANCED STEEL STRUCTURES | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To study and design members subjected to lateral loads and axial loads
- To focus on the study and design of various steel towers and steel chimneys
- To study the design concepts and design Light gauge steel structures

Syllabus

Review of loads on structures, Types of connections, Design of self supporting chimney, Theory of plastic bending, Behaviour of Compression Elements

Course Outcome:

- The student will also gain knowledge of designing different types of steel members
- The student will have an exposure to design of steel tower and chimneys.
- the student will also gain the knowledge of designing light gauge steel structures

Text Books:

References:

- Subramanian.N, "Design of Steel Structures", Oxford University Press, 2008.
- Dayaratnam.P, "Design of Steel Structures", A.H.Wheeler, India, 2007.
- Linton E. Grinter, "Design of Modern Steel Structures", Eurasia Publishing House, New Delhi, 1996.
- John E. Lothers, "Design in Structural Steel", Prentice Hall of India, New Delhi, 1990.
- Lynn S. Beedle, "Plastic Design of Steel Frames", John Wiley and Sons, New York, 1990.
- Wie Wen Yu, "Design of Cold Formed Steel Structures", McGraw Hill Book Company, New York, 1996.
- S.S Bhavikatti " Design of steel structures" I.K International Publishing house Pvt Ltd
- S.K Duggal " Limit State Design of steel structures' TMH publications



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|---------------------------|----------------------|----------------------------|
| 04 CE 6422 | ADVANCED STEEL STRUCTURES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Review of loads on structures – dead, live, wind and seismic loads as per IS 800-2007 , Design of purlins, Louver rails, gable column and gable wind girder – Analysis and design of gable frames – design of moment resisting base plates | | 7 | 15 |
| MODULE 2: Types of connections –design requirement of bolted and welded connections– Seated Connections – Unstiffened and Stiffened seated Connections – Moment Resistant Connections – Semi rigid Connections – Split beam Connections – Framed Connections | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Design of self supporting chimney – design of base plates, foundations and anchor bolts- Guyed steel chimney – guy ropes – stresses due to wind . Along with load calculation – gust factor method. | | 7 | 15 |
| MODULE 4: Theory of plastic bending - plastic hinge concept-mechanism method- Application to continuous beam and portal frames – plastic moment distribution. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Limit State Design –Ultimate and serviceability limit states – Limit state design of axially loaded members- Design of beams. | | 7 | 20 |
| MODULE 6: Behaviour of Compression Elements – Effective width for load and deflection determination – Behaviour of Unstiffened and Stiffened Elements – Design of webs of beams – Flexural members – Lateral buckling of beams – Shear Lag – Flange Curling – Design of Compression Members – Wall Studs | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|--------------------------------------|----------|------|
| 04 CE 6424 | QUANTITATIVE METHODS IN CONSTRUCTION | 3-0-0- 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To understand various quantitative techniques applied in construction industry

Syllabus

Operations Research, Graphical and Simplex Methods, Production Management, Safety Stock, Decision Theory.

Course Outcome:

- To bring about an exposure to quantitative techniques applied to construction industry.

Text Books:

References:

- Frank Harrison, E., The Managerial Decision Making Process, Houghton Mifflin Co., Boston,1999.
- HamdyA.Taha, Operations Research: An Introduction, Prentice Hall, 2010.
- Levin, R.I, Rubin,D.S., and Stinson J., Quantitative Approaches to Management, McGraw Hill College, 1993.
- S.L.Tang, IrtishadU.Ahmad,SyedM.Ahmed, Ming Lu, Quantitative Technique for Decision making in Construction, Hongkong University Press, HKU, 2004.
- Schroeder, R.G, Operations Management, McGraw Hill, 2009.
- Vohra, Nd., Quantitative Techniques in Management, Third Edition, Tata McGraw-Hill Company Ltd, 2007



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|---|----------------------|----------------------------|
| 04 CE 6424 | QUANTITATIVE METHODS IN CONSTRUCTION | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Operations Research - Introduction to Operations Research -Linear Programming | | 7 | 15 |
| MODULE 2: Graphical and Simplex Methods , Duality and Post – Optimality Analysis –Transportation and Assignment Problems | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Production Management - Inventory Control-EOQ -Quantity Discounts | | 7 | 15 |
| MODULE 4: Safety Stock –Replacement Theory–Simulation Models–Quality Control. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Decision Theory - Decision Theory –Decision Rules –Decision making under conditions of certainty, risk and uncertainty –Decision trees–Utility Theory. | | 7 | 20 |
| MODULE 6: Managerial Economics : Cost Concepts–Break-even analysis–Pricing Techniques–Game theory Applications. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-----------------------------------|----------|------|
| 04 CE 6426 | PROJECT FORMULATION AND APPRAISAL | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

- **Course Objectives:** To study elements of project formulation and appraisal
- To study the costing and financial aspects of projects
- To study the implications of private sector participation in construction project

Syllabus

Project, Concepts, Project Cash Flows, Indian Practice of Investment Appraisal, Project Financing.

Course Outcome:

- To introduce and study formulation, costing, appraisal and finance of construction projects

Text Books:

References:

- Barcus, S.W. and Wilkinson.J.W., Hand Book of Management Consulting Services, McGraw Hill, New York, 1986.
- 2.Joy P.K., Total Project Management-The Indian Context, New Delhi, Macmillan India Ltd.,1992
- 3.Prasanna Chandra, Projects –Planning, Analysis, Selection, Implementation Review, McGraw Hill Publishing Company Ltd., New Delhi. 2006.
- 4.United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 6426 | PROJECT FORMULATION AND APPRAISAL | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Project–Concepts –Capital investments-Generation and Screening of Project Ideas -Project identification –Preliminary Analysis, Market, Technical, Financial, Economic and Ecological -Pre-Feasibility Report and its Clearance. | | 7 | 15 |
| MODULE 2: Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report –Different Project Clearances required | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Project Cash Flows –Time Value of Money–Cost of Capital.NPV–BCR–IRR –ARR –Urgency –Pay Back Period–Assessment of Various Methods | | 7 | 15 |
| MODULE 4: Indian Practice of Investment Appraisal –International Practice of Appraisal–Analysis of Risk –Different Methods–Selection of a Project and Risk Analysis in Practice | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Project Financing –Means of Finance–Financial Institutions –Special Schemes– Key Financial Indicators –Ratios. | | 7 | 20 |
| MODULE 6: Private sector participation in Infrastructure Development Projects-BOT, BOLT, BOOT-Technology Transfer and Foreign Collaboration -Scope of Technology Transfer. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|----------------------------|---------|------|
| 04 CE 6494 | STRUCTURAL ENGINEERING LAB | 0-0-2:1 | 2015 |

LIST OF EXPERIMENTS

1. Mix design of concrete of different grades and using admixtures.
2. Tensile and flexural strength of concrete of different grades.
3. Testing of simply supported RCC beams for flexural failure.
4. Testing of simply supported RCC beams for shear failure.
5. Study on the behavior of prestressed concrete beam.
6. Testing of simply supported RCC beam for combined bending and shear failure.
7. Testing of RCC column.
8. Non-destructive testing of concrete including rebound hammer and ultrasonic pulse method.
9. Structural Dynamics:
 - i. Free vibration analysis of cantilever beam.
 - ii. Free vibration analysis of simply supported beam.

Free vibration analysis of simply supported beam with tuned mass.



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---|----------|------|
| 04 CE 7401 | DESIGN OF STEEL-CONCRETE COMPOSITE STRUCTURES | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To get introduced to various connections and connection design of composite structures
- To get introduced to composite construction and composite behaviour of steel concrete composite structures.
- To obtain the knowledge to conceptualise and design the composite structures

Syllabus

Introduction to steel-concrete composite construction, Introduction to steel, Design of composite member.

Course Outcome:

- The student can gain the knowledge of connection behaviour and design.
- The student will possess knowledge of the composite behaviour of structures.
- The student will have the ability to design various composite structural elements

References:

- Teaching Resource material for Structural Steel Design', Volume 2/3 prepared by IIT, Anna University, SERC and Institute for Steel Development and Growth'Calcutta,2009.
- Owens and Knowels," Steel design manual", Steel Concrete Institute (UK)-Oxford Blackwell Scientific Publications, 1992.
- Johnson.R.P., "Composite structures of steel and concrete-Beams, slabs, columns and frames of buildings", (3rd edition),Blackwell Publishing, U.K, 2004.
- Bungale S. Taranath, "Steel concrete and composite design of tall buildings", McGrawhill, 1998.
- David Collings, "Steel Concrete Composite Bridges", Thomas Tefford, 2005.
- Johnson.R.P., "Composite structures of steel and concrete-Beams, slabs, columns and frames of buildings", (3rd edition),Blackwell Publishing, U.K, 2004.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 7401 | DESIGN OF STEEL-CONCRETE COMPOSITE STRUCTURES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Introduction to steel-concrete composite construction -Theory of composite structures | | 7 | 15 |
| MODULE 2: Introduction to steel-concrete-steel sand witch construction. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Design of composite member -Behavior of composite beams-Design of composite beams | | 7 | 15 |
| MODULE 4: Behaviour of composite columns -Design of steel-concrete composite columns. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Design of composite trusses -Types of connections in composite structures-Shear connections-Design of connections in composite trusses. | | 7 | 20 |
| MODULE 6: Composite girder bridges -Behavior of girder bridges-Design concepts Seismic behavior of composite structures. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-------------------|---------|------|
| 04 CE 7403 | DESIGN OF BRIDGES | 3-0-0:3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To study the various bridge forms and typical loadings on the bridges.
- To get familiarised with the design of short span bridges.
- To possess knowledge on the design concepts of long span bridges.
- To design the prestressed concrete bridges.
- To design the substructure for bridges, plate girder to IRS loadings, foundation for bridges and bearings.

Syllabus

Indian Road Congress(IRC) bridge codes, Beam bridges, Hollow girder bridges, Prestressed concrete bridges.

Course Outcome:

- At the end of the course the student will understand the design theories for super structure and substructure of bridges
- The student will be able to design Culvert, R.C.C T beam bridge.
- The student will possess the knowledge to design prestressed concrete bridges.
- Also the student will be able to design different types of bearings , abutments, piers and various types of foundations for Bridges.

Text Books:

References:

- Krishna Raju.N."Design of Bridges",Oxford& IBM Publishing Co,Bombay,1988.
- Johnson Victor D.,"Essentials of Bridge Engineering",Oxford and IBH Publishing Co.Pvt.Ltd.,New Delhi,2006.
- Krishna Raju.N."Design of Bridges",Oxford& IBM Publishing Co,Bombay,1988.
- Raina.V.K,"Concrete Bridge Practice",Tata McGraw Hill Publishing Co.,New Delhi-1991.
- Taylor F.W, Thomson S.E and Smulski.E"Reinforced Concrete Bridges",John Wiley &Sons, New York-1955.
- Conference Proceedings,'Advances and innovations in Bridge Engineering',IIT,Madras and Indian Institute of Bridge Engineers,Tamilnadu,AlliedPublisher,New Delhi,1999.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|--------------------------|----------------------|----------------------------|
| 04 CE 7403 | DESIGN OF BRIDGES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Indian Road Congress(IRC) bridge codes -dimensions-dead and live loads-impact effect-wind and seismic forces-longitudinal and centrifugal forces-hydraulic forces-earth pressure-temperature effect and secondary stresses | | 7 | 15 |
| MODULE 2: Beam bridges -Pigeaud curves-Courbon's theory-Hendry Jaegar method-analysis and design of T-beam bridges. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Hollow girder bridges -balanced cantilever bridges-continuous girder bridges-rigid frame bridges-arch bridges-bow string girder bridges. | | 7 | 15 |
| MODULE 4: Prestressed concrete bridges -composite prestressed concrete super structures | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Erection of precast girders -continuous construction-recent trends. | | 7 | 20 |
| MODULE 6: Design of bearings for slab, girder, skew bridges -Design of piers-abutments-trestles, Joints-expansion joints. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|------------------------------------|----------|------|
| 04 CE 7405 | CONSTRUCTION ECONOMICS AND FINANCE | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

- To study the concepts of Construction Economic and Finance such as comparing alternatives proposals, evaluating alternative investments, management of funds, and management of accounting.

Syllabus

Basic Principles - Time Value of Money, Single Payment Compound Amount Factor, Comparing Alternatives Proposals, Evaluating Alternative Investments.

Course Outcome:

- The students will be able to know the concepts in economics and finance in constructions

Text Books:

- **References:** Shrivastava,U.K., (2000)Construction Planning and Management,2ndEdn. Galgotia Publications Pvt. Ltd. New Delhi.
- Blank, L.T., and Tarquin,a.J (1988) Engineering Economy,4th Edn. Mc-Graw Hill Book Co.
- Collier C and GlaGola C (1998) Engineering Economics & Cost Analysis, 3rd Edn. Addison Wesley Education Publishers.
- Patel, B M (2000) Project management-strategic Financial Planning, Evaluation and Control, Vikas Publishing House Pvt. Ltd. New Delhi.
- Shrivastava,U.K., (2000)Construction Planning and Management,2ndEdn. Galgotia Publications Pvt. Ltd. New Delhi.

Steiner, H.M. (1996) Engineering Economic principles, 2nd Edn. Mc-Graw Hill Book, New York



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|---|----------------------|----------------------------|
| 04 CE 7405 | CONSTRUCTION ECONOMICS AND FINANCE | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Basic Principles - Time Value of Money –Cash Flow diagram– Nominal and effective interest-continuous interest | | 7 | 15 |
| MODULE 2: Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)–Problem time zero (PTZ)- equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient (G), Geometric Gradient (C). | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Comparing Alternatives Proposals -Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis- Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis | | 7 | 15 |
| MODULE 4: Evaluating Alternative Investments - Real Estate -Investment Property, Equipment Replace Analysis | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Depreciation –Tax before and after depreciation –Inflation- Funds Management- Project Finance–Sources of finance -Long-term and short -term finance | | 7 | 20 |
| MODULE 6: Working Capital Management , Inventory valuation, Mortgage Financing -International financial management-foreign currency management | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|--------------------------|----------|------|
| 04 CE 7407 | DESIGN OF TALL BUILDINGS | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

The Student will be able to:-

- Plan tall buildings considering structural systems, fire rating, local considerations etc
- Evaluate loading for tall structures · Analyze and design of tall structural systems including structural connections

Syllabus

Design Philosophy, Gravity loading, Earthquake loading, Behaviour of High rise structures, Analysis and Design principles of various horizontal load transfer systems, Stability Analysis

Course Outcome:

- At the end of this course the student will be able to know design principles and different types of loading
- Describe the various structural systems used in the construction of Tall structures

Text Books:

References:

- Taranath.B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill Co. 1988.
- Schuller.W.G. "High Rise Building Structures", John Wiley & sons, 1977.
- Lynn.S.Beedle, "Advances in tall Buildings", CBS Publishers and Distributors, New Delhi, 1986.
- Lin T.Y and StotesBurry.D, "Structural concepts and systems for Architects and Engineers", John Wiley and Sons, 1988.
- Dr.Gupta.Y.P, Editor, "Proceedings of National Seminar on High Rise Structures-Design and Construction practices for Middle Level Cities", Nov-14-16, 1955. New Age International Publishers Ltd., Chennai.
- Smith.B.S and Coull.A., "Tall Building Structures", Analysis and Design', John Wiley & sons, inc., 1991



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--------------------------|----------------|---------------------|
| 04 CE 7407 | DESIGN OF TALL BUILDINGS | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Design Philosophy-History-advantages and disadvantages-Vertical city concepts-essential amenities-Fire safety-water supply-drainage and garbage disposal-service systems-structural and foundation systems. Factors affecting height, growth and form-Human comfort criteria | | 7 | 15 |
| MODULE 2: Gravity loading-Dead and live load-calculation-Impact and construction loads. Wind loading-static and dynamic approach-Analytical and wind tunnel experimental method. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Earthquake loading-Equivalent lateral force, Modal analysis-combination of loading in various design philosophies. Materials for tall buildings-High strength concrete-Light weight concrete-Fibre reinforced concrete Composite materials. | | 7 | 15 |
| MODULE 4: Behavior of High rise structures-Different system for load distribution in steel and concrete-Vertical and horizontal load resistant systems-Rigid frames-braced frames-infilled frames-shear walls-Wall frames-tubular systems-outrigger braced systems-Mega systems. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Analysis and Design principles of various horizontal load transfer systems-approximate methods-Modelling for accurate analysis-3D analysis-Member forces-displacements. Analysis for various secondary effects-Creep, shrinkage and temperature. | | 7 | 20 |
| MODULE 6: Stability Analysis-Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity loading, P-effect and various methods of analysis –influence of foundation instability, out of plumb effects-Elastic Deformations.Dynamic Analysis-Principles of design of tall braced frames for earthquake and blast resistant design. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---|----------|------|
| 04 CE 7409 | DESIGN OF CYLINDRICAL SHELL AND FOLDED PLATES | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives: The Student will be able to:-

- To classify and analyse the different type of shell structures
- To classify and analyse the different type of folded plates

Syllabus

Classification of shells, Design of cylindrical shell, Design of shells with double curvature, Design of paraboloid shells, Types of Hyperbolic paraboloids, Analysis of the edge members, Folded plate, Design of reinforcements in folded plates and supporting diaphragms

Course Outcome:

- Students who successfully complete this course will be able to analyse various shells and understand the behaviour of folded plates.

Text Books:

References:

- P.C.Varghese., "Design of reinforced concrete shells and folded plates" - PHI-New Delhi - 2010
- Krishna Raju .N., "Advanced Reinforced concrete Design". - CBS Publishers and distributor – New Delhi-2003
- Ramaswamy G.S., "Design and construction of concrete shell roofs" – CBS Publishers
- Chatterjee B.K., "Theory and Design of concrete shell"- Chapman & Hall
- Bandhopadhyay., "Thin shell structures"- New age International Publishers – New Delhi
- Chandrasekhar., " Analysis of thin concrete shells" - New age International Publishers– New Delhi.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------------|----------------------------|
| 04 CE 7409 | DESIGN OF CYLINDRICAL SHELL AND FOLDED PLATES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: General classification of shells - shells of revolution - translational shells - ruled surfaces - folded plates (hipped plates).Gaussian curvature – thin – thick shells – long shells – short shells – Design of cylindrical shell based on membrane theory | | 7 | 15 |
| MODULE 2: Design of cylindrical shell with edge beams-Design of transverse stiffeners of long shells. Design of shells with double curvature – Design of spherical domes | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Membrane analysis-Analysis of domes with skylight – Design of ring beams (edge member)- Design of conical shells - conical dome roof with ring beams. | | 7 | 15 |
| MODULE 4: Design of paraboloid shells-(shells formed from two parabolas). Types of Hyperbolic paraboloids – Types of hyper shells with straight rectangular edges – shallow and deep H.P shells | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Analysis of shell part of shallow hyper shells with straight edges-Analysis of the edge members. Folded plate – introduction-methods of analysis – complete analysis of folded plates. | | 7 | 20 |
| MODULE 6: Design of reinforcements in folded plates and supporting diaphragms – Design of steel for transverse moments- Design of longitudinal steel. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|---------------------------------|----------|------|
| 04 CE 7411 | CONSTRUCTION PROJECT MANAGEMENT | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

To give the Student:-

- To study how the owner view a project in consideration with project life cycle, construction agencies legal requirements etc
- To study the various types of organization and their impact on and suitability to construction projects
- To study the design and construction procedures along with labour material and equipment utilization

Syllabus

Students who successfully complete this course can recognize the Preparation of Project, Guidelines by Planning Commissioning, Project appraisal, Market feasibility study, Construction material Management, inventory monitoring. Construction accounts management, ratio analysis, funds flow statement. Risk and Insurance in Construction.

Course Outcome:

To study the elements of construction project management consisting of owners' perspective, organization, design and construction procedures, resource utilization and cost estimation

References:

1. Kumar NeerajJha., "Construction Project Management- Theory and Practice", Pearson Education.
2. N V R Naidu & T Krishna Rao., "Management & Entrepreneurship", I K International Publishing House Pvt. Ltd. 1st edition.
3. Stephen Robbins., "Management", Pearson Education/PHI- 17th Edition.
4. Kumar NeerajJha., "Construction Project Management- Theory and Practice", Pearson Education.
5. K Anbuvelan., "Management Concepts for Civil Engineers", University Science Press.
6. K KChitkara., "Construction Project Management-Planning, Scheduling and Controlling" , Tata McGraw Hill Education Private Limited.

Stuart H Bartholomew., "Construction contracting: Business and Legal Principles", Prentice Hall



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|---|--|----------------|---------------------|
| 04 CE 7411 | CONSTRUCTION PROJECT MANAGEMENT | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Preparation of Project: Meaning of project- Project identification- Project selection- Project report-Need and significance of project- Contents- Formulation- Guidelines by Planning Commissioning for project report- Network analysis- Errors of project report- Project appraisal | | 7 | 15 |
| MODULE 2: Identification of business opportunities- Market feasibility study- Technical feasibility study- Financial feasibility study- Social feasibility study. | | 6 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Construction material Management:Material procurement process in construction organization – materials management functions- planning, procurement, custody, accounting, transportation, inventory monitoring and control, codification, computerization-inventory management-functions, policies, inventory control, inventory models. | | 8 | 15 |
| MODULE 4: Construction accounts management: Principles of accounting-accounting process-Construction contract revenue recognition-Construction contract status report- limitations of accounting- balance sheet-profit and loss account-working capital-need, operating cycle, components, determination and financing sources of working capital- ratio analysis- liquidity, capital structure profitability, activity, supplementary- funds flow statement. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Risk in Construction:Definition - risk identification process- check list, consequences, mapping, classification-risk analysis and evaluation process- data collection, modeling uncertainty, evaluation of potential impact of risk- response management process | | 7 | 20 |
| MODULE 6: Insurance in Construction: insurance in construction industry- principles, insurance policies- project insurance-contractor's All- risk insurance, transit insurance, fire policy, liquidity damages insurance. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|--|----------|------|
| 04 CE 7413 | MAINTENANCE AND REHABILITATION OF STRUCTURES | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

To give the Student:-

- Identify scope of rehabilitation work for dilapidated / obsolete buildings
- Identify and apply appropriate structural and construction technologies to rectify maintenance problems

Syllabus

Quality assurance for concrete construction ,Influence on serviceability and durability, Maintenance and repair strategies,, Assessment procedure for evaluating a damaged structure,testing techniques. Materials for repair,Special concretes and mortar,Techniques for repair:– Examples of repair to structures

Course Outcome:

- Students who successfully complete this course can recognize the mechanisms of degradation of concrete structures and to design durable concrete structures and also they can learn how to conduct field monitoring and non-destructive evaluation of concrete structures

Text Books:

References:

- Denison Campbell, Allen and Harold Roper, "Concrete Structures , Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
- R.T.Allen and S.C.Edwards, "Repair of Concrete Structures" ,Blakie and Sons, UK, 1987.
- M.S.Shetty, "Concrete Technology – Theory and Practice" ,S.Chand and Company, New Delhi, 1992.
- 4. Santhakumar, A.R., " Training Course notes on Damage Assessment and repair in Low Cost Housing ", " RHDC–NBO " Anna University, July, 1992.



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|---|----------------------|----------------------------|
| 04 CE 7413 | MAINTENANCE AND REHABILITATION OF STRUCTURES | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking | | 7 | 15 |
| MODULE 2: Influence on serviceability and durability:–Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosioninhibitors, corrosion resistant steels, coatings, cathodic protection. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Maintenance and repair strategies:–Definitions : Maintenance, repair andrehabilitation, Facets of Maintenance importance of Maintenance, Preventive measures onvarious aspects Inspection, Assessment procedure for evaluating a damaged structure,causes of deterioration , testing techniques. | | 7 | 15 |
| MODULE 4: Materials for repair:–Special concretes and mortar, concrete chemicals, specialelements for accelerated strength gain, Expansive cement, polymer concrete, sulphurinfiltrated concrete, ferro cement, Fibre reinforced concrete. | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Techniques for repair:–Rust eliminators and polymers coating for rebars during repairfoamed concrete, mortar and dry pack, vacuum concrete, Guniting and ShotcreteEpoxyinjection, Mortar repair for cracks, shoring and underpinning. | | 7 | 20 |
| MODULE 6: Examples of repair to structures:–Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, fire, leakage, marineexposure–case studies. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-----------------------------------|----------|------|
| 04 CE 7415 | CONSTRUCTION PERSONNEL MANAGEMENT | 3-0-0: 3 | 2015 |

Pre-requisites: Nil

Course Objectives:

To give the Student:-

- To bring about awareness on fundamentals of human behaviour under varying stress conditions
- To apply the studied behaviour pattern to manpower planning in organizational setups To study the means of management of construction personnel and utility of training as a tool for improvement

Syllabus

Manpower Planning,PersonnelPrinciples,Organisation,,Placement and TrainingHuman Relations And Organisational Behaviour.Conflict in organizations,WelfareMeasures,Employee appraisal and assessment,Health Management.

Course Outcome:

- Students who successfully complete this course can recognize the elements of human behaviour and their impact on construction personnel management.

Text Books:

References:

- Carleton Counter II and Jill Justice Coutler, The Complete Standard Handbook of Construction Personnel Management, Prentice-Hall, Inc., 1989.
- Charles D Pringle,JustinGooderiLongenecter, Management, CE Merril Publishing Co. 1981.
- Dwivedi R.S, Human Relations and OrganisationalBehaviour, Macmillian India Ltd.,2005.
- Josy.J. Familaro, Handbook of Human Resources Administration, McGraw-Hill InternationalEdition, 1987.
- Memoria,C.B., Personnel Management, Himalaya Publishing Co., 1997



COURSE PLAN

| COURSE CODE: | COURSE TITLE | CREDITS | |
|--|--|----------------|---------------------|
| 04 CE 7415 | CONSTRUCTION PERSONNEL MANAGEMENT | 3-0-0:3 | |
| MODULES | | Contact Hours | Sem. Exam Marks (%) |
| MODULE 1: Manpower Planning- Manpower Planning process, Organising, Staffing, directing, and controlling –Estimation, manpower requirement –Factors influencing supply and demand of human resources –Role of HR manager –Personnel Principles. | | 7 | 15 |
| MODULE 2: Organisation - Requirement of Organisation –Organisation structure –Organisation Hierarchical charts –Staffing Plan - Development and Operation of human resources -Managerial Staffing –Recruitment –Selection strategies –Placement and Training. | | 7 | 15 |
| INTERNAL TEST 1 (MODULE 1 & 2) | | | |
| MODULE 3: Human Relations And Organisational Behaviour - Basic individual psychology–Approaches to job design and job redesign –Self managing work teams –Intergroup –Conflict in organizations – Leadership-Engineer as Manager –all aspects of decision making | | 7 | 15 |
| MODULE 4: Organizing skills:- Significance of human relation and organizational –Individual in organization–Motivation –Personality and creativity –Group dynamics, Team working –Communication and negotiation skills | | 7 | 15 |
| INTERNAL TEST 2 (MODULE 3 & 4) | | | |
| MODULE 5: Welfare Measures:- Employee Management And Development Methods -Compensation –Safety and health –GPF –EPF –Group Insurance–Housing -Pension –Laws related to welfare measures | | 7 | 20 |
| MODULE 6: Wages- Wages and Salary, Employee benefits, Employee appraisal and assessment –Employee services –Safety and Health Management. | | 7 | 20 |
| END SEMESTER EXAM | | | |



| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-----------------|---------------|----------|------|
| 04 CE 6491/7491 | SEMINAR-I /II | 0-0-2: 2 | 2015 |

Course Objectives:

1. Improve the technical presentation skills of the students.
2. To train the students to do literature review.
3. To impart critical thinking abilities.

Methodology

Individual students are required to choose a topic of their interest from related topics to the stream of specialization, preferably from outside the M. Tech syllabus. The students are required to do a moderate literature review on the topic and give seminar. A committee consisting of at least three faculty members (preferably specialized in the respective stream) shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation. Each student shall submit two copies of a write up of his seminar topic. The seminar report shall not have any plagiarised content (all sources shall be properly cited or acknowledged). One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other shall be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation. It is encouraged to do simulations related to the chosen topic and present the results at the end of the semester.

| COURSE CODE | COURSE NAME | L-T-P:C | YEAR |
|-------------|-------------------|-----------|------|
| 04 CE 7493 | PROJECT PHASE - I | 0-0-12: 6 | 2015 |

Course Objectives:

The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real-life problems related to industry and current research.

The project work can be a design project/experimental project and/or computer simulation project on any of the topics related to the stream of specialisation. The project work is chosen/allotted individually on different topics. Work of each student shall be supervised by one or more faculty members of the department. The students shall be encouraged to do their project work in the parent institute itself. If found essential, they may be permitted to carry out their main project outside the parent institute, subject to the conditions specified in the M. Tech regulations of the Kerala Technological University. Students are encouraged to take up industry problems in consultation with the respective supervisors.

The student is required to undertake the main project phase-1 during the third semester and the same is continued in the 4th semester (Phase 2). Phase-1 consist of preliminary work, two reviews of the work and the submission of a preliminary report. First review would highlight the topic, objectives, methodology and expected results. Second review evaluates the progress of the work, preliminary report and scope of the work which is to be completed in the 4th semester.



| COURSE CODE | COURSE NAME | L-T-P: C | YEAR |
|--------------------|---------------------------|-------------------|-------------|
| 04 CE7494 | PROJECT PHASE - II | 0-0-21: 12 | 2015 |

Main project phase II is a continuation of project phase-I started in the third semester. There would be two reviews in the fourth semester, first in the middle of the semester and the second at the end of the semester. First review is to evaluate the progress of the work, presentation and discussion. Second review would be a pre -submission presentation before the evaluation committee to assess the quality and quantum of the work done. It is encouraged to prepare at least one technical paper for possible publication in journals or conferences. The project report (and the technical paper(s)) shall be prepared without any plagiarised content and with adequate citations, in the standard format specified by the Department /University.