

| Course Code | Course Name                    | L-T-P-Credits | Year of Introduction |
|-------------|--------------------------------|---------------|----------------------|
| CE302       | DESIGN OF HYDRAULIC STRUCTURES | 4-0-0-4       | 2016                 |

**Prerequisite :** CE309 Water Resources Engineering

**Course objectives:**

- To impart knowledge regarding the design of the various minor irrigation structures
- To convey the knowledge on the causes of failure, design criteria and stability analysis of different types of dams

**Syllabus :**

Diversion head works - layout and functions of components. Causes of failure of weirs on permeable soils, Bligh's theory and Khosla's theory. Irrigation canals- Design of unlined canals through alluvial soils-Kennedy's theory and Lacey's theory. Minor irrigation structures- Cross drainage works, Canal Regulation works : Falls and Regulators, Design of Hydraulic Structures: Aqueduct, siphon aqueduct, Canal falls-notch type, well type, Sardar type, and Cross regulator. Dams-Types, Gravity dam - forces acting - stability analysis and modes of failure - theoretical and practical profiles- Functions of shafts, galleries, keys and water stops. Arch dams-types, Thin cylinder theory. Earth dams-types, causes of failure and design criteria. Spillways-Types. Ogee type spillway-profile.

**Course Outcomes:**

The students will be able to

- Perform the stability analysis of gravity dams
- Explain the causes of failure of different types of dams and their design criteria
- Design minor irrigation structures such as regulators, cross drainage works and canal falls

**Text Books :**

1. Garg S.K, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2006.
2. Modi. P. N., Irrigation Water Resources and Water Power Engineering, Standard Book House, 2009.
3. Punmia B.C. Ashok K Jain, Arun K Jain, B. B. L Pande, Irrigation and Water Power Engineering, Laxmi Publications (P) Ltd. 2010.

**References:**

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, 2010.
2. Asawa. G.L. Irrigation and Water Resources Engineering, New Age International, 2000
3. Sahasrabudhe S.R., Irrigation Engineering & Hydraulic Structures, S.K. Kataria & Sons, 2013
4. Sathyanarayana M. C. Water Resources Engineering-Principles and Practice, New Age International Publishers. 2009
5. Varshney, R.S. Theory & Design of Irrigation Structures - Vol III, Nem Chand & Bros., Roorkee.

**COURSE PLAN**

| Module | Contents   | Hours | Sem. Exam Marks % |
|--------|--|-------|-------------------|
| I      | Diversion head works- layout and functions of components, Weir and barrage- Causes of failure of weirs on permeable soils - Bligh's theory. Design of vertical drop weir. Khosla's theory of independent variables- Khosla's corrections-Use of Khosla's charts. | 6     | 15                |

|                                    |  |    |    |
|------------------------------------|--|----|----|
| <b>II</b>                          | Irrigation canals, canal alignment- cross section of unlined canals- Design of canals through alluvial soils-Kennedy's theory and Lacey's theory.<br>Cross drainage works-Types, selection of suitable type, Type of aqueducts.<br>Regulation Works - Canal falls-necessity, classification.<br>Canal regulators- Regulator cum road bridge- Head regulators and cross regulators.     | 8  | 15 |
| <b>FIRST INTERNAL EXAMINATION</b>  |  |    |    |
| <b>III</b>                         | Design and Drawing of the following hydraulic structures:<br>1. Aqueduct (Type III)<br>2. Syphon Aqueduct (Type III)<br>3. Canal Fall (Trapezoidal Notch type)<br>4. Siphon Well Drop<br>5. Sarda Type Fall (High Discharge only)<br>6. Cross Regulator (Using Khoslas Theory)   | 30 | 50 |
| <b>SECOND INTERNAL EXAMINATION</b> |  |    |    |
| <b>IV</b>                          | Dams-Types, Gravity dam – selection of site- forces acting - stability analysis and modes of failure – Principal and shear stresses-Problems - Elementary profile –limiting height of gravity dams-high and low dams- Practical profiles, Functions of various components shafts, keys, water stops, and different types of gallery, Grouting. Instrumentation in dams (Concept only). | 6  | 10 |
| <b>V</b>                           | Arch dams-types, methods for design (list only)-Thin cylinder theory. Earth dams-types, causes for failure and design criteria. Spillways-Types. Effective length of spillway- Ogee type spillway-profile. Energy dissipation below spillways - Stilling basins- Indian standard Type I and Type II (design not necessary).  | 6  | 10 |
| <b>END SEMESTER EXAMINATION</b>    |  |    |    |

Note: In Internal Evaluation the marks for assignment shall be awarded based on the submission of drawings.

### QUESTION PAPER PATTERN (End semester examination)

**Maximum Marks : 100**

**Exam Duration: 4 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III : One question out of 2 questions carrying 50 marks ; with weightage for design as 25 marks and sketching of two views of design specified in question : 25 marks

Part C - Module IV & V : 2 questions out of 3 questions carrying 10 marks each.

| Course Code | Course Name                        | L-T-P-Credits | Year of Introduction |
|-------------|------------------------------------|---------------|----------------------|
| CE304       | DESIGN OF CONCRETE STRUCTURES - II | 3-0-0-3       | 2016                 |

**Pre-requisites : CE301 Design of Concrete Structures - I**

**Course objectives:**

- To provide knowledge in the structural design of selected advanced structures of concrete and enable them to design reinforced concrete structures for real-world applications.

**Syllabus :**

Columns subjected to compression , uniaxial bending and biaxial bending- design using SP16 charts for limit state-design of slender columns- design of wall/strip footing- design of rectangular footings-eccentrically loaded rectangular footing- circular footings-detailing-combined footings-rectangular and trapezoidal (design principles only)- design of cantilever retaining wall without surcharge-detailing - design principles of counter fort retaining wall and detailing- Circular slabs- simply supported, fixed and partially fixed subjected to udl- design of water tanks-design philosophy and requirements-joints-IS code recommendations- design of rectangular and circular water tanks using IS code coefficients (IS 3370)- Pre-stressed concrete-concept of prestressing- materials-methods of prestressing – prestressing systems- losses of prestress. analysis of prestressed beams ( rectangular and I-sections) at stages of transfer and service

**Expected Outcomes:**

The students will be able to

- Design eccentrically loaded and slender columns using SP 16 design charts and different
- types of foundations
- Design and detail cantilever retaining wall and understand the design principles of Counter fort retaining wall
- Design and detail circular slabs and domes
- Design rectangular and circular water tanks using IS code coefficients (IS 3370).
- Gain knowledge of prestressed concrete fundamentals and analyse pre and post tensioned beams.

**Text Books / References:**

- N. Krishnaraju, Prestressed Concrete , Tata McGraw- Hill, 5e, 2012
- Pillai S.U & Menon D – Reinforced Concrete Design, Tata McGraw Hill Book Co., 2009
- Punmia, B. C, Jain A.K and, Jain A.K , R C C Designs, Laxmi Publications Ltd., 10e, 2015
- Relevant IS codes (IS 456, IS 875IS 1343, IS 3370, SP 16, SP 34 )

**COURSE PLAN**

| Module | Contents  | Hours | Sem. Exam Marks % |
|--------|---|-------|-------------------|
| I      | Analysis and design of short columns under eccentric loading- Columns subjected to compression and uniaxial bending- design using SP16 charts for limit state<br>Columns subjected to combined axial load and biaxial bending moments-code procedure for design- design using SP16 charts for | 8     | 15                |

|                                    |  |   |    |
|------------------------------------|--|---|----|
|                                    | limit state<br>Slender columns- behavior of slender columns-braced and unbraced columns-design procedure- design using SP16 charts for limit state   |   |    |
| II                                 | Foundations- classification-IS code provisions for design of isolated footings- design principles of rectangular footings- Design of rectangular footings-uniform thickness and sloped- eccentrically loaded rectangular footing of uniform thickness-detailing.<br>Combined footings (design principles only)- analysis of combined footings-rectangular and trapezoidal. | 8 | 15 |
| <b>FIRST INTERNAL EXAMINATION</b>  |  |   |    |
| III                                | Retaining walls-Types- Cantilever retaining wall- earth pressure and forces acting-stability-proportioning-structural behavior of components -design example of cantilever retaining wall without surcharge-detailing<br>Counterfort retaining wall- design principles of components and detailing (design not required)   | 6 | 15 |
| IV                                 | Circular slabs- stresses- reinforcements- simply supported, fixed and partially fixed subjected to uniformly distributed loads<br>Design and detailing of spherical and conical domes  | 6 | 15 |
| <b>SECOND INTERNAL EXAMINATION</b> |  |   |    |
| V                                  | Introduction to design of water tanks-design philosophy and requirements-joints- IS code recommendations<br>Design of rectangular water tanks using IS code coefficients (IS 3370).<br>Design of circular water tanks using- IS code coefficients (IS 3370)  | 7 | 20 |
| VI                                 | Introduction to Pre-stressed concrete: Concept of pre-stressing- Materials-High strength concrete and high tensile steel.<br>Analysis of pre-stressed beams (Rectangular and I-sections) at stages of transfer and service. Losses in Prestress  | 7 | 20 |
| <b>END SEMESTER EXAMINATION</b>    |  |   |    |

- Note:**
1. All designs shall be done as per current IS specifications
  2. Special importance shall be given to detailing in designs
  3. SI units shall be followed.
  4. Students shall submit a term project on design and detailing of any structure of real- world application at the end of the semester.

**QUESTION PAPER PATTERN (End semester examination) :**

**Maximum Marks :100**

**Exam Duration: 3 Hrs**

- Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each  
Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each  
Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

- Note :**
1. Each part should have at least one question from each module
  2. Each question can have a maximum of 4 subdivisions (a,



| Course Code | Course Name                                       | L-T-P-Credits | Year of Introduction |
|-------------|---|---------------|----------------------|
| CE306       | COMPUTER PROGRAMMING AND COMPUTATIONAL TECHNIQUES | 3-0-0-3       | 2016                 |

**Pre-requisites :** Nil

**Course Objectives:**

- To provide adequate knowledge for coding in C++ language
- To give awareness about the different computational methods and their implementation to analyze basic Engineering problems

**Syllabus**

Computer programming - Elements of C++ programming language - control statements - Basic concepts of object oriented programming  
 Computational Techniques – Roots of transcendental equation- Interpolation -Functional approximation- Numerical Integration, Solution of simultaneous linear equations.

**Expected Outcome:**

- The students will be able to develop computer programs and implement numerical techniques for solving basic engineering problems using C++ language.

**Text Books:**

1. Balaguruswamy, Object Oriented programming with C++. Tata Mcgraw Hill., 2008
2. Gerald C. F. and P. O. Wheatley, Applied Numerical Analysis, Pearson Edu., 2004
3. Robert Lafore ., C++ Programming., Sams publishers.,4th Edition, 2001

**Reference Books:**

1. Barkakati N., Object Oriented Programming in C++, SAMS, 1991.
2. Kamthane A. M., Object Oriented Programming with ANSI & Turbo C++, Pearson Education, 2009.
3. Lippman S. B. and J. Lajoie, C++ Primer, Pearson Education, 2005.
4. Maria Litvin.and Gary Litvin, C++ for You++, Skylight Publishing, 1998.
5. Ravichandran D., Programming with C++, Tata McGraw Hill, 2007.

**COURSE PLAN**

| Modules | Contents  | Hours | Sem. Exam Marks % |
|---------|---|-------|-------------------|
| I       | Introduction to C++: Structure of C++ program; Character set; Keywords; Identifiers; Data types – integer, real, character, string, Boolean, Enumerated data types, Constants and Variables; Operators – assignment, arithmetic, relational, logical, increment, decrement and conditional operators; Statements – simple & compound, declaration statements. Input and output streams.<br>Selection statements: if, if-else, switch statements | 7     | 15                |
| II      | Looping statements - for, while, do-while statements, Jump statements – break, continue, goto, exit (). Arrays - single and multi-dimensional arrays, initializing array elements, pointers & arrays, Character arrays, string functions, Unformatted console I/O functions, Unformatted Stream I/O   | 6     | 15                |

|                                 |  |   |    |
|---------------------------------|--|---|----|
|                                 | functions.<br>Preparation of programs for evaluation of factorial of a number, Infinite series, Sorting, Searching and Matrix manipulations.   |   |    |
| <b>FIRST INTERNAL TEST</b>      |  |   |    |
| <b>III</b>                      | User defined functions – Arguments, return values, call by value, call by reference, functions calling functions, functions and arrays - Global variables, automatic, static and register variables, recursive functions.  | 6 | 15 |
| <b>IV</b>                       | Structures - functions and structures - Arrays of structures - structures within structures, Structures containing arrays. Files - Input & Output, sequential & random access. Basic concepts of object oriented programming - class, objects, constructors and destructors, inheritance (Programs not required) | 7 | 15 |
| <b>SECOND INTERNAL TEST</b>     |  |   |    |
| <b>V</b>                        | Roots of Transcendental equations - Successive approximations, Regula - Falsi, Newton Raphson Methods, Interpolation-Lagrange interpolation method.  | 8 | 20 |
| <b>VI</b>                       | Functional approximation - Fitting straight line & parabola, Numerical Integration - Trapezoidal, Simpson's rule & Gauss quadrature Method. Solution of simultaneous linear algebraic equations – Gauss elimination method. Solution of Partial differential Equation - Finite Difference Method                 | 8 | 20 |
| <b>END SEMESTER EXAMINATION</b> |  |   |    |

**QUESTION PAPER PATTERN (End semester examination)**

**Maximum Marks :100**

**Exam Duration: 3 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

**Note :** 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a,b,c,d)

| Course Code | Course Name                    | L-T-P-Credits | Year of Introduction |
|-------------|--------------------------------|---------------|----------------------|
| CE308       | TRANSPORTATION ENGINEERING - I | 3-0-0-3       | 2016                 |

**Pre-requisite : NIL**

**Course objectives:**

- To introduce the principles and practice of Highway Engineering and Airport Engineering.
- To enable students to have a strong analytical and practical knowledge of geometric design of highways.
- To introduce pavement design concepts, material properties, construction methods and to design highway pavements.
- To understand the principles of traffic engineering and apply this for efficient management of transportation facilities.

**Syllabus:**

Classification and alignment of highways- Geometric design of highways- Properties and testing of pavement materials- CBR method of flexible pavement design- Construction and maintenance of pavements- Design of runways, taxiways and aprons.  
 Traffic characteristics- Traffic studies and analysis- Traffic control devices  
 Airport characteristics- Aircraft component parts- Site selection-Design of runways, taxiways and aprons- Terminal area planning- Airport marking and lighting

**Expected Outcomes:**

The students will be able to

- Design various geometric elements of a highway
- Determine the characteristics of pavement materials and design flexible pavements
- Conduct traffic engineering studies and analyze data for efficient management of roadway facilities, Plan and design basic airport facilities

**Text Books :**

1. Khanna, S.K. & Justo E.G., Highway Engineering, Nem Chand & Bros., 2000
2. Kadiyali, L. R., Principles of Highway Engineering, Khanna Publishers, 2001
3. Khanna, S. K. & Arora. M. G., Airport Planning and Design, Nemchand& Bros.

**References:**

1. Horonjeff R. & McKelvy, F., Planning and Design of Airports, McGraw Hill, 5e, 2010
2. IRC: 37-2001, Guidelines for the Design of Flexible Pavements, IRC 2001, New Delhi
3. IRC:37-2012, Tentative Guidelines for the Design of Flexible Pavements
4. O' Flaherty, C.A (Ed.), Transport Planning and Traffic Engineering, Elsevier, 1997
5. Rangwala, S. C. , Airport Engg. Charotar Publishing Co., 16e, 2016
6. Yoder, E. J & Witezak, M. W, Principles of Pavement Design, John Wiley & Sons, 1991

**COURSE PLAN**

| Module | Contents | Hours | Sem. Exam Marks % |
|--------|----------|-------|-------------------|
|--------|----------|-------|-------------------|

|                                    |  |   |    |
|------------------------------------|--|---|----|
| I                                  | Introduction to Transportation Engineering, Classification of roads, Typical cross sections of roads in urban and rural area, Requirements and factors controlling alignment of roads, Engineering surveys for highway location- Introduction to geometric design of highways, Design controls and criteria, Design of highway cross section elements. | 6 | 15 |
| II                                 | Sight distance, Stopping sight distance, Overtaking sight distance, Design of horizontal alignment and Vertical alignment  | 7 | 15 |
| <b>FIRST INTERNAL EXAMINATION</b>  |  |   |    |
| III                                | Introduction to highway materials, design and construction, Desirable properties and testing of road aggregates, bituminous materials and sub grade soil.<br>Flexible and rigid pavements, Factors influencing the design of pavements, CBR method and IRC guidelines for flexible pavements   | 7 | 15 |
| IV                                 | Introduction to performance grading and superpave, Construction of bituminous pavements, Types and causes of failures in flexible and rigid pavements, Highway drainage.<br>Introduction to Traffic Engineering, Traffic characteristics, Traffic studies and their applications.  | 6 | 15 |
| <b>SECOND INTERNAL EXAMINATION</b> |  |   |    |
| V                                  | Types of road intersections, Traffic control devices, Traffic signs, Road markings and Traffic signals, Design of isolated signals by Webster's method.<br>Introduction to Airport Engineering, Aircraft characteristics and their influence on planning of airports, Components of airport, Selection of site for airport                             | 8 | 20 |
| VI                                 | Runway orientation, basic runway length and corrections required, Geometric design of runways, Design of taxiways and aprons, Terminal area planning, Airport markings, Lighting of runway approaches, taxiways and aprons, Air traffic control  | 8 | 20 |
| <b>END SEMESTER EXAMINATION</b>    |  |   |    |

**QUESTION PAPER PATTERN (End semester examination)**

**Maximum Marks :100**

**Exam Duration: 3 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

**Note :** 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a, b, c, d)



| Course Code | Course Name                    | L-T-P-Credits | Year of Introduction |
|-------------|--------------------------------|---------------|----------------------|
| CE332       | TRANSPORTATION ENGINEERING LAB | 0-0-3-1       | 2016                 |

**Pre-requisite : CE308 Transportation Engineering - I**

**Course objectives:**

- To enable the students to conduct different tests to find various properties of aggregates, bitumen and soil subgrade and hence to assess their suitability in pavement construction.

**List of Experiments** (All experiments shall be conducted as per BIS/ASTM/AASHTO procedures)

I. Tests on aggregates

- Aggregate crushing value
- Aggregate impact value
- Los Angeles abrasion value
- Shape tests-Flakiness index and Elongation index
- Angularity of coarse aggregates and fine aggregates
- Specific gravity and water absorption of coarse aggregate
- Stripping value of road aggregates
- Dry Packing characteristics of aggregates (ASTM C29/ C29 M – 97)

II. Test on soil

- California Bearing Ratio test (*Soaked and Un-soaked CBR*)
- Dynamic cone penetration test (ASTM D6951 (2015) procedure)

III. Tests on bitumen

- Penetration value of bitumen
- Softening point of bitumen
- Ductility of bitumen
- Flash and Fire point of bitumen
- Measurement of mixing and compaction temperature of bitumen (Brookfield viscometer)  
(The test was previously written in the draft syllabus as Viscosity test on bitumen, but we have specified it)

IV. Test on bituminous mixes

- Determination of theoretical specific gravity of loose mix and bulk specific gravity of

*compacted mix (ASTM D2041, ASTM D1188)*

2. *Moisture sensitivity test of bituminous mixes (AASHTO T283 procedure)*

V. Functional evaluation of pavements

1. *Use of MERLIN apparatus to determine road roughness*

**Expected outcome:**

- The students will be able to assess the quality of various pavement materials and their suitability in highway construction.

**Reference books :**

1. L .R. Kadiyali, Principles and Practices of Highway Engineering, Khanna Publishers, 2009
2. MoRTH (2013) Specification for Road and bridge works (5<sup>th</sup> revision)
3. MS-2 manual (2015) Seventh edition, Asphalt Institute.
4. S. K. Khanna, C. E. G. Justo, A Veeraragavan, Highway Engineering, Khanna Publishers, 10e.



| Course Code | Course Name                          | L-T-P-Credits | Year of Introduction |
|-------------|--------------------------------------|---------------|----------------------|
| CE334       | COMPUTER AIDED CIVIL ENGINEERING LAB | 0-0-3-1       | 2016                 |

**Prerequisite : CE231 Civil Engineering Drafting Lab**

**Course objectives:**

1. To introduce the fundamentals of Civil Engineering drafting and drawing.
2. To familiarize with the FEA software packages for analysis and Design of structures
3. To understand the Total Station data transfer and interpretation.
4. To enable the usage of Project Management Software

**List of Experiments :**

- I. Structural Drawings for
  - a) Slabs and Beams
    - i. One Way / Two way Slab/Continuous Slabs
    - ii. Singly reinforced /Double reinforced Beams
    - iii. Continuous / Flanged Beams
  - b) Stair Case ( Doglegged and Tread and Riser Type)
  - c) Foundations (Isolated and Combined Rectangular)
- II Analysis and design of steel and RCC elements using STAAD/SAP 2000/ ETABS/any FEM software package.
  - a) Continuous and Cantilever beams
  - b) Plane truss and Frames
- III Use of Project Management Software ( MS Project/Primavera)
  - a) Preparation of Bar Chart/Gantt Charts/CPM/PERT Charts and finding Critical Path
  - b) Practice on Resource allocation (and Project Monitoring( Cost and Time)
- IV. Conduct of Survey camp using Total Station ( minimum 3 days duration) and its plotting.

**Expected Outcomes:**

- The students are expected to accomplish the abilities/skills for the use of Civil Engineering Drafting/Analysis, Design and Project Management Software.

**Text Books / References:**

1. N Krishna Raju, Structural Design and Drawing, Second Edition, Universities Press (India), Private Limited, Hyderabad, 2009
2. Reference Manual of the Relevant Software
3. Satheesh Gopi, Dr. R Sathikumar, N Madhu, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2006
4. AutoCAD Essentials, Autodesk official Press, John Wiley & Sons, US, 2015

**Note:**

- (1) Evaluation of drawing, along with a viva, to be done at the end of every class.
- (2) A survey camp of minimum 3 days duration using total station is to be conducted in the semester, and is compulsory
- (3) Evaluation Criteria :
 

|                           |   |                    |
|---------------------------|---|--------------------|
| Best 8 plate/Exercises    | - | 40 marks           |
| Survey Camp               | - | 30 marks           |
| .End semester examination | - | 30 marks           |
| <b>TOTAL</b>              |   | <b>- 100 marks</b> |

| Course Code | Course Name                   | L-T-P-Credits | Year of Introduction |
|-------------|-------------------------------|---------------|----------------------|
| CE362       | GROUND IMPROVEMENT TECHNIQUES | 3-0-0-3       | 2016                 |

**Pre-requisite :CE305 Geotechnical Engineering - II**

**Course objectives:**

- To impart fundamental knowledge of Ground Improvement Techniques
- To make capable of choosing and designing the appropriate method of Ground Improvement according to site conditions and requirement

**Syllabus :**

Classification of Ground Modification Techniques- Soil distribution in India- Reclaimed soils- Ground Improvement Potential- Grouting – Aspects – Groutability, Grouting materials, Suspension grouts and solution grouts, Compaction grouting. Procedure and applications of grouting- Chemical stabilization – Granular admixtures, Cement, Lime, Calcium Chloride, Fly Ash, Bitumen, Chemical admixtures. Construction Methods-Ground Anchors – Applications, types and components, Anchor tests. Rock bolts – Applications and types- Rock bolt action around an excavation. Soil Nailing – construction sequence – analysis of nailed soil-Compaction- Moisture Density relationship. Shallow surface compaction-Rollers – operational aspects. Deep Compaction – Explosion- heavy tamping- vibro compaction and vibro replacement. Properties of compacted soil, Compaction control tests- Hydraulic modification- Methods of dewatering- open sumps and ditches, Well point systems, deep well drainage, Vacuum dewatering, Electro osmosis. Design of dewatering for excavations

**Expected Outcomes:**

- An understanding about types of ground improvement techniques and soil distribution in India
- Knowledge about various types of grouts and their applications
- Knowledge about types of chemical stabilization and their construction method
- Understanding about Ground Anchors, Rock Bolts and Soil Nailing
- Knowledge about Compaction of soil
- Understanding about various methods of dewatering of soil

**Text Books / References:**

1. Manfred. R. Hausmann, Engineering Principles of Ground Modification, McGraw Hill, 1989
2. P. Purushothamaraj, Ground Improvement Techniques ,University Science Press, 2005

**COURSE PLAN**

| Module | Contents  | Hours | Sem. Exam Marks % |
|--------|---|-------|-------------------|
| I      | Introduction to Engineering Ground Modification- Classification of Ground Modification Techniques- Soil distribution in India- Reclaimed soils- Ground Improvement Potential. | 6     | 15                |



|                                    |  |   |    |
|------------------------------------|--|---|----|
| II                                 | Grouting – Aspects – Groutability, Grouting materials, Suspension grouts and solution grouts, Compaction grouting. Procedure and applications of grouting.   | 6 | 15 |
| <b>FIRST INTERNAL EXAMINATION</b>  |  |   |    |
| III                                | Chemical stabilization – Granular admixtures, Cement, Lime, Calcium Chloride, Fly Ash, Bitumen, Chemical admixtures. Construction Methods.   | 6 | 15 |
| IV                                 | Ground Anchors – Applications, types and components, Anchor tests. Rock bolts – Applications and types- Rock bolt action around an excavation. Soil Nailing – construction sequence – analysis of nailed soil                                    | 7 | 15 |
| <b>SECOND INTERNAL EXAMINATION</b> |  |   |    |
| V                                  | Compaction- Moisture Density relationship. Shallow surface compaction-Rollers – operational aspects. Deep Compaction – Explosion- heavy tamping- vibro-compaction and vibro-replacement. Properties of compacted soil, Compaction control tests. | 9 | 20 |
| VI                                 | Hydraulic modification- Methods of dewatering- open sumps and ditches, Well point systems, deep well drainage, Vacuum dewatering, Electro osmosis. Design of dewatering for excavations.   | 8 | 20 |
| <b>END SEMESTER EXAMINATION</b>    |  |   |    |

**QUESTION PAPER PATTERN (End semester examination)**

**Maximum Marks :100**

**Exam Duration: 3 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

**Note :** 1.Each part should have at least one question from each module

2. Each question can have a maximum of 4 subdivisions (a,b,c,d)

| Course Code | Course Name                        | L-T-P-Credits | Year of Introduction |
|-------------|------------------------------------|---------------|----------------------|
| CE366       | TRAFFIC ENGINEERING AND MANAGEMENT | 3-0-0-3       | 2016                 |

**Pre-requisite: NIL**

**Course objectives:**

- To set a solid and firm foundation in traffic engineering management, traffic regulation, highway capacity, design of introduction and traffic flow theory concepts.

**Syllabus:**

Scope and objective of traffic engineering and management, Traffic regulation rules, Highway capacity and introduction to 2010 manual, Design of at grade, grade separated, rotary and signals, traffic safety, influencing factors and preventive measures for traffic accidents, basic diagrams of traffic flow theory, introduction to car following and queuing.

**Expected Outcomes:**

- This course will enable students to learn advanced topics in traffic engineering and management

**Text Books:**

- Kadiyali L.R. Traffic Engineering and Transport planning, Khanna Tech Publishers, 2011
- Khanna O.P and Justo C.G; Highway Engineering, Nem Chand Publishers, 9e.
- Donald Drew, Traffic Flow Theory Chapter 14 in Differential Equation Models, Springer, 1983

**References:**

- Martin Whol, Brian V Martin, Traffic system Analysis for Engineers and Planners, McGraw Hill, NY, 1967
- HCM 2010 (3 volume set), TRB Publications, 2010

| Module | Contents   | Hours | Sem. Exam Marks % |
|--------|--|-------|-------------------|
| I      | Traffic management – scope of traffic management measures – restrictions to turning movements – one way streets – tidal flow operations-Traffic segregation –Traffic calming- Exclusive bus lanes, Introduction to ITS | 7     | 15                |
| II     | Regulation of traffic – Need and scope of traffic regulations- Motor Vehicle Act – Speed limit at different locations- regulation of the vehicle – regulations concerning the driver rules of the road enforcement     | 7     | 15                |

**FIRST INTERNAL EXAMINATION**

|                                    |  |          |           |
|------------------------------------|--|----------|-----------|
| <b>III</b>                         | Highway capacity: Its importance in transportation studies – basic, possible and practical capacity – determination of theoretical maximum capacity -passenger car units – level of service – concept in HC manual – factors affecting level of service.                 | <b>7</b> | <b>15</b> |
| <b>IV</b>                          | Design of Intersection: Design of at grade & grade separated intersection – rotary intersection – capacity of rotary intersection – traffic signals – warrants of traffic signals,-types of signals, signal coordination, design of fixed time signal –Websters approach | <b>7</b> | <b>15</b> |
| <b>SECOND INTERNAL EXAMINATION</b> |  |          |           |
| <b>V</b>                           | Traffic Safety: causes of road accidents – collection of accident data – influence of road, the vehicle .the driver, the weather and other factors on road accident – preventive measures  | <b>7</b> | <b>20</b> |
| <b>VI</b>                          | Traffic Flow: theory of traffic flow – scope – definition and basic diagrams of traffic flow- basic concepts of light hill – Whitham’s theory – Introduction to Car ‘following theory and queuing’   | <b>7</b> | <b>20</b> |
| <b>END SEMESTER EXAMINATION</b>    |  |          |           |

### QUESTION PAPER PATTERN (End semester examination)

**Maximum Marks :100**

**Exam Duration: 3 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

**Note :** 1.Each part should have at least one question from each module

2. Each question can have a maximum of 4 subdivisions (a,b,c,d)

| Course code   | Course Name    | L-T-P - Credits | Year of Introduction |   |          |  |          |   |          |
|---|----------------|-----------------|----------------------|---|----------|--|----------|---|----------|
| **341   | DESIGN PROJECT | 0-1-2-2         | 2016                 |   |          |  |          |   |          |
| <b>Prerequisite : Nil</b>   |                |                 |                      |   |          |  |          |   |          |
| <p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>• To understand the engineering aspects of design with reference to simple products</li> <li>• To foster innovation in design of products, processes or systems</li> <li>• To develop design that add value to products and solve technical problems</li> </ul>  |                |                 |                      |   |          |  |          |   |          |
| <p><b>Course Plan</b></p> <p><b>Study :</b>Take minimum three simple products, processes or techniques in the area of specialisation, study, analyse and present them. The analysis shall be focused on functionality, strength, material, manufacture/construction, quality, reliability, aesthetics, ergonomics, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.</p> <p><b>Design:</b> The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality, design for strength is not expected.</p> <p><i>Note :</i> The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.</p> |                |                 |                      |   |          |  |          |   |          |
| <p><b>Expected outcome.</b></p> <p>The students will be able to</p> <ol style="list-style-type: none"> <li>i. Think innovatively on the development of components, products, processes or technologies in the engineering field</li> <li>ii. Analyse the problem requirements and arrive workable design solutions</li> </ol>   |                |                 |                      |   |          |  |          |   |          |
| <p><b>Reference:</b></p> <p>Michael Luchs, Scott Swan, Abbie Griffin, 2015. Design Thinking. 405 pages, John Wiley &amp; Sons, Inc</p>  |                |                 |                      |   |          |  |          |   |          |
| <p><b>Evaluation</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 70%;">First evaluation ( Immediately after first internal examination )</td> <td style="text-align: right;">20 marks</td> </tr> <tr> <td>Second evaluation ( Immediately after second internal examination)</td> <td style="text-align: right;">20 marks</td> </tr> <tr> <td>Final evaluation ( Last week of the semester)</td> <td style="text-align: right;">60 marks</td> </tr> </table> <p><i>Note:</i> All the three evaluations are mandatory for course completion and for awarding the final grade.</p>  |                |                 |                      | First evaluation ( Immediately after first internal examination ) | 20 marks | Second evaluation ( Immediately after second internal examination) | 20 marks | Final evaluation ( Last week of the semester) | 60 marks |
| First evaluation ( Immediately after first internal examination )   | 20 marks       |                 |                      |   |          |  |          |   |          |
| Second evaluation ( Immediately after second internal examination)  | 20 marks       |                 |                      |   |          |  |          |   |          |
| Final evaluation ( Last week of the semester)   | 60 marks       |                 |                      |   |          |  |          |   |          |



| Course code   | Course Name               | L-T-P - Credits | Year of Introduction |
|---|---------------------------|-----------------|----------------------|
| **352   | Comprehensive Examination | 0-1-1-2         | 2016                 |
| <b>Prerequisite : Nil</b>   |                           |                 |                      |
| <b>Course Objectives</b>  |                           |                 |                      |
| <ul style="list-style-type: none"> <li>To assess the comprehensive knowledge gained in basic courses relevant to the branch of study</li> <li>To comprehend the questions asked and answer them with confidence.</li> </ul>   |                           |                 |                      |
| <b>Assessment</b>   |                           |                 |                      |
| <p><b>Oral examination</b> – To be conducted by the college (@ three students/hour) covering all the courses up to and including V semester– 50 marks</p> <p><b>Written examination</b> - To be conducted by the Dept. on the date announced by the University– common to all students of the same branch – objective type ( 1 hour duration)– 50 multiple choice questions ( 4 choices) of 1 mark each covering the six common courses of S1&amp;S2 and six branch specific courses listed – questions are set by the University - no negative marks – 50 marks.</p> <p><i>Note:</i> Both oral and written examinations are mandatory. But separate minimum marks is not insisted for pass. If a students does not complete any of the two assessments, grade I shall be awarded and the final grade shall be given only after the completion of both the assessments. The two hours allotted for the course may be used by the students for discussion, practice and for oral assessment.</p> |                           |                 |                      |
| <b>Expected outcome.</b>  |                           |                 |                      |
| <ul style="list-style-type: none"> <li>The students will be confident in discussing the fundamental aspects of any engineering problem/situation and give answers in dealing with them</li> </ul>   |                           |                 |                      |



| Course code  | Course Name                            | L-T-P - Credits | Year of Introduction |
|--|--|-----------------|----------------------|
| <b>**451</b>   | <b>Seminar and Project Preliminary</b> | <b>0-1-4-2</b>  | <b>2016</b>          |
| <b>Prerequisite : Nil</b>  |  |                 |                      |
| <p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>• To develop skills in doing literature survey, technical presentation and report preparation.</li> <li>• To enable project identification and execution of preliminary works on final semester project</li> </ul>  |  |                 |                      |
| <p><b>Course Plan</b></p> <p><b>Seminar:</b> Each student shall identify a topic of current relevance in his/her branch of engineering, get approval of faculty concerned, collect sufficient literature on the topic, study it thoroughly, prepare own report and present in the class.</p> <p><b>Project preliminary:</b> Identify suitable project relevant to the branch of study. Form project team ( not exceeding four students). The students can do the project individually also. Identify a project supervisor. Present the project proposal before the assessment board (excluding the external expert) and get it approved by the board.</p> <p>The preliminary work to be completed: (1) Literature survey (2) Formulation of objectives (3) Formulation of hypothesis/design/methodology (4) Formulation of work plan (5) Seeking funds (6) Preparation of preliminary report</p> <p><b>Note:</b> The same project should be continued in the eighth semester by the same project team.</p> |  |                 |                      |
| <p><b>Expected outcome.</b></p> <p>The students will be able to</p> <ol style="list-style-type: none"> <li>Analyse a current topic of professional interest and present it before an audience</li> <li>Identify an engineering problem, analyse it and propose a work plan to solve it.</li> </ol>   |  |                 |                      |
| <p><b>Evaluation</b></p> <p>Seminar : <b>50 marks</b><br/>(Distribution of marks for the seminar is as follows: i. Presentation : 40% ii. Ability to answer questions : 30% &amp; iii. Report : 30%)</p> <p>Project preliminary : <b>50 marks</b>( Progress evaluation by the supervisor : 40% and progress evaluation by the assessment board excluding external expert : 60%. Two progress evaluations, mid semester and end semester, are mandatory.)</p> <p><b>Note:</b> All evaluations are mandatory for course completion and for awarding the final grade.</p>   |  |                 |                      |

| Course code   | Course Name                      | Credits | Year of Introduction |                              |                                  |                           |                             |  |                             |
|---|----------------------------------|---------|----------------------|------------------------------|----------------------------------|---------------------------|-----------------------------|--|-----------------------------|
| **492   | PROJECT                          | 6       | 2016                 |                              |                                  |                           |                             |  |                             |
| <b>Prerequisite : Nil</b>   |                                  |         |                      |                              |                                  |                           |                             |  |                             |
| <b>Course Objectives</b> <ul style="list-style-type: none"> <li>• To apply engineering knowledge in practical problem solving</li> <li>• To foster innovation in design of products, processes or systems</li> <li>• To develop creative thinking in finding viable solutions to engineering problems</li> </ul>  |                                  |         |                      |                              |                                  |                           |                             |  |                             |
| <b>Course Plan</b><br>In depth study of the topic assigned in the light of the preliminary report prepared in the seventh semester<br>Review and finalization of the approach to the problem relating to the assigned topic<br>Preparing a detailed action plan for conducting the investigation, including team work<br>Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed<br>Final development of product/process, testing, results, conclusions and future directions<br>Preparing a paper for Conference presentation/Publication in Journals, if possible<br>Preparing a report in the standard format for being evaluated by the dept. assessment board<br>Final project presentation and viva voce by the assessment board including external expert |                                  |         |                      |                              |                                  |                           |                             |  |                             |
| <b>Expected outcome</b><br>The students will be able to <ul style="list-style-type: none"> <li>iii. Think innovatively on the development of components, products, processes or technologies in the engineering field</li> <li>iv. Apply knowledge gained in solving real life engineering problems</li> </ul>  |                                  |         |                      |                              |                                  |                           |                             |  |                             |
| <b>Evaluation</b><br><b>Maximum Marks : 100</b> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">(i) Two progress assessments</td> <td style="width: 50%;">20% by the faculty supervisor(s)</td> </tr> <tr> <td>(ii) Final project report</td> <td>30% by the assessment board</td> </tr> <tr> <td>(iii) Project presentation and viva voce</td> <td>50% by the assessment board</td> </tr> </table> <p><i>Note:</i> All the three evaluations are mandatory for course completion and for awarding the final grade.</p>   |                                  |         |                      | (i) Two progress assessments | 20% by the faculty supervisor(s) | (ii) Final project report | 30% by the assessment board | (iii) Project presentation and viva voce | 50% by the assessment board |
| (i) Two progress assessments  | 20% by the faculty supervisor(s) |         |                      |                              |                                  |                           |                             |  |                             |
| (ii) Final project report   | 30% by the assessment board      |         |                      |                              |                                  |                           |                             |  |                             |
| (iii) Project presentation and viva voce  | 50% by the assessment board      |         |                      |                              |                                  |                           |                             |  |                             |

| Course code  | Course Name  | L-T-P - Credits | Year of Introduction |
|--|--|-----------------|----------------------|
| HS300  | Principles of Management   | 3-0-0-3         | 2016                 |
| <b>Prerequisite : Nil</b>  |  |                 |                      |
| <b>Course Objectives</b> <ul style="list-style-type: none"> <li>To develop ability to critically analyse and evaluate a variety of management practices in the contemporary context;</li> <li>To understand and apply a variety of management and organisational theories in practice;</li> <li>To be able to mirror existing practices or to generate their own innovative management competencies, required for today's complex and global workplace;</li> <li>To be able to critically reflect on ethical theories and social responsibility ideologies to create sustainable organisations.</li> </ul> |  |                 |                      |
| <b>Syllabus</b><br>Definition, roles and functions of a manager, management and its science and art perspectives, management challenges and the concepts like, competitive advantage, entrepreneurship and innovation. Early contributors and their contributions to the field of management. Corporate Social Responsibility. Planning, Organizing, Staffing and HRD functions, Leading and Controlling. Decision making under certainty, uncertainty and risk, creative process and innovation involved in decision making.  |  |                 |                      |
| <b>Expected outcome.</b><br>A student who has undergone this course would be able to <ol style="list-style-type: none"> <li>manage people and organisations</li> <li>critically analyse and evaluate management theories and practices</li> <li>plan and make decisions for organisations</li> <li>do staffing and related HRD functions</li> </ol>  |  |                 |                      |
| <b>Text Book:</b><br>Harold Koontz and Heinz Weihrich, <i>Essentials of Management</i> , McGraw Hill Companies, 10th Edition.  |  |                 |                      |
| <b>References:</b> <ol style="list-style-type: none"> <li>Daft, <i>New era Management</i>, 11th Edition, Cengage Learning</li> <li>Griffin, <i>Management Principles and Applications</i>, 10th Edition, Cengage Learning</li> <li>Heinz Weirich, Mark V Cannice and Harold Koontz, <i>Management: a Global, Innovative and Entrepreneurial Perspective</i>, McGraw Hill Education, 14th Edition</li> <li>Peter F Drucker, <i>The Practice of Management</i>, McGraw Hill, New York</li> <li>Robbins and Coulter, <i>Management</i>, 13th Edition, 2016, Pearson Education</li> </ol>                      |  |                 |                      |
| <b>Course Plan</b>   |  |                 |                      |
| Module   | Contents   | Hours           | Sem. Exam Marks      |
| I  | Introduction to Management: definitions, managerial roles and functions; Science or Art perspectives- External environment-global, innovative and entrepreneurial perspectives of Management (3 Hrs.)– Managing people and organizations in the context of New Era- Managing for competitive advantage - the Challenges of Management (3 Hrs.) | 6               | 15%                  |



|                                    |  |   |     |
|------------------------------------|--|---|-----|
| <b>II</b>                          | <b>Early Contributions and Ethics in Management:</b> Scientific Management- contributions of Taylor, Gilbreths, Human Relations approach-contributions of Mayo, McGregor's Theory, Ouchi's Theory Z (3 Hrs.) Systems Approach, the Contingency Approach, the Mckinsey 7-S Framework Corporate Social responsibility- Managerial Ethics. (3 Hrs)  | 6 | 15% |
| <b>FIRST INTERNAL EXAMINATION</b>  |  |   |     |
| <b>III</b>                         | <b>Planning:</b> Nature and importance of planning, -types of plans (3 Hrs.)- Steps in planning, Levels of planning - The Planning Process. – MBO (3 Hrs.).  | 6 | 15% |
| <b>IV</b>                          | <b>Organising for decision making:</b> Nature of organizing, organization levels and span of control in management Organisational design and structure –departmentation, line and staff concepts (3 Hrs.) Limitations of decision making- Evaluation and selecting from alternatives- programmed and non programmed decisions - decision under certainty, uncertainty and risk-creative process and innovation (3 Hrs.)  | 6 | 15% |
| <b>SECOND INTERNAL EXAMINATION</b> |  |   |     |
| <b>V</b>                           | <b>Staffing and related HRD Functions:</b> definition, Empowerment, staff – delegation, decentralization and recentralisation of authority – Effective Organizing and culture-responsive organizations –Global and entrepreneurial organizing (3 Hrs.) Manager inventory chart-matching person with the job-system approach to selection (3 Hrs.) Job design-skills and personal characteristics needed in managers-selection process, techniques and instruments (3 Hrs.) | 9 | 20% |
| <b>VI</b>                          | <b>Leading and Controlling:</b> Leading Vs Managing – Trait approach and Contingency approaches to leadership - Dimensions of Leadership (3 Hrs.) - Leadership Behavior and styles – Transactional and Transformational Leadership (3 Hrs.) Basic control process- control as a feedback system – Feed Forward Control – Requirements for effective control – control techniques – Overall controls and preventive controls – Global controlling (3 Hrs.)                  | 9 | 20% |
| <b>END SEMESTER EXAM</b>           |  |   |     |

#### Question Paper Pattern

Max. marks: 100, Time: 3 hours .

The question paper shall consist of three parts

**Part A:** 4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part B :** 4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part C:** 6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

**Note:** In all parts, each question can have a maximum of four sub questions, if needed.