

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY & MEDICAL SCIENCES
SCHOOL OF ENGINEERING
Undergraduate Degree Courses in Engineering & Technology
Department of Civil Engineering

Course Content

V SEMESTER

CEA-501	Advance Surveying	2L:1T:0P	3 credits	3Hrs/Week
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Preamble:-

The main objectives of the course are

- To make students aware with different advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the principles being same.
- To prepare the students to handle the errors they are likely to come across any large scale survey works.

Outcome:-

- On the successful completion of this course the students will get a diverse knowledge of surveying practices applied for real life problems.
- The students will learn to work with various surveying equipment's, like, Theodolite, Total station, etc. in order to apply the theoretical knowledge to carry out practical field work.
- The knowledge of limits of accuracy will be obtained by making measurements with various surveying equipment employed in practice.

UNIT-I

5 Hr

Modern equipment's for surveying: Digital levels and theodolites, Electromagnetic Distance measurement(EDM), Total Station and Global Positioning Systems (GPS), Digital Planimeter .

UNIT-II

9 Hr

Surveying Astronomy: Definitions of astronomical terms, coordinate systems for locating heavenly bodies, geographic, geodetic, geocentric, Cartesian, local and projected coordinates for earth resources mapping, convergence of meridian, parallel of latitude, shortest distance between two points on the earth, determination of latitude and longitude.

UNIT-III

9 Hr

GPS Surveying: Introduction & components of GPS, Space segment, control segment and user segment, Elements of Satellite based surveys-Map datum's, GPS receivers, GPS observation methods and their advantages over conventional methods. Digital Terrain Model (DTM): Topographic representation of the terrain and generation of DTM on computers using spot heights and contour maps.

UNIT-IV

10 Hr

Photogrammetry : Principle, definitions and classifications of terrestrial and aerial photogrammetry, flight planning for aerial photography, scale and relief displacements of vertical aerial photographs, stereoscopic vision

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on vertical photographs, computation of position, length and elevations of objects using photographs and photo mosaic.

UNIT-V

12 Hr

Remote Sensing: Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications. Geographic Information Systems (GIS): Definition, components and advantages. Surveying Project - Student will go for one week Surveying Camp to carry out Project Work.

References Books :

1. Surveying and Leveling-Part-I & II by T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi Griha Prakashan, Pune
2. Engineering Surveying : Theory and Examination Problems for Students by W. Schofield, Butterworth, Heinemann, Oxford.
3. Surveying: Problems Solving with theory and objective type questions by A.M. Chandra, New Age International Publishers N. Delhi.
4. Advance Surveying by A.M. Chandra, New Age International Publishers N. Delhi.
5. Surveying Vol. II by S.K. Duggal, Tata McGraw Hill Publishing Company Ltd. New Delhi.
6. Remote Sensing and image interpretation by Lillesand T.M. and Kiefer R.W.

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CEA-501	Advance Surveying	0L:0T:2P	1 credits	2Hrs/Week
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List of Experiments:-

SURVEYING PROJECT:-

Student will go for one week surveying camp to carry project

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CEA-502	Fluid Mechanics	2L:1T:0P	3 credits	3Hrs/Week
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Preamble:-

•To introduce the students about properties of the fluids, behavior of fluids under static conditions and to impart basic knowledge of the dynamics of fluids through the control volume approach and to expose to the applications of the conservation laws to uniform and non-uniform flow in open channel, flow through pipes (both laminar and turbulent) and forces on pipe bends with an exposure to the significance of boundary layer theory and its applications and fluid machines.

Outcome:-

On completion of the course, the student is expected to be able to-

- Demonstrate the difference between solid and fluid, its properties and behavior in static conditions.
- Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.
- Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.
- Explain the concept of boundary layer and its application to find the drag force exerted by the fluid on the flat solid surface.

UNIT-I

8Hr

Properties of fluid :- Fluid and continuum, Physical properties of fluids. Newtonian and non-Newtonian fluids. Pressure transducers, Pascal's law, pressure variation in a fluid at rest, Hydrostatic law, Manometer, Hydrostatic force on submerged body, Buoyancy and Flotation.

UNIT-II

10Hr

Uniform & Non uniform flow in open channels: Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, Saint Venant equation. Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, Venturi flume

UNIT-III

10Hr

Laminar flow & Turbulent flow: Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically smooth and rough boundaries, Reynolds's experiment, Hagen-Poiseuille Equation, flow of viscous fluids between two parallel plates, Drop of pressure head. Effect of turbulence, Expression for loss of head due to friction in pipes. Resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes. Pipe flow problems: Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes. Hardy Cross Method.

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UNIT-IV

5Hr

Forces on immersed bodies: Types of drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, Magnus effect.

UNIT-V

12Hr

Fluid Machines: Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation. Pumps: Centrifugal pumps: Various types and their important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves. Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manometric head, Acceleration head.

Reference Books:

1. Fluid Mechanics - Modi & Seth - Standard Book house, Delhi
2. Open Channel Flow by Rangaraju - Tata Mc Graw - Hill Publishing Comp. Ltd., New Delhi
3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi
4. Fluid Mechanics, Hydraulics & Hydraulic Mechanics - K.R. Arora - Standard Publishers Distributors 1705- B, Nai Sarak, Delhi-6
5. Hyd. of open channels By Bakhmetiff B.A. (McGraw Hill, New York)
6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)
7. Engineering Hydraulics By H. Rouse
8. Centrifugal & Axial Flow Pump By Stenpanoff A.J. New York
9. Relevant IS codes.

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CEA-502	Fluid Mechanics	0L:0T:2P	1credits	2Hrs/Week
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List of Experiments-

1. Study the performances characteristics of Pelton Wheel
2. Study the performances characteristics of Francis Turbine
3. Study the performances characteristics of Kaplan Turbine
4. Calibration of multistage (Two) Pump & Study of characteristic of variable speed pump
5. To study the performance & details of operation of Hyd. Ram
6. Determination of coefficient of discharge for a broad crested weir & to plot water surface Profile over weir
7. Study of the characteristic of the Reciprocating pump
8. To study the variation of friction factor for pipe flow.
9. To determine the head loss for a sudden enlargement.
10. To determine the head loss for a sudden Contraction.
11. To determine of head loss in various pipe fittings.
12. To study of Reynolds experiment for demonstration of stream lines & turbulent flow
13. To study the characteristics of a centrifugal pump

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CEA-503	Structural Design & Drawing-I	2L:1T:0P	3credits	3Hrs/Week
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Preamble:-

•To impart knowledge on basic of concepts of design of reinforced concrete structures and to make the students able to design and detail the basic elements like beam, slab, column, footing and staircase.

Outcome:-

At the end of the course the student will be able to

- Explain the various design concepts and design a beam under flexure and draw the reinforcement details.
- Design the beam under shear and torsion, Calculate the anchorage and development length and check the serviceability requirements for RC structural elements.
- Design a RC slab and staircase and draw the reinforcement details.
- Design short columns and strip, isolated and combined footings and draw the reinforcement details.

UNIT –I

11Hr

Basic Principles of Structural Design: Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

UNIT – II

10Hr

Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

UNIT- III

7Hr

Design of Slabs: Slabs spanning in one direction. Cantilever, simply supported and Continuous slabs, Slabs spanning in two directions, Circular slabs, Waffle slabs, Flat slabs, Yield line theory.

UNIT - IV

10Hr

Columns & Footings: Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

UNIT -V

7Hr

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slab less tread-riser staircase.

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Reference Books: -

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammutham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju

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CEA-503	Structural Design & Drawing-I	0L:0T:2P	1credits	2Hrs/Week
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Student should prepare the drawing sheets for reinforcement detail of the following-

1. Reinforcement details of RCC Beam.
2. Reinforcement details of RCC Slab.
3. Reinforcement details of RCC Column.
4. Reinforcement details of footings (Isolated, stepped, combined footing)
5. Reinforcement details of Stair Cases

NOTE:- All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids)

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Program Elective- I

CEA-504(A)	Water Resources & Irrigation Engineering	3L:1T:0P	4 credits	4Hrs/Week
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Preamble:-

•To introduce the students to the concept of soil-plant characteristics and their water requirements and to understand the necessity of planning an irrigation system to provide water at the right time and right place.

Outcome:-

On completion of the course, the student is expected to be able to

- Describe the national water policy structure and soil plant water characteristics.
- Describe the basics of requirements and estimation of crop water.
- Design the various types of hydraulic structure includes dams, spillways and dissipaters.
- Design the components of irrigation canal include canal drops and cross drainage works.
- Apply the concepts of Irrigation water management, water user association for participatory irrigation management.

UNIT - I

12Hr

Irrigation water requirement and Soil-Water-Crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

UNIT - II

10Hr

Ground Water and Well irrigation: Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow Conditions, infiltration galleries. Ground water recharge-necessity and methods of improving Ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence causes and effects. Reclamation of water logged and salt affected lands. Types of wells, well Construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

UNIT- III

11Hr

HYDROLOGY : Hydrological cycle, precipitation and its measurement, recording and non-recording rain gauges, estimating missing rainfall data, rain gauge networks, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

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UNIT - IV

7Hr

Canals and Structures: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics. Introductions to Hydraulic Structures viz. Dams, Spillways, Weirs, Barrages, Canal Regulation Structures.

UNIT - V

5Hr

Floods: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

Reference Books:-

1. Irrigation & Water Power Engineering by Punmia & Pandey B.B.Lal
2. Engineering Hydrology by K. Subramanya - Tata Mc Graw Hills Publ. Co.
3. Engineering Hydrology - J.NEMEC - Prentice Hall
4. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
5. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
6. Engineering Hydrology by H.M. Raghunath

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Program Elective- I

CEA-504 (B)	Renewable Energy System	3L:1T:0P	4 Credits	4Hrs/Week
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Preamble:-

- Understand the various forms of conventional energy resources.
- Learn the present energy scenario and the need for energy conservation.
- Explain the concept of various forms of renewable energy.
- Outline division aspects and utilization of renewable energy sources for both domestic and industrial application.
- Analyse the environmental aspects of renewable energy resources.

Outcome:-

Upon completion of the course, the student will be able to-

- Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
- Know the need of renewable energy resources, historical and latest developments.
- Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.
- Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
- Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.
- Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.

UNIT-I

9Hr

Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions. Solar thermal conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.

UNIT-II

6Hr

Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells.

UNIT-III

10Hr

Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes. power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy.

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UNIT-IV

12Hr

Production of biomass, Classification of biomass; Physicochemical characteristics of biomass as fuel Biomass

conversion routes: biochemical, chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values. Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

UNIT-V

8Hr

Small Hydropower Systems: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues.

Reference Books:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn
2. Khan, B H, NonConventional Energy, TMH.
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application

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Open Core Elective – I

CEA-505 (A)	Remote Sensing & GIS	3L:1T:0P	4 Credits	4Hrs/Week
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Preamble:-

- To make the students to understand the concepts, components and source of remote sensing.
- To gain knowledge about different types of remote sensing platforms and sensors.
- To explain the concept of satellite image interpretation.
- To understand the applications of remote sensing in Civil Engineering

Outcome:-

On completion of the course, the student is expected to be able to

- Understand the concepts and laws related to remote sensing
- Understand the interaction of electromagnetic radiation with atmosphere and earth material
- Acquire knowledge about satellite orbits and different types of satellites
- Understand the different types of remote sensors
- Gain knowledge about the concepts of interpretation of satellite imagery and civil engineering applications
- Apply various spatial analysis tools for deriving GIS based outcome

UNIT

8Hr

Introduction And Concepts- Introduction of Remote Sensing – Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with Atmosphere scattering, Absorption, EMR interaction with earth surface features reflection, absorption, emission and transmission, Spectral response pattern , vegetation, soil, water bodies- Spectral reflectance

UNIT II-

7Hr

Aerial Photography And Photogrammetry- Introduction-,Terrestrial and Aerial photographs - vertical and oblique photographs - height determination contouring - photographic interpretations - stereoscopy – parallax bar- Flight Planning- Photo Interpretation, Applications of aerial Photos-Photo theodolite.

UNIT II

8Hr

Satellite Remote Sensing Principles Data Acquisition –Procedure, Reflectance and Digital numbers- Intensity Reference data , Ground truth, Analog to digital conversion, Detector mechanism-Spectro- radiometer-Ideal remote sensing system – Characters of real and successful remote sensing system- Platforms and sensors- orbits types – Resolution

UNIT IV

12Hr

Remote Sensing Satellites Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, Weather/Meteorological satellites, INSAT series, NOAA, GOES, NIMBUS Applications, Marine observation satellites OCEANSAT

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UNIT V

10Hr

Types Of Remote Sensing And Image Interpretation Introduction- Active, Passive, Optical Remote sensing, visible, infrared, thermal, sensors and characters. Microwave remote sensing Sensors, Concept of Microwave remote sensing, SLAR, SAR Scattro-meters,- Altimeter, Characteristics , Image interpretation characters.

Reference Books:-

1. M. Anji Reddy, Textbook of Remote Sensing and Geographical Information systems, BS Publications, Hyderabad. 2011. ISBN: 81- 7800-112-8
2. A.M.Chandra and S.K. Gosh. Remote Sensing and GIS, Narosa Publishing Home, New Delhi 2009.
3. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman Remote sensing and image interpretation John Wiley & Sons, 2008
4. George Joseph , Fundamentals of Remote Sensing Universities Press, Hyderabad 2005

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Open Core Elective – I

CEA-505 (B)	Highway Engineering	3L:1T:0P	4 Credits	4Hrs/Week
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Preamble:-

To give an overview on the basics of highway engineering and to impart the various process and methods involved in the planning, development, design, construction and maintenance of highways.

Outcome:-

On completion of the course, the student is expected to be able to -

- Understand the concepts and standards adopted in Planning, Design and construction of Highways and its related infrastructures.
- Apply the knowledge of science and engineering fundamentals in designing the geometrics for an efficient Highway network and design concepts.
- Designing various types of pavements to meet specified needs of safety, efficiency and long time sustainability by adopting various design standards.
- Select appropriate methods for construction, evaluation and maintenance of roadways.
- Understand the bidding processes and types of highway projects and analyze the economic, financial aspects of the highway projects

UNIT-I

10Hr

HIGHWAY PLANNING AND ALIGNMENT :- History of road development in India – Classification of highways – Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment – Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT-II

12Hr

GEOMETRIC DESIGN OF HIGHWAYS :- Typical cross sections of Urban and Rural roads -- Cross sectional elements – Horizontal curves, super elevation, transition curves, widening of curves – Sight distances – Vertical curves, gradients, hairpin bends – Lateral and vertical clearance at underpasses – IRC standards-Road signs and safety. Urban utility services.

UNIT III

6Hr

DESIGN OF FLEXIBLE AND RIGID PAVEMENTS :- Design principles – pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only).

UNIT IV

10Hr

HIGHWAY CONSTRUCTION AND MAINTENANCE :- Highway construction materials, properties, testing methods – Construction practice of flexible and concrete pavements including modern materials and methods, Highway drainage – Special considerations for hilly roads; Evaluation and Maintenance of pavements.

UNIT V

7Hr

HIGHWAY ECONOMICS AND FINANCE Introduction, Highway User Benefits, Highway Costs, Vehicle Operation Costs, Economic analysis, Highway projects under Public-Private Sector Participation, Bidding process, Highway finance.

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Reference Books:

1. Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2005
2. Kadiyali. L. R. Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 1997.
3. Indian Road Congress (IRC), Guidelines and Special Publications on Planning and Design of Highways.
4. Sharma.S.K Principles , Practices and Design of Highway Engineering, S.Chand and Company Ltd.1995

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Industrial Training-I

CEA-506	Industrial Training-I	0L:0T:4P	2credits	4Hrs/Week
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Objective of Industrial Training

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem .

Scheme of Studies:

Duration: Minimum 2 weeks in summer break after IV semester, assessment to be done in V Semester

Scheme of Examination:

For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term Work in Industry Marks Allotted

Attendance and General Discipline 20

Daily diary Maintenance 20

Initiative and participative attitude during training 30

Assessment of training by Industrial Supervisor 30

Total 100*

(b) Practical/Oral Examination (Viva-Voce) in Institution Marks Allotted

1. Training Report 50

2. Seminar and cross questioning (defense) 100

Total 150

* - Marks of various components in industry should be awarded by the I/c of training in Industry but in special circumstances if not awarded by the industry then faculty in charge /T.P.O. will give the marks.

During training students will prepare a first draft of training report in consultation with section In charge. After training they will prepare final draft with the help of T.P.O. /Faculty of the Institute. Then they will present a seminar on their training and they will face viva-voce on training in the Institute.