CE010 701 DESIGN OF HYDRAULIC STRUCTURES

Teaching scheme:  
2 hours lecture and 2 hours tutorial per week

Objective: Students are expected to know the details of major and minor irrigation structures and their design. A student, who successfully completes the course, should be able to carry out design of various hydraulic structures in the given field conditions.

Module 1 (13 hours)
Dams: classifications - factors governing the selection of the type of dam and site of the dam- Gravity dam: forces acting - modes of failure and stability requirements - elementary profile and practical profile - principal and shear stress - base width of elementary profile by stress and stability criteria-stresses developed in the elementary profile - low and high gravity dam – design of gravity dam (introduction only) – galleries, joints, keys, water stops – foundation treatment - brief description on types of spill ways.

Module 2 (10 hours)
Earthen dam - types of earth dams - causes of failure - design criteria - phreatic line in an earth dam with horizontal drainage filter - different dam sections to suit available materials and foundation.
Rock fill dam – materials of construction-impervious membrane type and earth core type (brief description only)

Module 3 (13 hours)

Module 4 (13 hours)
Canal regulation works-design of head regulator and cross regulator- Canal falls- necessity and location of falls-types-design of vertical drop fall- Sarda type only and siphon well drop. (Design emphasizing the hydraulic aspects only)

Module 5 (11 hours)
Cross drainage works – necessity-types-design of aqueduct and syphon aqueduct.
Water power engineering: Classification of hydel plants- runoff river plants, storage plants and pumped storage plants - low, medium and high head schemes - investigation and planning - fore bay – intakes - surge tanks - penstocks - powerhouse – selection of turbine-Scroll casing - draft tube – tail race- definition of gross head - operating head - effective head - firm power –secondary power- load factor, capacity factor and utilization factor.
Note:
Only sketches are required for all designs.

References

2. P. M. Modi, Irrigation-water resources and water power, Standard book house.
5. V. B. Priyani, Irrigation and water power Engg. , Charotar Book stall.
7. Sathyanarayana Murthy, Water Resources Engineering, Wiley Eastern
Teaching scheme: Credits: 4
2 hour lecture and 2 hour tutorial per week

Objective:
- To understand the basic principles of Water Supply Engineering
- To develop knowledge in unit operations and design of water treatment systems

Module 1 (10hrs)
Scope of Environmental Engg. Water supply Engineering: Rural and Urban water supply systems - water demand - per capita demand, factors affecting per capita demand, variations in the rate of consumption, fire demand, design period, forecasting population. Quality of water: impurities in water and their importance - water borne diseases - analysis of water - physical, chemical and bacteriological tests - MPN total coliforms, fecal coliforms. WHO and Indian standards for drinking water.

Module 2 (10hrs)
Collection of water: intakes - location, types, pipe materials - hydraulics-of flow - design of pipes - Pumps: Classification - selection of pumps - location of pumping stations. Appurtenances in the distribution system - meters, valves, fire hydrants etc. pipe laying, testing & disinfections of mains. Storage of water - effect of storage on quality of water

Module 3 (15hrs)

Module 4 (15hrs)
Filtration - Theory of filtration, filter media - sand for filtration. Classification of filters - design, construction, control, operation and maintenance of rapid sand filters and slow sand filters, pressure filters. Disinfection: requirements of a good disinfectant, chlorination - action, application, and dosage chlorine demand, pre-chlorination, post chlorination, double chlorination, super chlorination, breakpoint chlorination. Other disinfectants.

Module 5 (10hrs)
Miscellaneous treatment methods: color, odour and taste removal, iron and manganese removal, defluoridation, removal of hardness, desalination. Distribution of water: pumping system, gravity system, pumping and storage system, distribution reservoirs - storage capacity of balancing reservoir, pipe grids,
methods of analysis of network. Detection and prevention of leaks in distribution system-cleaning and maintenance of distribution system, pipe corrosion and its control.

References:

CE010 703  DESIGN OF CONCRETE STRUCTURES – II

Teaching Scheme                                                                                     Credit: 3
2 hours lecture and 1 hour tutorial per week.

Objective
   To provide knowledge in the structural design of selected structures.

Module 1 (10 Hrs)
Prestressed Concrete: IS specifications- general principles- analysis of prestress and bending stress -methods and systems of prestressing – losses of prestress- design of simply supported rectangular beams with constant eccentricity only.

Module 2 (10 Hrs)
Retaining walls: Types-Earth pressure diagrams- modes of failure-design of cantilever and counter fort retaining walls (“L” not included)

Module 3 (8 Hrs)
Design of continuous beams: Using coefficients given in IS 456.
Circular beams: Uniformly loaded and supported on symmetrically placed columns

Module 4 (8 Hrs)
Domes: Membrane stresses in spherical and conical domes-design of domes with uniformly distributed and concentrated loads-openings-ring beams

Module 5 (9 Hrs)
Water Tanks: types-design of ground supported and overhead water tanks- circular with flat bottom-flexible and rigid joints-design of staging-columns and bracings-IS code method.

References
1. Relevant IS codes (IS 456, IS 875, IS 1343, IS 3370 Part 2 and Part 4 ,SP 16)
2. Park R and Pauloy T, Reinforced concrete structures, John wiley & sons Inc
5. Mallick S K, Reinforced concrete, oxford & IBH publishing company
7. Ashok K Jain Reinforced concrete –Limit state design, new chand & bose
8. Krishna Raju, prestressed concrete oxford and ibh publishing company ltd
9. Ramamrutham S, Design of reinforced concrete structures, Dhanpat Rai publishing co
10. Punmia B C Reinforced concrete structures vol 2. Laxmi publications
Teaching scheme:  
2 hour lecture and 1 hour tutorial per week

Credits: 3

Objective:  
- To understand the basic principles of architectural design and functional planning of buildings
- To develop knowledge in town planning concepts and related principles

Module 1 (10 hrs)
Architecture - Definition - factors influencing architectural development, characteristic features of a style - historical examples, Theory of architectural design – pragmatic, iconic, canonic and analogic design, Creative principles - function, strength, aesthetics, primary elements in architectural design, Design principles - unity, balance, proportion, scale, rhythm, character, contrast, texture, form perception, characteristics of form, form expressive of function- form related with material and structural system. Concept of space - activity space, circulation space and tolerance space

Module 2 (15 hrs)
Functional planning of buildings: Occupancy classification of buildings - general requirements of site and building - building codes and rules - licensing of building works. Functional planning of residential, institutional, commercial, process of identifying activity areas and linkages - circulation diagrams - checking for circulation, ventilation, structural requirements and other constraints, preparing site plan and working drawings

Module 3 (10 hrs)
Building Services:- Vertical transportation: Stairs - lay out and details of timber, masonry, metal, concrete and precast-concrete stairs-Elevators-drum and traction type, passenger and service goods elevators, design constraints of passenger elevators- handling capacity, arrangement of lifts, Escalators- features, operation arrangements, location - moving walk and moving ramp.
Ventilation and Air conditioning - ventilation requirements - natural and mechanical ventilation - cross ventilation - effect of orientation - calculation of air conditioning load - summer and winter air conditioning- consideration of comfort factors such as acoustics, lighting, and thermal aspects.

Module 4 (13 hrs)
Town planning - Evolution of towns-objectives and principles of town planning- growth of towns - problems of urban growth- garden city movement, conservative surgery and comprehensive planning, Radburn plan - evolution in town planning acts and legislation - forms of planning - requirements of new towns - surveys – zoning - transportation network and planning – housing, neighbourhood unit planning, - legislation on environmental pollution - land use planning and theories.
Module 5 (12 hrs)
Planning process:- Master plan, preparation and execution- -planning standards for different land use allocation for commerce, industries, public buildings, parks and play grounds.-implementation of development plans - land acquisitions - slums - causes and clearance schemes

References:
2. Satish Chandra Agarwala – Architecture and Town Planning- Dhanpat Rai and Co
5. V.K Jain – Hand book of Designing and installation of services in building complex – khanna publishers
8. Abir Bandyopadhyay – Text book of Town planning – Books and Allied (P) Ltd.
Objectives: To understand the principles and design of highway, traffic and airport engineering

Module 1 (8 hours)
Classification, alignment and surveys - classification of highways - typical cross section of roads in urban and rural areas - requirements and factors controlling alignment of roads, engineering surveys for highway location.

Geometric Elements of highways: Highway cross sectional elements - pavement surface characteristics, camber and width requirements, median, kerbs, road margins – right of way, Sight distances - over taking zone requirements and related problems.

Module 2 (14 hours)
Geometric Design of Highways

Module 3 (8 hours)
Traffic Engineering: Traffic characteristics - traffic studies and their applications Traffic control devices- Traffic signs, traffic signals, road markings and traffic islands. Types of road intersection - kerb parking (Design of traffic signals not expected).

Module 4 (8 hours)
Highway materials: Aggregates - desirable properties and tests - Bituminous materials - properties and tests - sub grade soil - desirable properties.
Pavement design: Basic difference between flexible and rigid pavements -factors affecting their design – design of flexible pavements-CBR & IRC Introduction to performance grading and superpave. Types and causes of failures in flexible and rigid pavements, highway drainage.
Highway construction and maintenance: Bituminous surface dressing, bituminous macadam.
Module 5 (10 hours)

**Airport Engineering:** Classification of airports - Aircraft characteristics - planning, selection of site for airport - factors to be considered. Runway orientation and layout of runways: use of wind rose diagrams, basic runway length and corrections required - Imaginary surfaces - approach zone and turning zone, obstructions and zoning laws - Stop way, clearway.


**References**

6. Horenjeft, Robert & Francise Mc Kelvy, Planning and design of airports, Mc Graw Hill.
Objective:

The course is designed to give an insight into the latest developments in construction field regarding the automated building services, smart materials and their use in structures.

Module 1 (14 hours)

Module 2 (12 hours)
Building service control systems: Introduction, Building Management System (BMS)-control theory, benefits, Safety systems- life safety system, access control system, smoke detection system, fire sprinkler system, Comfort systems- occupancy sensors, temperature sensors, smart glass, light control system

Module 3 (12hours)
Eco friendly buildings – concepts of Green building, sustainable sites, brown field development, water conservation, energy conservation, ozone depletion, eco friendly building materials and resources, indoor environment quality maintenance, new innovative building designs for eco friendliness.

Module 4 (11hours)
Smart materials: Introduction, Piezoelectric materials, Piezoelectric properties, Vibration control, Embedded actuators, Fiber optics, Fiber characteristics, Fiber optic strain sensors, Applications of optical fibers, Electrorheological and Magnetorheological fluids, mechanism and properties, Applications.

Module 5 (11 hours)
Control of structures: Control strategies and limitations, Classification of control systems, Classical control, Modern control, Optimal control and Digital control.

References:
Objective:
The rapid urban and industrial development pose an increasing demand for land reclamation and utilization of unstable and environmentally affected ground. The objective of the course is to provide an opportunity to the students to familiarize with the recent developments and techniques in geo-technical engineering to improve the properties of such problematic/difficult soils.

Module 1 (15 Hrs)
Necessity of soil improvement—selection of improvement method—mechanical stabilization—effect on engineering properties—dewatering—well-point system electro osmosis—pre-loading—sand drains—methods of installation—vibroflotation and stone columns.

Module 2 (11 Hrs)

Module 3 (11 Hrs)
Introduction to grouts and grouting—basic functions—classification of grouts—suspension grout and solution grout—groutability ratio—properties of grouts—fluidity and viscosity, bleeding and stability, rigidity and thixotropy, strength and permeance—grouting applications—seepage control in soil and rock under dams and for cut off walls—stabilization grouting for underpinning and other applications.

Module 4 (12 Hrs)
Earth Reinforcement—mechanism and concept—advantages—factors affecting—uses—design theories and stability analysis of retaining wall—external and internal stability—tie back analysis—coherent gravity analysis—application areas of earth reinforcement.

Module 5 (11 Hrs)
Geotextiles: Soil improvement with geotextiles—classification—concepts—geotextiles as reinforcement, separators, filters, and drainage media—damage and durability of geotextiles.

References
1. Purushotama Raj, P. Ground Improvement Techniques, Laxmi Publications
Teaching Scheme
2 hours lecture and 2 hours tutorial per week.

Objective:
*Pre stressed concrete constructions are gaining its importance in Civil engineering.*
*To understand the analysis, systems and applications of pre stressed concrete structures.*

Module 1 (10 hrs)

Module 2 (10 hrs)
Analysis of prestress – Extreme fibre stresses – profile of tendons – Concept of load balancing – pressure line or thrust line – Internal resisting couple – Deflection of beams – Load deflection curve.

Module 3 (12 hrs)
Losses of prestress – Loss due to elastic shortening, shrinkage, creep, relaxation of steel – Loss due to anchorage slip – Loss due to friction – Overcoming friction loss – Design of tension members.

Module 4 (14 hrs)
Elastic design of sections for flexure – sections and sections unsymmetrical about one axis – Design without tension and with tension – Design for shear and torsion – Ultimate moment of resistance.

Module 5 (14 hrs)

References:
4. IS: 1343, *Code of Practice for Prestressed Concrete*, Bureau of Indian Standards, New Delhi
Objective:
- To understand the basic principles of Environmental Impact Assessment
- To develop knowledge in various processes involved in EIA with case studies.

Module 1 (14 hours)

Introduction: Concepts of environmental impact analysis, key features of National environmental policy act, Environmental protection acts, EIA methodologies - Screening and scoping - matrix and network methodologies for impact identification, description of the affected environment – environmental indices. Rapid EIA and Comprehensive EIA

Module 2 (14 hours)

Prediction and Assessment of Impact on Air and Water Environment: Basic information on air quality, sources and effects of air pollutants, key legislations and regulations, impact prediction approaches, assessment of significance of impacts, identification and incorporation of mitigation measures
Assessment of impact on water quality (surface and ground water), Vegetation and wildlife.

Module 3 (12 hours)

Prediction & Assessment of Impact on Noise & Social Environment: Basic information on noise, key legislation and guidelines, impact prediction methods, assessment of significance of impacts, identification and incorporation of mitigation measures, Environmental Risk Analysis, Definition of Risk, Consequence Analysis.

Module 4 (10 hours)

Decision Methods for Evaluation of Alternative: Development of decision matrix. Public participation in environmental decision making, techniques for conflict management and dispute resolution, verbal communication in EIA studies.

Module 5 (10 hours)

Introduction to Environmental Management Systems, Environmental Statement-procedures, Environmental Audit: Cost Benefit Analysis, Life cycle Assessment, Strategic EIA
References:

6. Relevant IRC & CPCB codes.
Teaching Scheme
2 hours lecture and 2 hours tutorial per week.

Objective:
To develop the skills for the analysis of advanced structures in civil engineering.

Module 1 (12 hrs)

Module 2 (12 hrs)

Module 3 (12 hrs)

Module 4 (12 hrs)

Module 5 (12 hrs)

References:

4. G.S Ramaswamy, Design and Construction of Concrete Shell Roofs, Tata- McGraw Hill Book Co. Ltd.,.
Objective
The basic objective of this course is to introduce to the students the knowledge of traffic surveys and studies. The course also tries to expose the students to traffic management, capacity studies, design of intersections, safety studies, and the theories of traffic flow. They also become familiar with various traffic control and traffic management measures.

Module 1 (12 hrs)
Traffic management - scope of traffic management measures - restrictions to turning movements - one way streets - tidal flow operation - 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.

Module 2 (12 hrs)
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.

Module 3 (12 hrs)
Design of Intersection: Design of at grade & grade separated intersection – rotary intersection - capacity of rotary intersection - traffic signals - design of fixed timesignal - pretimed signalised intersection - performance - Websters approach for the design.

Module 4 (12 hrs)
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.

Module 5 (12 hrs)
Traffic Flow: theory of traffic flow - scope - definition and basic diagrams of traffic flow - basic concepts of light hill - Whitham’s theory - Car following theory and queuing

References
2. Khanna O.P and Jesto C.G; Highway Engineering, Nem Chand Publishers
3. Martin, Whol, Traffic system Analysis for Engineers
4. Donald Drew, Traffic Flow Theory
Teaching scheme:  
3 hour practical per week

Objective:  
To familiarize the students on the software packages for analysis, design and project management

Module I & II
• INTRODUCTION
Overview and the Environment of STAAD pro Package.
• GENERAL DESCRIPTION
Type of structure, Unit systems, structure geometry and Co-ordinate systems, global co-ordinate system, Local co-ordinate systems
• STAAD III -Commands- Using Edit Input-Command Formats-Text Input.
• STAAD POST – Graphical Post Processing – Animation – Icons – Isometric View – Zooming- Results of Analysis & Design – Query reports.
• LOAD – Member Load, Element Load, Joint Load, Floor Load, Self weight Command, Load case no, Load Combination .Load Generation for Wind Load, Seismic Load and Moving Load
• FINITE ELEMENT ANALYSIS & Dynamic Analysis.
• DESIGN for Concrete and Steel Structures using IS: 456 and IS 800 respectively.

Note
The student has to practice the above topics by working out problems in
1. Analysis and design of beams and trusses, Steel and RCC framed structures.
2. Analysis and design of multi-storied framed structures.

Module III & IV
Project management using CPM/PERT Software
(Microsoft Project /PRIMAVERA software)
1. Practice on the GUI of the software and Input of Date
2. Practice on Creating Bar Charts/Ghant charts
3. Practice on creating CPM/PERT charts and finding out critical path.
4. Practice on resource allocation and leveling of resources.
5. Practice on Project Monitoring (Cost &Time)
6. Plotting and printing of various charts and project

Note
The student has to practice the above topics by doing Project Management for Turn key projects related to Civil Engineering applications.

References
1. STAAD III Reference Manual
2. MS Project/PRIMAVERA Reference Manual
Teaching scheme:  
3 hour practical per week

Objective:  
*To make the students aware of the properties of various materials used in road constructions.*

TEST ON SOIL  
1. California bearing ratio method.

TEST ON BITUMEN  
2. Softening point of Bitumen  
3. Ductility test on Bitumen  
4. Specific gravity of Bitumen  
5. Flash and fire point test  
6. Stripping value test  
7. Viscosity using Viscometer

TESTS ON ROAD AGGREGATES  
8. Aggregate crushing value test  
9. Impact value test  
10. Specific gravity test  
11. Shape tests - Flakiness index and elongation index  
12. Los angles abrasion test  
13. Bulk density, specific gravity, void ratio and porosity of coarse aggregate, water absorbtion.

TESTS ON MIXES  
14. Marshell stability value  
15. Determination of bitumen content by bitumen extractor.

References

CE 010 709 Seminar

Teaching scheme

2 hours practical per week

The seminar power point presentation shall be fundamentals oriented and advanced topics in the appropriate branch of engineering with references of minimum seven latest international journal papers having high impact factor.

Each presentation is to be planned for duration of 25 minutes including a question answer session of five to ten minutes.

The student’s internal marks for seminar will be out of 50. The marks will be awarded based on the presentation of the seminar by the students before an evaluation committee consists of a minimum of 4 faculty members. Apportioning of the marks towards various aspects of seminar (extent of literature survey, presentation skill, communication skill, etc.) may be decided by the seminar evaluation committee.

A bona fide report on seminar shall be submitted at the end of the semester. This report shall include, in addition to the presentation materials, all relevant supplementary materials along with detailed answers to all the questions asked/clarifications sought during presentation. All references must be given toward the end of the report. The seminar report should also be submitted for the viva-voce examination at the end of eighth semester.

For Seminar, the minimum for a pass shall be 50% of the total marks assigned to the seminar.
Project work, in general, means design and development of a system with clearly specified objectives. The project is intended to be a challenge to intellectual and innovative abilities and to give students the opportunity to synthesize and apply the knowledge and analytical skills learned in the different disciplines.

The project shall be a prototype; backed by analysis and simulation etc. No project can be deemed to be complete without having an assessment of the extent to which the objectives are met. This is to be done through proper test and evaluation, in the case of developmental work, or through proper reviews in the case of experimental investigations.

- The project work has to be started in the seventh semester and to be continued on to eighth semester.
- Project work is to be done by student groups. Maximum of four students only are permitted in any one group.
- Projects are expected to be proposed by the students. They may also be proposed by faculty member (Guide) or jointly by student and faculty member.
- Students are expected to finalise project themes/titles with the assistance of an identified faculty member as project guide during the first week of the seventh semester.

The progress from concept to final implementation and testing, through problem definition and the selection of alternative solutions is monitored. Students build self confidence, demonstrate independence, and develop professionalism by successfully completing the project.

Each student shall maintain a project work book. At the beginning of the project, students are required to submit a project plan in the project book. The plan should not exceed 600 words but should cover the following matters.

- Relevance of the project proposed
- Literature survey
- Objectives
- Statement of how the objectives are to be tackled
Time schedule

Cost estimate

These proposals are to be screened by the evaluation committee (EC- minimum of 3 faculty members including the guide) constituted by the head of department, which will include a Chairman and the EC will evaluates the suitability and feasibility of the project proposal. The EC can accept, accept with modification, request a resubmission, or reject a project proposal.

Every activity done as part of project work is to be recorded in the project book, as and when it is done. Project guide shall go through these records periodically, and give suggestions/comments in writing in the same book.

The students have to submit an interim report, along with project work book showing details of the work carried out by him/her and a power point presentation at the end of the 7th semester to EC. The EC can accept, accept with modification, request a resubmission, or extension of the project.

The student’s internal marks for project will be out of 50, in which 30 marks will be based on day to day performance assessed by the guide. Balance 20 marks will be awarded based on the presentation of the project by the students before an evaluation committee consists of a minimum of 3 faculty members including the guide.

For Project, the minimum for a pass shall be 50% of the total marks assigned to the Project work.