DEPARTMENT OF CIVIL ENGINEERING

Scheme of Instruction

And

Syllabi

M.E. (CIVIL)

(Full Time)

Specialization in

INFRASTRUCTURE ENGINEERING

(With effect from 2017-2018)

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 015

INSTITUTE

Vision

The Vision of the institute is to generate and disseminate knowledge through harmonious blending of science, engineering and technology. To serve the society by developing a modern technology in students' heightened intellectual, cultural, ethical and humane sensitivities, fostering a scientific temper and promoting professional and technological expertise.

Mission

- To achieve excellence in Teaching and Research
- To generate , disseminate and preserve knowledge
- To enable empowerment through knowledge and information
- Advancement of knowledge in Engineering, Science and Technology
- Promote learning in free thinking and innovative environment
- Cultivate skills, attitudes to promote knowledge creation
- Rendering socially relevant technical services to the community
- To impart new skills of technology development
- To inculcate entrepreneurial talents and technology appreciation programmes
- Technology transfer and incubation

DEPARTMENT

Vision

To be as a leading academic department on pace with global standards and contribute to the development of economic, technically viable and useful to societal problems and challenges of civil engineering profession and also contribute to the regional and country's developmental activities.

Mission

- To train the human resources with knowledge base in the field of Civil Engineering so that they can face the challenges of civil and infrastructural engineering problems to provide viable solutions.
- To integrate their understanding and attainable knowledge on the specializations for effective functioning in their profession and useful to the welfare and safety of mankind.
- To enhance the technical knowledge and research aptitude in the domains of various Civil Engineering specializations to serve the society in highly professional manner.
- Produce highly competent and capable professionals and motivated young academicians to provide solutions to real life problems of Engineering and Technology and has apt for continuous learning and dedication towards societal issues.

Infrastructure Engineering

Programme Educational Objectives (PEO):

1. Impart and enrich knowledge in the fields of Structural and Transportation Engineering
2. Capable of integrating their knowledge of multidisciplinary subjects to analyze Infrastructure problems
3. Apply management and economic theories to formulate strategies to enable organizations to achieve goals in Infrastructure Engineering
4. contribute as team members adding value through innovation, customer focus, and professional responsibility with the

objectives of the Infrastructure projects in which they are involved and the organizations they support

Programme Outcomes (PO):

1. Capable of applying multidisciplinary subject knowledge in real time projects.
2. Familiar with the management techniques for application to Infra structure problems.
3. Analyse various Infrastructure projects using structural design and transportation Engineering knowledge.
4. Demonstrate knowledge and understanding of the Infrastructure Engineering and management principles and apply these to different type of projects, as a member and leader in a team, to manage projects and in multidisciplinary environments.

MAPPING OF PEO'S WITH PO'S

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES			
	PO-1	PO-2	PO-3	PO-4
PEO-1	YES	--	YES	YES
PEO-2	YES	--	YES	YES
PEO-3	--	YES	--	YES
PEO-4	YES	YES	YES	YES

Scheme & Syllabus for
M.E. (Civil Engineering) with
Specialization in Infrastructure Engineering
(With effect from the academic year 2017-2018)

Sl. No	Ref. No.	Subjects	Periods per week		Duration in Hrs.	Max. Marks		Credi-ts
			L/T	D/P		Univ. Exam	Sessio -nals	
CORE SUBJECTS								
1.	CE1501	Infrastructure Development	3	-	3	70	30	3
2.	CE1502	Structural Design Aspects in Infra structure Engineering	3	-	3	70	30	3
3.	CE1503	Geo techniques in Infrastructure Engineering	3	-	3	70	30	3
4.	CE1504	Urban Transportation in Infrastructure Planning	3	-	3	70	30	3
5.	CE1505	Infrastructure Management	3	-	3	70	30	3
6.	CE1506	Water Resources Applications in Infrastructure Engineering	3	-	3	70	30	3
ELECTIVE SUBJECTS								
7	CE1507	Earthquake Engineering	3	-	3	70	30	3
8	CE1508	Prefabrication Engineering	3	-	3	70	30	3
9	CE1509	Computer Aided Analysis and Design of Structures	3	-	3	70	30	3
10	CE1510	Project Performance Management	3	-	3	70	30	3
11	CE 1115	Pre-stressed Concrete	3	-	3	70	30	3
12	CE 1116	Advanced Concrete Technology	3	-	3	70	30	3
13	CE 1118	Bridge Engineering	3	-	3	70	30	3
14	CE 1121	Retrofitting and Rehabilitation of Structures	3	-	3	70	30	3
15	CE1125	Disaster Management	3	-	3	70	30	3

Sl. No	Ref. No.	Subjects	Periods per week		Duration in Hrs.	Max. Marks		Credi-ts
			L/T	D/P		Univ. Exam	Sessio -nals	
16	CE1206	Water Resources Systems	3	-	3	70	30	3
17	CE1212	Environmental Impact Assessment	3	-	3	70	30	3
18	CE 1216	Hydraulic Structures	3	-	3	70	30	3
19	CE 1316	Geospatial Technology	3	-	3	70	30	3
20	CE 1511	Advanced Foundation Engineering	3	-	3	70	30	3
21	CE 1312	Ground Improvement Techniques	3	-	3	70	30	3
22	CE 1401	Traffic Engineering	3	-	3	70	30	3
23	CE 1405	Pavement Systems Engineering	3	-	3	70	30	3
24	CE 0111	Engineering Research Methodology	3	-	3	70	30	3
25	CE 1404	Statistical Techniques	3	-	3	70	30	3
DEPARTMENTAL REQUIREMENT								
27	CE1531	Infrastructure Engineering Laboratory - I	-	3	-	-	50	2
28	CE1532	Infrastructure Engineering Laboratory -II	-	3	-	-	50	2
29	CE1533	Seminar - I	-	3	-	-	50	2
30	CE1534	Seminar - II	-	3	-	-	50	2
31	CE1535	Project Seminar #	-	4	-	-	100	8
32	CE1536	Dissertation*	-	6	-	-	200	16

\# Minimum of two seminars presentations to be given before final viva is required.

A comprehensive viva required at the end of the third semester.

* Marks 200

Note: M.E. dissertation synopsis requires to be approved within four weeks of registration.

CE 1501 *w.e.f. 2017-2018*

INFRASTRUCTRE DEVELOPMENT

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- To examine the power sector infrastructure requirements including maintenance issues.
- To review various infrastructures needs of roads, railways, water ways and airports in the country.
- To discuss various communication systems and postal services infrastructure requirements.
- To consider the possibilities for housing and construction demand as per the country needs and scope of privatisation.

Outcomes:

- To explain professional issues related to power sector infrastructure needs and maintenance strategies.
- To describe and evaluate roads, railways, waterways and airways infrastructure in any country
- To distinguish different types of communications systems and postal services in the context of infrastructure.
- To demonstrate importance of housing sector and privatization in the present day context.

UNIT - I

Introduction - Infrastructure management, concepts, definitions, importance of infrastructure, management in infrastructure, role of civil engineers, concept of management, need for management in infrastructure projects.

Power Sector - Generation, types of generation, infrastructure requirements for power generation, hydroelectric, thermal and nuclear energy, non-conventional energy, critical infrastructure requirements for the projects, maintenance issue in power generation, transmission, technology involved, tower foundations, distribution, transmission cables and poles, distribution

boxes, demand scenario in India, issues of importance, infrastructure shortcomings, Government policies on electric power, case studies in power industry.

UNIT - II

Transport (People and Cargo)

Roads - Existing infrastructure in India, importance of the economy, National Highway Development Program (NHDP), road planning and construction, bridges, Government policies on road construction.

Rail - Overview of situation in India, elements of railway infrastructure, platform, rails, communication, infrastructure maintenance issues, Government policies.

Water Transport - Shipping industry overview, ship building infrastructure needs, basic components of port and harbor; infrastructure needs, machinery needs, and Government policies.

Air Transport - Overview, types of air cargo transport, basic components of an airport, infrastructure requirements, runway, airport security, communication towers, aircraft building, and issues of importance, Government policies, and cases in transportation industry.

UNIT - III

Communication - Telecommunication, overview of industry, wired and wireless services, infrastructure requirements, exchanges, wires, towers, junction boxes, software needs, Government regulations, issues in telecommunication.

Postal Services: Extent of networks in India, other services provided, need for other infrastructure facilities, appraisal of postal infrastructure, cases in communication industry.

UNIT - IV

Housing and Commercial Construction - Commercial construction need, overview in India, infrastructure essentials, planning, special parks, domestic construction, overview of Indian scene, town planning and development, Government policies, regulations and schemes.

Privatisation - Need for privatisation, scheme for privatisation, Need of Public Private Participation (PPP), Built Operate Transfer (BOT), Build Own Operate Transfer (BOOT), Build Transfer Lease Operate (BTLO), Develop Build Operate (DBO), application of each type of scheme in

specific projects, Incentives to the private participants and challenges of PPP mode of projects implementation.

UNIT - V

Financing and Pricing - Project cost estimation, feasibility analysis, social cost benefit analysis, sources of finance, evaluation of various sources of financial institutions, types of sourcing used for each type of infrastructure project, pricing issues in infrastructure investment recovery, Government regulations in infrastructure pricing and identification of sources of pricing of individual sector.

Infrastructure Appraisal - Type of Engineering Surveys: A case study, issues in grading roads, communication, waterways, bridges, energy and construction, cases in infrastructure appraisal.

Suggested Reading:

1. L. N. Dash, Infrastructure Development and the Indian Economy, Regal Publications, 2008.
2. Rajarshi Majumder **,** Infrastructure and development in India**,** Inter linkages and Policy Issues, Rawath Publications.
3. The Contributions of Infrastructure to Economic Development: A Review of Experience and Policy, World Bank Publications, 01-Jan-1993.
4. Manorama Year Books & Panorama Year Books
5. UPSC-Handbook for General studies.
6. Economic Survey by Government of India, 1999-2000, New Delhi.
7. Infrastructure, CMIE, Bulletins, Mumbai.
8. Planning Commission website.: http://planningcommission.gov.in/

CE 1502 *w.e.f. 2017-2018*

STRUCTURAL DESIGN ASPECTS IN INFRASTRUCTURE ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Course Objectives:

- To understand the design of curved beams, deep beams and flat slabs.
- To know the design procedures and solutions of continuous, portal frames and multi storied building frames.
- To understand design of domes, bunkers and silos.
- To know the design principles of grillage foundations and plastic design of steel structures.
- To understand composite construction design techniques and design of plumbing services

Course Out comes:

- To be able to design the structures such as curved beams deep beams and flat slabs
- To be able understand basic design steps and procedures for portal frames and multistoried residential buildings
- To be able to know design concepts of domes, bunkers and silos.
- To be able to design grillage foundations and plastic designs with latest design procedures.
- To be able to design composite structures and their advanced techniques.

UNIT – I

Infrastructural Designs **-** Introduction, Materials, methodologies Urban and rural infrastructure, cost effective materials, sustainable design technologies.

Beams Curved in Plan - Introduction, need for curve beams, design principles, structural design of beams curved in plan of circular and rectangular type.

Deep Beams - Introduction, flexural and shear stresses in deep beams, IS Code provisions, design of deep beams.

Flat Slabs - Introduction, components parts of infrastructure materials, IS code recommendations, design methods, design for flexure and shear, openings in flat slabs, moments in columns.

UNIT – II

Continuous Beams - Design of continuous reinforced concrete beams.

Reinforced Concrete Portal Frames - Introduction, analysis and design of rectangular portal frames for vertical loading, design of hinges.

Multi-stroreyed Building Frames - Design for vertical loads using substitute frame method and design for lateral loads.

UNIT - III

Domes - Introduction, stresses and forces in domes, design of spherical and conical domes.

Bunkers and Silos - Introduction, design principles and theories, IS Code provisions, design of square and circular bunkers, design of cylindrical silos.

UNIT - IV

Grillage Foundations - Introduction, necessity of grillage foundations, various types, grillage foundations for single and double columns.

Plastic Design of Steel Structures - Introduction materials, Plastic analysis and design of indeterminate beams and portal frames of up to single bay two storey's and two bay single storey, minimum weight design.

UNIT - V

Composite Construction - Introduction, infrastructure materials, design principles, shear connectors and their types, IS codal provisions, design of slab-beam type composite construction systems.

Design aspects of plumbing's - Introduction**,** Types of pipes**,** Design of pipes, drainages, and culverts, Manufacturing and infrastructure management.

Suggested Reading:

1. B. C. Punmia, R.C.C. Design, Laxmi Publications, 1998.
2. H. J. Shah, Reinforced Concrete, Vol. II, Charotar Publications, 2000.
3. S. Ramamrutham, Steel Structures, Dhanpat Rai Publications, 2001.
4. S. A. Raj, Design of Steel Structures, New Age Publications, 2002.
5. B. C. Punmia, Design of Steel Structures, Laxmi Publications, 2001.
6. P. Dayaratnam, Design of Steel Structures, Orient Longman Publications, 1987.

CE 1503 *w.e.f. 2017-2018*

GEOTECHNICS IN INFRASTRUCTURE ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Course Objectives:

- To provide insight in to the characterization of soils and greater understanding about the engineering behavior of soils
- To understand essentials of foundation engineering
- To learn the analysis, design and construction of Earth Retaining systems
- To understand the aspects of earth quake geotechnical engineering

Course Outcomes:

- Ability to identify different types of soils and to predict their engineering behavior
- Competence to select suitable type of foundation system ideal for any given site conditions
- Ability to apply the knowledge of Retaining systems in selection of a suitable type and its construction
- Competence to understand the geotechnical challenges in Infrastructure Engineering project and to provide ideal solutions.

UNIT - I

Characterization of Soils **-** Index properties of the soil – classification of the soil as per IS: 1498-1970- field identification

UNIT - II

Seepage, Strength and Compressibility Characteristics **-** Flow through soil media – Capillarity – Construction and application of Flow nets Consolidation phenomena – Estimation of consolidation settlement, Compaction mechanism – Factors affecting compaction – Field compaction & quality control.

UNIT - III

Foundation Systems - Geotechnical Investigations - Types of foundations and their suitability - General requirements of Design of foundations- Estimation of Bearing capacity – Settlement analysis of foundations – Foundations on Expansive Soils.

UNIT - IV

Earth Retaining Systems & Reinforced Earth - Computation of Earth pressure – Types and suitability of Earth retaining structures, Concept of reinforced earth – Fiber reinforced earth - Applications of Geo-synthetics.

UNIT - V

Earthquake Geo-Technical Engineering Systems - Aspects of earth quake – Liquefaction phenomena – Remediation of Liquefaction - Case histories – Provisions for Earth quake resistant design of structures.

Suggested Reading:

1. Whitman and Lambe, Soil Mechanics.
2. Venkataramaiah, Geotechnical Engineering.
3. Joseph Bowls, Foundation Analysis and Design, Fifth edition, McGraw-Hills.
4. Coduto, Geotechnical Engineering.

CE 1504 *w.e.f. 2017-2018*

URBAN TRANSPORTATION INFRASTRUCTURE PLANNING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- To discuss various urban transportation systems planning process
- To understand a variety of travel surveys and data collection procedures
- To review different travel demand forecasting models
- To examine urban land use models and urban goods transportation models

Outcomes:

- To describe and evaluate various urban transportation issues and planning methodologies
- To identify the appropriate data collection methods and its procedures
- To demonstrate effective way of understanding trip distribution and mode split models
- To explain various issues related to trip assignment and land use transportation models

UNIT - I

Urban Transportation Systems - Urban Transportation system definition, urban issues, evolution of planning process, demand and supply, challenges, limitation, measure of effectiveness, measure of collectiveness, traffic problem elements, planning and management, models, various planning methodologies.Long term planning process and short term planning process, inputs for preparation of Master plan to provide urban infrastructure.

UNIT - II

Travel Surveys and data collection - Importance of surveys, design of survey format, sampling techniques, organization of surveys and analysis, study area definition, formulation of zoning system, types and sources of data, road side interview method, home interview survey, in-vehicle surveys, sampling, types, various techniques, expansion factors, logical checks, use of

secondary sources of data, planning variables including socio-economic data, vehicles ownership, projection of data and statistical techniques for filtration and validation of data.

UNIT - III

Travel Demand Forecasting - Various trends, overall planning process, travel attributes, traffic analysis zones, trip generation-trip production and attraction, linear regression analysis and category analysis.

UNIT - V

Trip Distribution and Model Split Analysis - Growth factor models, synthetic pattern models, gravity model, competing opportunity model, intervening opportunity model, linear programming model and abstract mode model, time series models, aggregate and disaggregate models. Mode choice models, Toronto transit model, service ratio model, probabilistic models, discriminate analysis, probit analysis and logit analysis, and probabilistic approaches.

UNIT - V

Traffic Assignment and Land Use - Nodes, links, transport network, coding, route characteristics, network skims, various methods, diversion curves, network assignment, all or nothing assignment, capacity restraint techniques, multi-path assignment technique. Introduction to urban goods transport and land use transportation models.

Suggested Reading:

1. Hutchinson, B.G., Principles of Urban Transport Systems Planning, McGraw Hill, New York, 1974.
2. Ortuzar, J. and Willumsen, L.G., Modelling Transport, Wiley, Chinchestor, 1994.
3. Oppenheim, N., Urban Travel Demand Modeling: From Individual Choices to General Equilibrium, Wiley, New York, 1995.
4. Thomas, R., Traffic Assignment Techniques, Avebury Technical, Aldershot, 1991.
5. Taniguchi, E., Thompson, R.G., Yamada, T. and Van Duin, R., City Logistics - Network Modelling and Intelligent Transport Systems, Elsevier, Pergamon, Oxford, 2001.
6. Bruton, M.J., Introduction to Transportation Planning, Hutchinson, London, 1985.
7. Dickey, J.W., Metropolitan Transportation Planning, Tata McGraw Hill, New Delhi, 1975.

CE 1505 *w.e.f. 2017-2018*

INFRASTRUCTURE MANAGEMENT

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Course Objectives

- Understand various functions and principles of management with respect to infrastructure development
- Know the infrastructure development issues, policies, programmes at rural, urban and national level.
- To study and understand the concept of planning, scheduling, cost and quality control for construction project.

Course outcomes

- Understand the principles of project management, resource management and inventory.
- Able to apply the concepts of performance management system in infrastructure projects.
- Prepare work break down plan and estimate resources requirements
- Plan and develop management solutions to construction projects.
- Know the development of construction planning, scheduling procedure and controls.
- Solve problems of resource allocation and levelling using network diagrams.

UNIT – I

Meaning and scope of Infrastructure Management, functions, components, stages and principles of management in relation to infrastructure development, infrastructure development issues at national, regional and human settlement (Urban & Rural) levels, process of decision making for infrastructure development at national level, infrastructure Development in India, policies, programs and provisions in the National Five Year Plans,

Recommendations of various committees, task forces and commissions from time to time.

UNIT - II

Historical background and introduction to infrastructure project planning, basic concepts in the development of infrastructure plans, bar charts, development and limitations of bar charts, milestone charts, and work breakdown structure.

UNIT - III

Basic tools and techniques of infrastructure management, role of network in infrastructure management, Events and activities, numbering of network ,time estimates, float, slack, probability of completion time, application of PERT/CPM to construction industry problems, and infrastructure related problems.

UNIT – IV

Cost Analysis - Direct cost, indirect costs, and slope of the project activities, optimization of cost and schedule through network contraction, applications in construction industry and infrastructure projects.

Cost Control - Cost control in construction projects, importance of cost control and its objectives, resource analysis, smoothing and leveling of various construction projects including infrastructure projects.

UNIT – V

Repetitive project modeling technique, LOB technique, and mass haul diagrams

Precedence Network - Advantages of precedence network, logic of precedence network diagram, and computer applications on network problems related to construction industry including infrastructure projects.

Suggested Reading:

1. "Infrastructure Planning Handbook: Planning, Engineering, and Economics Hardcover" Alvin S. Goodman, Makarand Hastak.
2. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
3. Srinath,L.S., "Pert and CPM Priniples and Applications ", Affiliated East West Press, 2001

4. Moder. J.J., Phillips.C.R., and Davis .E.W., (1986), Project Management with CPM and PERT and Precedence Diagramming, C.B.S. Publishers, New Delhi.
5. Pilcher .P, (1992), Project Cost Control in Construction, Collins, London.
6. Brien. J.J, (1971), CPM in Construction Management, McGraw-Hill Book Co. Inc., New York.

CE 1506 *w.e.f. 2017-2018*

WATER RESOURCES APPLICATIONS IN INFRASTRUCTURAL ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Exposure to the principles involved in the design of pipe networks
- Description of Flood mitigation, adjustment, and regulation
- Knowledge of various aspects of recharge of groundwater

Outcomes:

- Application of different methods for the design of pipe networks
- Ability to analyze the importance of flood mitigation measures
- Comprehend the various parameters of groundwater and hydropower

UNIT – I

Water Supply: Pipe networks (Hardy Cross Method, and Newton Raphson Method), Joining and laying of pipes and pipe specials (Cast Iron, Ductile Iron, Pre stressed Concrete, and HDPE), Non conventional water treatment systems.

UNIT - II

Flood mitigation: Flood mitigation reservoirs (purpose, location, size and operation) levees and flood walls (location, maintenance and flood fighting), flood ways, channel improvement, evacuation and flood proofing, land management, flood plain management, estimating benefits of flood mitigation.

UNIT - III

Groundwater Development: Classification of wells, infiltration galleries, radial collector wells, filter basins, siphon wells, factors affecting the safe yield, and artificial recharge methods.

UNIT - IV

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks

UNIT – V

Hydro Power: Study of stream flow data for power estimation - pondage and storage, design aspects of surge tanks, and anchor blocks, selection of pumps and turbines, gates and their operations.

Suggested Reading:

1. Ven Te Chow, (1964), Hand Book of Applied Hydrology, McGraw-Hill Book Company, New York.
2. Bhave, P.R., Gupta, R. (2006), 'Analysis of flow in water distribution networks', Narosa Publishing House, New Delhi.
3. Murthy, J.V.S (19198), 'Watershed Management', Prentice – Hall of India, New Delhi.
4. Todd. D.K., (1980), Groundwater Hydrology, John Wiley and Sons, New York.
5. Karanth. K.R, (1987), Groundwater Assessment, Development and Management', Tata McGraw-Hill Publishing Company, New Delhi.
6. Creager. W.P., and Justin. J.D., (1959), Hydroelectric Hand Book, John Wiley and Sons Inc., New York.

CE 1511 *w.e.f. 2017-2018*

EARTHQUAKE ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Description of causes and effects of earthquakes
- Analyse structures due to earthquake using various methods
- Knowledge in dynamic properties of soil

Outcomes:

- Ability to analyse structures subjected to earthquake using various methods
- Learn how to compute earthquake hazard and design response spectra
- Analyse dynamic properties f soil

UNIT - I

Earthquakes - Causes, Magnitude and Intensity, Ground Motions, Site effects, Sensors.

UNIT - II

Response Spectrum - Construction, Characteristics, Design Response spectrum; Linear Earthquake analysis: Idealization of structures, Response spectrum analysis, torsionally coupled systems, Frequency domain analysis, and Time domain analysis.

UNIT - III

Nonlinear Earthquake Analysis - Force-deformation relationships, Equation of motion, Controlling parameters, Ductility demand, Allowable ductility.

UNIT - IV

Earthquake Resistance Design - philosophy, ductility based design, Detailing provisions, Codal Provisions, Concepts of passive controls.

UNIT – V

Geotechnical Aspects - Dynamic properties of soil, dynamic earth pressures, Liquefaction and ground improvement techniques; Retrofitting and strengthening of Buildings and Bridges.

Suggested Reading:

1. Clough.R.W. and Penzien. J., (1993), Dynamics of structures, second edition, McGraw Hill International edition.
2. Paz.M., (1987), Dynamics of structures, CBS Publications.
3. Chopra. A.K., (1997), Dynamics of structures- Theory and application to earthquake engineering, PHI.
4. Pauley.T and Priestly. M.S.N.,(1992), Seismic design of reinforced concrete and masonry buildings, John Wiley and Sons.
5. Priestly. M.N.S, Seible. F and Calvi. G.M, (1996), Seismic design and retrofit of bridges, John Wiley and Sons.
6. Dowrick. D.J, (1987), Earthquake resistant design: For engineers and architects, John Wiley and Sons.
7. Agarwal .P and Shirkhande .M., (2006), Earthquake resistant design of structures, PHI.

CE 1512 *w.e.f. 2017-2018*

PREFABRICATION ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Differentiate between different types of prefabrication
- Study various types of prefabricated elements

Outcomes:

- Application of production and hoisting technology in prefabricated construction.

UNIT - I

General Principles of Prefabrication - Comparison with monolithic construction, types of prefabrication, site and plant prefabrication, economy of prefabrication, modular coordination, standardization.

UNIT - II

Prefabricated Load Carrying Members - Planning for components of prefabricated structures, disuniting of structures, design of simple rectangular beams and I-beams, handling and erection stresses, elimination of erection stresses, beams, columns, symmetric frames.

UNIT - III

Prefabricated Elements - Roof and floor panels, ribbed floor panels, wall panels, footings

Joints - Joints for different structural connections, effective sealing of joints for water proofing, provisions for non-structural fastenings, expansion joints in precast construction.

UNIT - IV

Production Technology - Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup,

storage of precast elements, dimensional tolerances, acceleration of concrete hardening.

Hoisting Technology - Equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads.

UNIT - V

Applications - Designing and detailing of precast unit for factory structures, purlins, principal rafters, roof trusses, lattice girders, gable frames, singe span single storeyed simple frames, single storeyed buildings, slabs, beams and columns.

Suggested Reading:

1. Mokk. L, (1964), Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest.
2. Proceedings of the Advanced Course on Design and Construction of Prefabricated Residential Buildings, (1974), Organized by SERC, Madras.
3. Glover.C.W., (1965), Structural Precast Concrete, Asia Publishing House, India.
4. Koncz. I.T., (1968), Manual of Precast Concrete Construction, Vol. I, II, III & IV, Berlin.
5. Lewicki. B., (1966), Building with Large Prefabricates, Elsevier Publishing Co., London.
6. Structural Design Manual – (1978), Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete, Netherland Betor Verlag.
7. Murashev.V, Sigalov. E, and Bailov. V, (1968), Design of Reinforced Concrete Structures, Mir Publishers.
8. CBRI, (1990), Building Materials and Components, India.
9. Gerostiza. C.Z., Hendrickson. C, and Rehat. D. R, (1989), Knowledge Based Process Planning for Construction and Manufacturing, Academic Press, Inc.
10. Warszawski. A, (1990), Industrialization and Robotics in Building – A Management Approach, Harper & Row.

CE 1513 *w.e.f. 2017-2018*

COMPUTER AIDED ANALYSIS AND DESIGN OF STRUCTURES

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Learn different commands in C programming
- Analyse various civil engineering problems using C programming

Outcomes:

- Study representation of structural problems in computer graphics

UNIT - I

Introduction - Computer systems, computer specifications, peripherals, computer language and developments, concepts of programming, flow charts, algorithms and debugging.

C-Language - C-character set, identifiers and keywords, data types, constants, variables, arrays, declarations, expressions, statement and symbolic constants, data input and output, arithmetic, binary and relational operators, expressions, assignment and conditional operators, library functions, control statements and functions.

UNIT - II

File Management - File Management, pointers and their applications, structures and pointers, arrays and strings, processing of arrays.

Object Oriented Programming - Introduction to object oriented programming, basic concepts of object oriented programming and its advantages.

UNIT - III

Computer Graphics - Introduction, devices and world co-ordinates, transformation principles, windowing and clipping, display devices, graphic input devices, graphic output devices, graphical input techniques, realism in graphics, geometric modeling, drafting and computer graphics in CAD.

UNIT - IV

Computer Aided Analysis - Preparing and running complete programs in C for civil engineering problems such as analysis of beams, trusses and determinate frames, design of pipes, pavements and footings, slope stability analysis, and construction engineering problems, introduction to graphic primitives.

UNIT - V

Computer Aided Design - Computer aided design of civil engineering problems such as plane frame and space frames and construction engineering and management problems, introduction to software packages such as NISA and STAAD Pro.

Suggested Reading:

1. Krishnamoorthy. C. S. and Rajeev. S, (1993), Computer Aided Design, Narosa Publications.
2. Boyd C. Panbou, (1997), Computer Applications in Construction, Tata McGraw-Hill.

CE 1514 *w.e.f. 2017-2018*

PROJECT PERFORMANCE MANAGEMENT

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Course Objectives

- Understand the importance and concepts of performance management system.
- Able to measure the performance in any infrastructure projects
- To know the various factors affecting construction productivity and its improvement.

Course outcomes

- Able to apply the concepts of performance management system in infrastructure projects.
- Able to know the various factors affecting the construction productivity and measures taken to improve it.
- Able to measure the construction productivity by different methods

UNIT - I

Performance Management System - Introduction, concept, purpose, significance, characteristics, process of Performance Management & Compensation (PMS), developing a performance management system, emerging trends in PMS, application of management system.

Performance Measurement - Life cycle of a performance management system, Balanced scorecard, Key performance indicators.

UNIT - II

Strategic Management - The nature and value of Strategic Management, Strategic Management Process, Identifications of vision, mission, strategy, goals and objectives.

Levels and types of strategies, strategy formulation and translation,Strategic budgeting system.
The External Environment - Remote Environment, Industry Environment, Industry Analysis and Competitive Analysis, Operating Environment.
Global Environment - Why firm globalize, Global strategic planning, Competitive strategies in foreign markets.

UNIT - III
Productivity in Construction - Introduction to construction productivity analysis, definition of productivity, characteristics of the construction industry,
Factors Affecting Construction Productivity - On-Site Factors – job conditions, preplanning, management conditions, human factors, equipment utilization, material handling and site organization, work environment (temperature, humidity or wind) etc

UNIT - IV
Construction Productivity Improvement - Design state: value engineering, constructability study, selection of designers, contractor, and construction management firm etc.
Construction stage - data gathering for on-site productivity improvement, working condition improvement, site-organization improvement, preplanning for on-site productivity improvement, worker motivation, on-site communication, material and equipment management etc.
Operating modeling - use of operating modeling for productivity improvement such as CPM planning and scheduling, line of balance models, crew balance charts, etc .

UNIT - V
Construction Productivity Measurement: Direct productivity measurement: production units/ input units, Indirect productivity measurement: work sampling five-minute rating, time-motion study, etc.

Suggested Reading:

1. Performance Management: Prem Chadha, Publication –Macmillan Reference Books: 1. Human Resource Management: Snell &Bohlander, Publication – Thomson
2. Compensation: Milkovich& Neman, Publication – McGraw –Hill

3. Human Resource Management: Gary Dessler Publication – Thomson 4. Managing Human Resources: Monappa, Publication – Macmillan
4. Adrian, J. J., (1987), Construction Productivity Improvement, New York: Elsevier.
5. Oglesby, C., Parker, H. and Howell, G., (1989), Productivity Improvement in Construction, New York: McGraw-Hill.

CE 1116 *w.e.f. 2017-2018*

ADVANCED CONCRETE TECHNOLOGY

No. of Credits	**: 3 Credits**
Instruction	**: 3 Periods per week**
Duration of University Examination	**: 3 Hours**
Semester End Evaluation	**: 70 Marks**
Continuous Internal Evaluation	**: 30 Marks**

Course Objectives:

- Learn the characterization of constituents of concrete.
- Design concrete mix by various methods as per different codes.
- Study the different types of admixtures, mix design, properties and applications of special concretes.

Course Outcomes:

- Learn hydration of cement and tests on properties of cement and aggregates.
- Comprehend the properties and testing of concrete in fresh and hardened state.
- Understand the shrinkage and creep mechanisms, curing and durability of concrete.
- Design concrete mixes by various methods.
- Familiarize with the types of admixtures, and applications of special concretes.

UNIT - I

Cement: Types of cement and their composition - Manufacture of Portland cement - Hydration of cement and hydration product - Structure of hydrated cement - Heat of hydration - Gel theories - Review of tests on properties of cement.

Aggregate: Classification of aggregates - Particle shape and texture - Bond and strength of aggregate and its influence on strength of concrete - Porosity - Absorption and moisture content and their influence - Soundness of aggregate - Alkali aggregate reaction - Sieve analysis and grading of aggregate - Review of tests on properties of aggregate.

UNIT - II

Properties of Concrete: Mixing and batching - Workability - Factors affecting workability - Measurements of workability - Various tests and procedures - Segregation and bleeding - Vibration of concrete - Types of vibrators and their influence on composition - Analysis of fresh concrete - Strength of concrete - Water-cement ratio - Gel space ratio - Effective water in the mix - Mechanical properties of concrete - Tests and procedure - Influence of various parameters on strength of concrete - Relationship between various mechanical strengths of concrete.

UNIT - III

Shrinkage and creep of concrete: Types of shrinkage - Mechanism of shrinkage - Fctors affecting shrinkage - Creep mechanism - Factors influencing creep - Rheological model - Effects of creep.

Curing of Concrete: Methods of curing - Maturity concept - Influence of temperature on strength of concrete.

Durability of Concrete: Permeability of concrete - Chemical attack of concrete - Tests on sulphate resistance - Effect of frost - Concreting in cold weather - Hot weather concreting and air entrained concrete.

UNIT - IV

Mix design of concrete: Basic considerations - Process of mix design - Factors in the choice of mix proportions and their influence - Quality control - Various methods of mix design - IS code method - British and ACI methods.

UNIT - V

Admixtures: Classification of admixtures - Chemical and mineral admixtures - Influence of various admixtures on properties of concrete and their applications.

Fly ash concrete: Mix design - Properties and its applications.

High strength concrete: Mix design - Properties and its applications. Fiber reinforced concrete: Mix design - Properties and its applications.

Ferro cement - Lightweight concrete - High-density concrete - Recycled aggregate concrete and their applications.

Suggested Reading:

1. A.M. Neville, “Properties of Concrete”, English Language Book Society-Longman Publications, 1988.
2. P.K. Mehta and J.M.M. Paulo, “Concrete – Microstructure – Properties and Material”, McGraw-Hill, New York, 1997.
3. N. Krishna Raju, “Design of Concrete Mix”, CBS Publications, New Delhi, 1985.

CE 1118 *w.e.f. 2017-2018*

BRIDGE ENGINEERING

No. of Credits	**: 3 Credits**
Instruction	**: 3 Periods per week**
Duration of University Examination	**: 3 Hours**
Semester End Evaluation	**: 70 Marks**
Continuous Internal Evaluation	**: 30 Marks**

Course Objectives:

- Learn the hydraulic, geological and geo-technical aspects in bridge design.
- Analyse, design and detail the bridge deck and box girder systems, steel and composite bridges.
- Analyse and design the sub-structures, bridge bearings and various long span bridges.

Course Outcomes:

- Understand the fundamentals and codes of practice of bridge design.
- Design the bridge deck and box girder systems using appropriate method.
- Devise the steel truss and composite steel-concrete bridges.
- Propose the sub-structure components such as pier, abutments, etc. and bridge bearings.
- Design the various types of long span bridges, curved and skew bridges.

UNIT –I

Introduction: Types of bridges - Materials of construction - Codes of practice (Railway and Highway Bridges) - Aesthetics - Loading standards (IRC, RDSO, AASHTO) - Recent developments box girder bridges - Historical bridges (in India and overseas).

Planning and layout of bridges: Hydraulic design - Geological and geo-technical considerations - Design aids - Computer softwares- Expert systems.

UNIT – II

Concrete bridges: Bridge deck and approach slabs - Slab design methods - Design of bridge deck systems - Slab-beam systems (Guyon-Massonet and Hendry Jaeger methods) - Box girder systems - Analysis and design - Detailing of box girder systems.

UNIT – III

Steel and composite bridges: Introduction to composite bridges - Advantages and disadvantages - Orthotropic decks - Box girders - Composite steel-concrete bridges - Analysis and design - Truss bridges.

UNIT-IV

Sub-structure: Piers - Columns and towers - Analysis and design - Shallow and deep foundations - Caissons - Abutments and retaining walls.

Bridge appurtenances: Expansion joints - Design of joints - Types and functions of bearings - Design of elastomeric bearings - Railings - Drainage system - Lighting.

UNIT-V

Long span bridges: Design principles of continuous box girders - Curved and skew bridges - Cable stayed and suspension bridges - Seismic resistant design - Seismic isolation and damping devices.

Construction techniques: Cast in-situ - Prefabricated - Incremental launching - Free cantilever construction - Inspection - Maintenance and rehabilitation - Current design and construction practices.

Suggested Reading:

1. Wai-Fah Chen Lian Duan, "Bridge Engineering Handbook", CRC Press, USA, 2000.
2. R.M. Barker and J.A. Puckett, “Design of Highway Bridges”, John Wiley & Sons, New York, 1997.
3. P.P. Xanthakos, "Theory and Design of Bridges", John Wiley & Sons, New York, 1994.
4. D.J. Victor, “Essentials of Bridge Engineening,” Oxford & IBH Publishing, New Delhi, 2001.
5. N. Krishna Raju, “Design of Bridges,” Oxford & IBH Publishing, New Delhi, 1998.
6. T.R. Jagadeesh and M.A. Jayaram, “Design of Bridge Structures,” Prentice-Hall of India, New Delhi, 2006.

CE 1121 *w.e.f. 2017-2018*

RETROFITTING AND REHABILITATION OF STRUCTURES

No. of Credits	**: 3 Credits**
Instruction	**: 3 Periods per week**
Duration of University Examination	**: 3 Hours**
Semester End Evaluation	**: 70 Marks**
Continuous Internal Evaluation	**: 30 Marks**

Course Objectives:

- Learn the fundamentals of maintenance and repair strategies.
- Study the quality assurance, serviceability and durability of concrete.
- Know the various materials and techniques used for repair of structures.
- Educate the different repair, strengthening, rehabilitation and retrofitting techniques.
- Instruct the various health monitoring and demolition techniques.

Course Outcomes:

- Understand the fundamentals of maintenance and repair strategies.
- Diagnose for serviceability and durability aspects of concrete.
- Know the materials and techniques used for repair of structures.
- Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.
- Use an appropriate health monitoring and demolition techniques.

UNIT - I

Maintenance: Repair and rehabilitation - Facets of maintenance - Importance of maintenance various aspects of inspection - Assessment procedure for evaluating damaged structure - Causes of deterioration.

Repair Strategies: Causes of distress in concrete structures - Construction and design failures - Condition assessment and distress-diagnostic techniques - Assessment procedure for inspection and evaluating a damaged structure.

UNIT - II

Serviceability and durability of concrete: Quality assurance for concrete construction - Concrete properties – Strength - Permeability - Thermal

properties and cracking. – Effects due to climate - Temperature - Chemicals - Corrosion – Design and construction errors – Effects of cover thickness and cracking.

UNIT - III

Materials and techniques for repair: Special concretes and mortar - Concrete chemicals - Special elements for accelerated strength gain - Expansive cement - Polymer concrete - Sulphur infiltrated concrete - Ferro cement - Fibre reinforced concrete - Bacterial concrete - Rust eliminators and polymers coating for rebars during repair - Foamed concrete - Mortar and dry pack – Vacuum concrete - Gunite and shotcrete - Epoxy injection - Mortar repair for cracks - Shoring and underpinning - Methods of corrosion protection - Corrosion inhibitors - Corrosion resistant steels - Coating and cathodic protection.

UNIT - IV

Repair, rehabilitation and retrofitting techniques: Repairs to overcome low member strength - Deflection - Cracking - Chemical disruption - Weathering corrosion - Wear - Fire - Leakage and marine exposure - Repair of structure – Common types of repairs – Repair in concrete structures – Repairs in under water structures – Guniting – Shot create – Underpinning - Strengthening of structures – Strengthening methods – Retrofitting – Jacketing.

UNIT – V

Health monitoring and demolition techniques: Long term health monitoring techniques - Engineered demolition techniques for dilapidated structures - Use of sensors – Building instrumentation.

Suggested Reading:

1. Barry A. Richardson, “Defects and Deterioration in Buildings”, E & FN Spon Press, London, 1991.
2. J. H. Bungey, “Testing of Concrete in Structures”, Chapman and Hall, New York, 1989.
3. A.R. Santakumar, “Concrete Technology”, Oxford University Press, New Delhi, 2006.
4. B.L. Gupta and Amit Gupta, ‘Maintenance and Repair of Civil Structures”, Standard Publications, New Delhi, 2010.

5. Peter H. Emmons, “Concrete Repair and Maintenance Illustrated”, RS Means, John Wiley & Sons, New York, 1981.
6. W.H. Ransom, “Building Failures: Diagnosis and Avoidance”, E & FN Spon Press, London, 1992.
7. P.K. Mehta and P.J.M. Monteiro, “Concrete - Microstructure, Properties and Materials”, McGraw-Hill, New York, 2014.
8. N. Jackson and R.K, Dhir, “Civil Engineering Materials”, Basingstoke, Macmillan, London, 1988.

CE 1115 *w.e.f. 2017-2018*

PRE-STRESSED CONCRETE

No. of Credits	**: 3 Credits**
Instruction	**: 3 Periods per week**
Duration of University Examination	**: 3 Hours**
Semester End Evaluation	**: 70 Marks**
Continuous Internal Evaluation	**: 30 Marks**

Course Objectives:

- Learn the concept of pre-stressed concrete, methods and systems of pre-stressing, losses of pre-stress.
- Analyse and design the sections for flexure, torsion and shear using different methods.
- Learn the design of sections for bond and anchorage and deflections of pre-stressed concrete beams.
- Study the analysis and design of statically indeterminate beams.
- Understand the analysis and design of axial members and slabs and grid floors.

Course Outcomes:

- Familiarize with fundamentals of pre-stressed concrete, methods and systems of pre- stressing and losses of pre-stress.
- Analyse and design the sections for flexure, shear bond and anchorages.
- Estimate the deflections of pre-stressed concrete elements.
- Know the circular pre-stressing, analysis and design of statically indeterminate beams.
- Solve the problems pertaining to axial members, slabs and grid floors.

UNIT I

Introduction: Basic concepts - Materials - Permissible stress – Systems of prestressing – Losses in pre-stress.
Design: Analysis and design of PSC beams for flexure using elastic and limit state methods.

UNIT II

Deflections: Importance of deflections - Factors influencing deflections - Codal provisions - Short term and long term deflections.
Shear: Shear in principal stresses – Cracked and uncracked sections - Codal provisions – Design of shear reinforcement.
Torsion and bond: Torsion for cracked and uncracked sections - Codal provisions and design – Bond - Codal provisions expressions and design.

UNIT III

End blocks: Nature of stresses - Stress distribution – Magnel and Guyol's Methods - Codal provisions - Design.
Continuous beams: Advantageous of continuous members – Codal provisions – Design of two span and three span Continuous beams – Concordant cable profiles.

UNIT IV

Tension members: Introduction - Ties - Circular prestressing – Design of PSC pipes and tanks.
Compression members: Introduction – Design of PSC columns - Poles and piles.

UNIT V

Slabs: Introduction – Types – Circular, rectangular and flat slabs – Cracking and strength – Codal provisions – Design of PSC floor slabs - One way and two way slabs and simple flat slabs.
Grid floors: Introduction – Analysis and design of PSC grid floor systems.

Suggested Reading:

1. Arthur H. Nilson, "Design of Prestressed Concrete", John Wiley, New York, 1987.
2. N. Krishna Raju, "Prestressed Concrete", Tata McGraw-Hill, New Delhi, 2001.
3. G.S. Pandit and S.P. Gupta, "Prestressed Concrete", CBS Publications, New Delhi, 1995.

CE 1206 *w.e.f. 2017-2018*

WATER RESOURCES SYSTEMS

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Introduction to various steps in water resources systems approach.
- Economic decision making in water resources.
- Identification of decision variables for linear and dynamic programming models and solution procedures for simple problems.

Outcomes

- Ability to understand water resources systems concepts their stages and procedures.
- Application of Cash flow diagrams and solution to Water Resources problems based on economical aspects
- Ability to formulate WRE problems by L.P. and D.P models and solving simple problems.

UNIT – I

Introduction: Objectives of water resources development, plan formulation, planning models and solution procedures, basic steps involved in water resources systems approach, cash flow diagrams, annuties, discounting (Net Present Value, Internal Rate of Return, and Benefit Cost Ratio), and non-discounting techniques (urgency, payback, and average rate of return), cost comparison, determination of project benefits, economic and financial analysis of projects.

UNIT – II

Water Resources Planning: Concept of Water Resources Planning, Categories of Water Use, Stages and Flow Activities, Relationship among stages, Data Collection and Processing, Estimation of Future Water Demands for Irrigation, Municipal Use, Industrial and Hydropower, Planning for Operation.

UNIT – III

Optimization techniques: Linear programming (introduction, geometrical approach and interpretation, basic concepts of simplex method), Dynamic Programming (basic concepts, general approach to recursive optimization, formulation of multistate problems), application to water resources engineering problems.

UNIT – IV

Stochastic optimization: Introduction to stochastic linear and stochastic dynamic programming, two stage linear programming, linear programming with chance constraints.

Simulation: Basic concepts and application to water resources engineering problems.

UNIT – V

River basin planning models: Irrigation planning model, resource inputs of irrigation, crop diversification, costs of inputs, formulation of linear programming models for single reservoir, multi reservoir cases with single and multiple objectives.

Suggested Reading:

1. Loucks, D. P., Stedinger, J. R., and Douglas, A.H. (1981), 'Water Resources Planning and Analysis', Prentice-Hall, New York.
2. Kuiper Edward (1965), 'Water Resources Project Economics', Butterworths and Company Ltd., London.
3. Jain, S.K. and Singh V.P. (2003), 'Water Resources Systems Planning and Management', Elsevier Science, B.V., Amsterdam.
4. Taha, H. A. (1982), 'Operations Research an introduction', Prentice-Hall of Indial, New Delhi.
5. Pramod. A. Bhave (2011) "Water Resources Systems" Narora Publishing House, 22, Medical Association Road, Dharyagunj, New Delhi – 110 002.

CE 1216 *w.e.f. 2017-2018*

HYDRAULIC STRUCTURES

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Description of the design aspects of different types spillways
- Knowledge regarding the design of energy dissipation arrangements
- Awareness about urban storm drainage and concepts of dam safety

Outcomes:

- Application of design principles to different types spillways, energy dissipation arrangements and urban storm drainage systems

UNIT–I

Introduction – Functions of Spillways, Design flood, Hydraulic design steps for Side Channel spillway, Chute Spillway, and Shaft Spillway

UNIT–II

Roller Compacted Concrete (RCC) dams, Hydraulic design steps for Stepped spillway, and air regulated siphon spillway
Hydraulic design steps for Labyrinth weir, and Duck bill spillway

UNIT – III

Energy Dissipaters – Factors governing the design, design criteria of energy dissipaters as per U.S.B.R.
Cavitation and air entrainment in spillway as per BIS 2804-1989

UNIT – IV

Urban drainage: Quantity of storm water, design of storm water drainage system, SCS curve technique, design of culverts for submerged and partly submerged flow situations, airport drainage.

UNIT–V

Dam safety – Principles and concepts for new dams and existing dams, hazard classification of dams, spillway capacity criteria, safety of existing embankment dams and appurtenant structures.

Suggested Reading:

1. Water Resources Technical Publication (1974) 'Design of Small Dams (USBR)' Oxford and IBH Publication Company, New Delhi.
2. Vischer D.L. & W.H. Hager (1998) 'Dam Hydraulics' Wiely International Edition., New York
3. Novak P., A.I.B. Moffat, R. Nalluri & R. Narayanan(1990), 'Hydraulic Structures' Unwin Publishers, London
4. Larry-W-Mays (2006), 'Water Resources Engineering', John Wiley & Sons, Singapore
5. John E. Gribbin (1997), 'Hydraulics and Hydrology for Stormwater Management', Delmar Publishers, New York
6. Creager W.P., Joel D. Justin and Julion Hinds,(1961) 'Engineering for Dams' Volume I,II & III John Wiley and Sons Inc, New York

CE 1312 *w.e.f. 2017-2018*

GROUND IMPROVEMENT TECHNIQUES

Instruction	**:3 periods per week**
Duration of Semester End Examination	**:3 hours**
CIE	**:30 marks**
SEE	**:70 marks**
Credits	**:3**

Course Objectives

- To understand the objectives, necessity and scope of ground improvement
- To learn different methods of insitu densification of cohesive / cohesion less grounds
- To understand the types, functions and applications of Geosynthetics

Course Outcomes:

- Ability to understand the causes and to identify the scope for ground improvement
- Selection of ideal ground improvement technique appropriate for a given ground conditions
- Competence in dealing with the applications of ground improvement in Infrastructure Engineering projects

UNIT - I

Introduction **-** Objectives and necessity of Ground Improvement – Formation of Rock and soils – Alteration of ground after its formation – Reclaimed soils – Ground improvement potential – Geotechnical processes.

UNIT - II

Densification Of Cohesionless Soils **-** Surface and deep compaction – Vibration methods – Vibro-compaction, vibro-displacement, vibro-replacement methods.

UNIT - III

Densification Of Cohesive Soils **-** Drainage methods – selection of pumps and accessories, Pre-compression methods – consolidation properties of soils – Pre-loading technique – consolidation acceleration methods - consolidation aided with vertical drains – Sand Drains - Pre-fabricated vertical drains,

Consolidation by Electro-osmosis and vacuum compression methods, Compression monitoring.

UNIT - IV

Grouting - Aspects of grouting – Types of grouting materials – grouting procedure – Applications of grouting in ground improvement

Soil Stabilisation - Types and suitability of stabilization methods - Mechanical, Cementing methods – Aggregants and dispersants.

UNIT - V

Reinforced Earth - Concept of reinforced earth – Types and suitability of reinforcement material – fiber reinforced earth – factors affecting reinforced earth.

Geo-Synthetics - Classification of Geosynthetics – Functions and applications – Concept of design by function.

Suggested Reading:

1. Purushotham Raj, (1999), Ground Improvement Techniques, Laxmi Publications.
2. Fang.H.S., (1985), Foundation Engineering Hand Book, CBS Publications.
3. Joseph Bowls, Foundation Analysis and Design, Fifth edition, Mc-Graw Hills

CE 1511 w.e.f. 2017-2018

ADVANCED FOUNDATION ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Course Objectives

- To understand the analysis and design of shallow and deep foundations
- To learn the essentials of Caisson Foundations
- To gain fundamental aspects of types and design of machine foundations
- To understand the foundation construction related aspects

Course Outcomes:

- Ability to analyse and design shallow & deep foundations
- Competence to select suitable type of a machine foundation
- Ability to deal with the Foundation related aspects of an infrastructure engineering project

UNIT - I

Design Of Foundations For Buildings - Geotechnical Investigations – Methods and techniques – Number, location and depth of explorations, Types and suitability of building foundations – Depth of the foundation, Design loads and stability requirements.

Allowable Soil Bearing Pressure - Safe against shear failure – Settlement – Computation of actual bearing pressure – Application to practical problems, Field tests – Standard penetration test- Plate load test – cone penetration test.

UNIT - II

Pile Foundations - Types and suitability of pile foundations – Estimation of load carrying capacity of Piles using Static formulae; dynamic formulae, penetration resistance and load tests, Design considerations – Load tests, Foundations on Expansive Soils.

UNIT - III

Caisson Foundations - Types and suitability of the caisson foundations – Design aspects of Caisson foundations – Construction procedure of Caisson foundations.

UNIT - IV

Essentials of Design of Machine Foundations - Types and suitability of Machine foundations – General Design requirements of a machine foundation – Case histories.

UNIT - V

Construction of Foundations - Types and suitability of Braced excavations – conduits - Dewatering systems – Coffer Dams – Under pinning methods.

Suggested Reading:

1. Johnson. S.M. and Kavanagh. T.C., The Design of Foundations for Buildings, McGraw-Hill Book Company.
2. Joseph Bowls, Foundation Analysis and Design, Fifth edition, McGraw-Hills.
3. Fang. H.Y, (1997), Foundation Engineering Hand Book, CBS Publications.

CE 1405 *w.e.f. 2017-2018*

PAVEMENT SYSTEMS ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Introduction to various factors affecting pavement design
- Concepts of mechanistic empirical methods of flexible and rigid pavements
- Knowledge of pavement evaluation and the related maintenance activities

Outcomes:

- Application of basic principles in pavement design
- Assimilation of mechanistic principles for the pavement design
- Explain about appropriate evaluation and maintenance measures for better maintenance of pavements

UNIT - I

Introduction of Pavement Design: Various Factors, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chasis and Articulated Commercial Vehicles, Legal Axle and Gross weights on single and multi units, Tire Pressure, Contact pressure, EAL and ESWL concepts, Equivalent Axle Load Factor, Traffic Analysis: ADT.AADT, Truck factor, Growth factor, Lane, Directional distributions & Vehicle Damage factors, Effect of Transient & Moving loads.

UNIT - II

Stresses in Pavements: Vehicle-Pavement Interaction, Stress inducing factors in flexible and Rigid pavements. Stress in Flexible Pavements: Visco-Elastic Theory and Assumptions. Layered system concepts, Stress solutions for one, two and three layered systems. Fundamental Design

concepts. Stresses in Rigid Pavements: Westergaard's theory and Assumptions, Stresses due loading, warping and Frictional Stresses, Friberg's Analysis of Dowel Bars and deflection of dowel-joints.

UNIT- III

Mechanistic Design Methodology for Pavements: General Methodology, Classification of design methods; Pavement Design Concepts; Flexible Pavements: Climatic Models, Structural models, Distress models: fatigue cracking, rutting and thermal cracking models; Rigid Pavements: Structural models, fatigue cracking: load and curling stress, Pumping and Erosion Models, Faulting Models, Joint Deterioration and Punchout models; Need and verification of Flexible and Rigid pavement Mechanistic design procedures.

UNIT - IV

Methods of Pavement Designs: Flexible Pavement Design Concepts, Asphalt Institute Methods with HMA and other Base Combinations, AASHTO, IRC Methods as per IRC37 and IRC:SP:72. Design of Rigid Pavements: Introduction to Calibrated Mechanistic Design Process, PCA, AASHTO, IRC specifications, Introduction to pre-stressed and continuously Reinforced cement Concrete Pavement Design, Dowel bar design and design of tie bars as per IRC:58.

UNIT - V

Pavement Evaluation and Design of Overlays: Types of pavement evaluation: Serviceability concepts, IRI, Quarter Car Model, skid resistance; Pavement Deflection - Different Methods of NDT, Benkelman Beam, LaCroix Deflectometer, Dynaflect, Road Ratar, Rolling Dynamic Deflectometer, Load man, Different Types of Falling Weight Deflectometers (FWD) for evaluation of rigid and flexible pavements. Design of overlays: Types & Design of overlays: Asphalt Institute's Principal Component Analysis, IRC Methods of Overlay Design.

Suggested Readings

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications.
2. Teng, Functional Design of Pavements - McGraw hill - 1990.
3. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
4. Principles of Pavement Design, Yoder J. & Witzac Mathew W. John Wiley & Sons.
5. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.
6. Pavement and surfacings for Highway & Airports, Micheal Sargious, Applied science Publishers Limited.
7. Kadiyali and Lal, Principles of highway engineering, Khanna Publishers, Delhi-6
8. IRC related Codes for Flexible and Rigid Pavements design

CE 1401 *w.e.f. 2017-2018*

TRAFFIC ENGINEERING

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- To introduce fundamental knowledge of traffic engineering so that students can understand and be able to deal with traffic issues including safety, planning, design, operation and control.
- To describe basic techniques for collecting and analysing traffic data, diagnosing problems.

Outcomes:

Students who successfully complete this course will be able to:

- Use statistical concepts and applications in traffic engineering.
- Identify traffic stream characteristics and Identify level of services
- Design a pre-timed signalized intersection, and determine the signal splits.

UNIT-I

Basic Aspects of Traffic Engineering Aim of traffic engineering, traffic stream components and characteristics, road user characteristics, vehicle characteristics, acceleration characteristics, measure of quality, measures of separation, relationship among traffic parameters and empirical relationships, mechanics of traffic flow, macroscopic approach, microscopic-approach and human factors approach, discrete distributions, binomial distribution, Poisson's distribution, exponentional distribution, exponential distribution, normal distribution.

UNIT-II

Traffic Studies, Measurement and Analysis; Volume studies, speed studies, travel forecasting principles and techniques, design hourly volumes and speed, origin and destination studies, presentation of data and analysis, testing of hypothesis relating to improvements.

UNIT-III

Travel Time amid Delay Studies; Various uses, travel time and delay studies, various methods, data collection and analysis, density studies and headways, gap acceptance studies, intersection delay studies, traffic flow theory, queuing theory and simulation models.

UNIT-IV

Capacity Analysis of Traffic Facilities; Uninterrupted facilities, interrupted facilities, Level of Service, quality of service as per HCM, factors affecting LOS, computation of capacity and LOS, Measure of effectiveness, highway capacity and performance characteristics, intersection design.

UNIT-V

Traffic Control, Design and Regulation; Traffic signals, types, principles of phasing, tune diagram, signalized intersection, saturation flow, saturation headway, capacity of lane group, concept of critical lane group, signal timing, phase plan, phase diagram, splitting of phase, clearance interval, pedestrian requirement, guidelines for protected movements, signal co-ordination, emerging themes, inter-modalism, access management, congestion management, environmental impact assessment.

Suggested Reading

1. McShane, W.R., Roess, R.P. and Prassas, E.S., Traffic Engineering. Prentice Hall, Englewood Cliffs, 1997.
2. Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C., 2000.
3. Daganzo, C.R, Fundamentals of Transportation and Traffic Operations, Pergamon, Elsevier Science Inc., New York, 1997.
4. Salter, R.J., Traffic Engineering: Worked Examples, Macmillan, London, 1989.
5. Pignataro, L.J., Traffic Engineering: Theory and Practice, Prentice Hall, Englewood lifts, 1973.
6. Wohl, M. and Martin, B.V, Traffic System Analysis for Engineers and Planners, McGraw Hill, New York, 1983.
7. Drew, D.R., Traffic Flow Theory, McGraw Hill, New York, 1964.

CE 1320 *w.e.f. 2017-2018*

GEOSPATIAL TECHNOLOGY

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Course Objectives:

- Discuss the various spatial and non-spatial data types, and data base management techniques
- Develop the concepts and professional skills in utility of geospatial techniques
- Improve the working knowledge of geospatial techniques in field problems

Course Outcomes:

- Geospatial technology relating to the data acquiring and processing that is associated with geographic locations
- Application of Geospatial techniques in the decision support systems useful for decision makers and community services.
- Utility of Geospatial techniques in the fields of natural resource management, environment, urban planning and development, etc.

UNIT –I

Introduction - Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems.

Projections and Coordinate Systems - Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT –II

Data Acquisition and Data Management - data types, spatial, non spatial (attribute) data, data structure and database management, data format, vector and raster data representation, object structural model filters and files data in computer, key board entry, manual digitizing, scanner, aerial photographic

data, remotely sensed data, digital data, cartographic database, digital elevation data, data compression, data storage and maintenance, data quality and standards, precision, accuracy, error and data uncertainty.
Data Processing - Geometric errors and corrections, types of systematic and non systematic errors, radiometric errors and corrections, internal and external errors.

UNIT –III
Data Modeling - Spatial data analysis, data retrieval query, simple analysis, recode overlay, vector data model, raster data model, digital elevation model, cost and path analysis, knowledge based system.
GIS Analysis and Functions - Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non spatial data.

UNIT –IV
Applications of GIS - Environmental and natural resource management, soil and water resources, agriculture, land use planning, geology and municipal applications, urban planning and project management, GIS for decision making under uncertainty, software scenario functions, standard GIS packages, introduction to Global Positioning Systems (GPS) and its applications.

UNIT – V
Introduction to Remote Sensing - General background of remote sensing technology, objectives and limitations of remote sensing, electro-magnetic radiation, characteristics, interaction with earth surface and atmosphere, remote sensing platforms and sensors, satellite characteristics, digital image processing, IRS series and high resolution satellites, software scenario functions, remote sensing applications to watershed modeling, environmental modeling, urban planning and management.

Suggested Reading:

1. Burrough, P. A., and McDonnell R. A. (1998). *Principles of Geographical Information Systems.* Oxford University Press, New York, Pp.333.
2. Choudhury S., Chakrabarti, D., and Choudhury S. (2009). *An Introduction to Geographic Information Technology.* I.K. International Publishing House (P) Ltd, New Delhi, Pp.276.
3. Kang-tsung Chang. (2006). *Introduction to Geographical information Systems*. Tata McGraw-Hill Publishing Company Ltd., Third Edition, New Delhi, Pp.432.
4. Lilysand T.M., and Kiefer R.W. (2002). *Remote Sensing and Image Interpretation*. John Wiley and Sons, Fourth Edition, New York, Pp.724.
5. Sabins F.F. Jr. (1978). *Remote Sensing Principles and Interpretations.* W.H. Freeman and Company, San Francisco, Pp. 426.
6. Tor Bernhardsen. (2002). *Geographical Information System.* Wiley India (P) Ltd., Third Edition, New Delhi, Pp. 428.
7. Hoffman-Wellenhof, B, et al. (1997). *GPS Theory and Practice.* Fourth Edition, Springer Wein, New York.

CE 0111 *w. e. f. 2017-2018*

ENGINEERING RESEARCH METHODOLOGY

No. of Credits	**:3 Credits**
Instruction	**:3 Periods per week**
Duration of University Examination	**:3 Hours**
Semester End Evaluation	**:70 Marks**
Continuous Internal Evaluation	**:30 Marks**

Course Objectives:

- Learn the research types, methodology and formulation.
- Know the sources of literature, survey, review and quality journals.
- Understand the research design for collection of research data.
- Understand the research data analysis, writing of research report and grant proposal.

Course Outcomes:

- Differentiate the research types and methodology.
- Able to do literature survey using quality journals.
- Able to collect research data.
- Process research data to write research report for grant proposal.

UNIT - I

Research methodology: Objectives and motivation of research - Types of research - Research approaches - Significance of research - Research methods verses methodology - Research and scientific method - Importance of research methodology - Research process - Criteria of good research - Problems encountered by researchers in India - Benefits to the society in general. Defining the research problem: Definition of research problem - Problem formulation - Necessity of defining the problem - Technique involved in defining a problem.

UNIT – II

Literature survey: Importance of literature survey - Sources of information - Assessment of quality of journals and articles - Information through internet. Literature review: Need of review - Guidelines for review - Record of research review.

UNIT – III

Research design: Meaning of research design - Need of research design - Feature of a good design - Important concepts related to research design - Different research designs - Basic principles of experimental design - Developing a research plan - Design of experimental set-up - Use of standards and codes.

UNIT – IV

Data collection: Collection of primary data - Secondary data - Data organization - Methods of data grouping - Diagrammatic representation of data - Graphic representation of data - Sample design - Need for sampling - Some important sampling definitions - Estimation of population - Role of statistics for data analysis - Parametric vs. non parametric methods - Descriptive statistics - Measures of central tendency and dispersion - Hypothesis testing - Use of statistical softwares.

Data Analysis: Deterministic and random data - Uncertainty analysis - Tests for significance - Chi-square - Student's t-test - Regression modeling - Direct and interaction effects – ANOVA - F-test - Time series analysis - Autocorrelation and autoregressive modeling.

UNIT - V

Research report writing: Format of the research report – Synopsis – Dissertation - Thesis - Its differentiation – References – Bibliography – Webliography - Technical paper writing - Journal report writing - Making presentation - Use of visual aids.

Research proposal preparation: Writing a research proposal and research report - Writing research grant proposal.

Suggested Reading:

1. C.R Kothari, "Research Methodology, Methods & Technique", New Age International Publishers, New Delhi, 2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, Chennai, 2011.
3. Ratan Khananabis and Suvasis Saha, "Research Methodology", Universities Press, Hyderabad, 2015.
4. Y.P. Agarwal, "Statistical Methods: Concepts, Application and Computation", Sterling Publishing Pvt. Ltd., New Delhi, 2004.
5. Vijay Upagade and Aravind Shende, "Research Methodology", S. Chand & Company Ltd., New Delhi, 2009.
6. G. Nageswara Rao, "Research Methodology and Quantitative methods", BS Publications, Hyderabad, 2012.

CE 1404 *w.e.f. 2017-2018*

STATISTICAL TECHNIQUES

Instruction	**: 3 periods per week**
Duration of University Examination	**: 3 Hours**
University Examination	**: 70 Marks**
Sessionlas	**: 30 Marks**

Objectives:

- To introduce fundamental knowledge of sampling techinue
- To describe basic statitistical techniques such as statistical distributons and correlation methods
- To impart knowledge on exact sampling distributions and the tests of significance

Outcomes:

Students who successfully complete this course will be able to:

- Use sampling techniques for conducting various surveys related to transportation engineering
- Decide best fit and develop the regression equations for the given variables
- Applications of sampling distributions in Highway and Traffic Engineering problems.

UNIT-I

Introduction: Frequency distribution; Measures of central tendency; Measures of dispersion; Standard error, Moments (about mean, arbitrary numbers and orgin); Skewness; Kurtosis; Sampling-Definitions and Applications; Simple random sampling; Stratified sampling; Systematic sampling; Sample size determination; Applications in Highway and Traffic Engineering

UNIT-II

Statistical Distribution; Probability, Bayes' Theorem; Binomial, Poisson, Exponential and Normal distributions; Fitting of distributions; Mean and variance; Chi-square test of goodness-of-fit; Applications in Highway and traffic Engineering. Mathematical expectation.

UNIT-III

Regression and Correlation : Linear regression and correlation; Multiple correlation; Multiple correlation coefficient; Standard error of estimate; Analysis of variance; Curvilinear regression; Applications in Transportation Engineering.

UNIT-IV

Multi Variate Data Distributions ; Types of data; Basic vectors and matrices; Simple estimate of centroid, Standard deviation Variance and covariance ; Correlation matrices ; Principal component analysis;. Time series analysis. Estimation-Point Estimation, In
terval Estimation, Box Plot, Maximum likelihood estimation, Biased & Non Biased Estimation.

UNIT - V

Exact Sampling Distributions and Tests of Significance; Chi-square distribution; students t-distribution; Snedectors F-distribution. Large sample and small sample tests ; Tests for single mean. Means of two samples, Proportions, two variances, two observed correlation coefficients, paired T-tests, Applications. Intervals for mean, variance and regression coefficients; Applications in Highway and Traffic Engineering Problems.

Suggested Reading

1. Basic Statistics - Simpson and Kafks; Oxford and IBH Calcutta,1969.
2. Fundamentals of Mathematical Statistics - Gupta, S.C. and Kapoor, K. V. Sultanchand
3. Multivariate Data Analysis – Cootey W.W & Cochens P.R; John Wiley & Sons

CE 1212 *w.e.f. 2017-18*

ENVIRONMENTAL IMPACT ASSESSMENT

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Objectives:

- Introduction of EIA concepts and methodologies.
- Importance of data collection of EIA assessment.
- Preparation of EIA reports and discussion about various environmental impact Laws pertaining to India.

Outcomes:

- Knowledge to assess environmental related projects.
- Understanding legislative acts to contribute towards clean environment
- Design of an efficient municipal solid waste management system

UNIT I

Environmental Impact Assessment - Definition, basic concepts and principles of EIA. Regulatory frame work in India. Environmental inventory, base line studies, over view of EIA studies.

UNIT II

Assessment and Methodologies - Physical, biological assessment, Socio economic and cultural environmental assessment, EIA methodologies– Adhoc, matrix, checklist approaches. Economic evaluation of impacts-cot benefits of EIA, Public participation in environmental decision making. Procedures for reviewing EIA analysis and statement.

UNIT III

Environmental Assessment - Introduction, process, Basic steps involved, Description of environmental setting – Base line data collection, possible impacts due to water resources projects. Impact prediction and assessment – methods of impact assessment, Matrix and check list method, Selection of proposed action. Preparation of environmental impact statement.

UNIT IV

Environmental Legislation and Regulations - Rationale, concerns, legislative data systems, safe drinking water act, clean water act, clean air act, noise control act, resource conservation and recovery act, comprehensive environmental response, compensation and liability act.

UNIT V

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/recycle, energy recovery, treatment and disposal).

Suggested Reading:

1. Canter, L.W. (1996), 'Environmental Impact Assessment', McGraw-Hill Book Company, New York.
2. Corbitt Robert A. (1999), Standard Hand Book of Environmental Engineering' McGraw-Hill Book Company, New York.
3. Marriott ( ), 'Environmental Impact Assessment: A Practical Guide', McGraw-Hill Book Company, New York.
4. Sabins F.F. Jr.(1978), 'Remote Sensing Principles and Interpretations' W.H. Freeman and Company, San Francisco
5. Jensen John R. (1986), 'Introductory Digital Image Processing', Prentice-Hall of India New York.

CE 1125 *w.e.f. 2017-18*

DISASTER MANAGEMENT

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
CIE	**: 30 marks**
SEE	**: 70 marks**
Credits	**: 3**

Course Objectives:

- Get exposure to disasters, their significance and types.
- Understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- Understand the approaches of disaster risk reduction.
- Enhance awareness of institutional processes in the country.
- Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where we live, with due sensitivity.

Course Outcomes:

- Understand the fundamentals of disasters and its impacts.
- Understand the cyclones, local storms and floods.
- Know the procedures to prevent, mitigate and prepare community based disaster risk reduction.
- Know the inter-relationship between disasters and development.
- Know the disaster risk management in India and case studies on reducing disaster risks.

UNIT-I

*Introduction to Disasters***:** Concepts and definitions of Disaster, Hazard, Vulnerability, Resilience, Risks.

Natural and Manmade disasters, impact of drought, review of past disasters and drought in India, its classification and characteristics. Classification of drought, causes, Impacts (including social, economic. political, environmental, health, psychosocial, etc.).

UNIT-II

*Disaster***:** Classifications, Causes, Impacts including social, economic, political, environmental, health, psychosocial etc.

Differential Impacts - in terms of caste, class, gender, age, location, disability Global trends in disasters, urban disasters, pandemics, complex emergencies, climate change.

*Cyclones and Floods***:** Tropical cyclones & Local storms, Destruction by tropical cyclones and local storms, Cumulative atmospheric hazards/ disasters, Cold waves, Heat waves, Causes of floods, Rood hazards in India.

UNIT-III

*Approaches to Disaster Risk Reduction***:** Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural sources, roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRis/ULBs), states, Centre, and other stake-holders.

UNIT-IV

*Inter-relationship between Disasters and Development***:** Factors affecting Vulnerabilities, differential impacts, impact of development projects such as darns, embankments, changes in Land-use etc. Climate Change Adaptation, Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT-V

*Disaster Risk Management in India***:** Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, OM Act and Policy, other related policies, plans, programmes and legislation)

*Field Work and Case Studies***:** The field work is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located.

Suggested Reading:

1. Sharma, V. K. (1999), “Disaster Management”, National Centre for Disaster Management, IIPE, Delhi.
2. Anil, K. Gupta and Sreeja, S. Nair (2011), “Environmental Knowledge for Disaster Risk Management”, NIDM, New Delhi.
3. Nick (1991), “Disaster Management: A Disaster Manager's Handbook”, Asian Development Bank, Manila Philippines.
4. Kapur, et al. (2005), “Disasters in India: Studies of Grim Reality”, Rawat Publishers, Jaipur.
5. Pelling Mark (2003), “The Vulnerability of Cities: Natural Disaster and Social Resilience”, Earthscan Publishers, London.

CE 1531 *w.e.f. 2017-2018*

INFRASTRUCTURE ENGINEERING LABORATORY - I

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
Internal Assessment	**: 50 marks**
Credits	**: 2**

I) Material Testing and concrete Technology:

Course objectives

- To understand the concrete through laboratory tests
- To learn testing of different materials and interpret the results

Course Outcomes

- Validation of theoretical concepts through laboratory testing
- Differentiate between Destruction and NDT and interpretation of test results.

1. Concrete Ingredient Testing
2. Tests on Structural Steel, Timber, Building blocks, Tiles and other construction materials
3. Concrete Mix Design –IS code method and other International code methods
4. Nondestructive tests and Interpretation of NDT results
5. Strain and Deflection measurements of structural members

II) Transportation Engineering:

1. Aggregate Impact test, Los Angels Abrasion test and shape test
2. Penetration, ductility, and softening point test
3. Marshal stability analysis and design
4. Benkelman beam test
5. Signal design and OD studies
6. Indirect tensile strength and creep of Bituminous mix samples.
7. Total station

CE 1532 *w.e.f. 2017-2018*

INFRASTRUCTURE ENGINEERING LABORATORY - II

Instruction	**: 3 periods per week**
Duration of Semester End Examination	**: 3 hours**
Internal Assessment	**: 50 marks**
Credits	**: 2**

I. Geo technical Engineering:

- Course objectives
- To understand the soil mechanics through laboratory tests
- To learn preparation of specimen and simulation of field conditions in the models
- To learn the laboratory test procedures, analysis of data

Course Outcomes

- Validation of theoretical concepts through laboratory testing
- Ability to model field conditions and preparation of specimen
- Competence to interpret the results and to evaluate the engineering behavior of soils through laboratory tests

1. Engineering classification of soils
2. Compaction and Consolidation properties of soils
3. Permeability of soils (including Quick sand Phenomenon)
4. Shear strength parameters using Triaxial shear test
   (Including demonstration of Liquefaction Phenomenon on cyclic Triaxial shear test facility)
5. CBR value
6. Plate load test (Laboratory version)

II. Computation simulation Laboratory - Relevant Programs Using MATLAB in Water Resources

1. Stability checking of Gravity Dams
2. Rainfall Runoff Modeling
3. Regression Analysis
4. Unit Hydrograph
5. Fitting of Probability distribution to data
6. SCS curve Method
7. Normal depth and critical depth

CE 1533 *w.e.f. 2017-2018*

SEMINAR I

Instruction	**: 3 periods per week**
Internal Assessment	**: 50 marks**
Credits	**: 2**

A Student is expected to take up an actual case study pertaining to a live INFRASTRUCTURE PROJECT and attend the site three times a week to note the development and implementation of project. He/She shall interact with the Seminar supervisor during the instruction period and prepare weekly report. At the end of semester, He/She shall present a SEMINAR on the Project.

CE 1534 *w.e.f. 2017-2018*

SEMINAR II

Instruction	**: 3 periods per week**
Internal Assessment	**: 50 marks**
Credits	**: 2**

A Student is expected to take up an actual case study pertaining to a live INFRASTRUCTURE PROJECT and attend the site three times a week to note the development and implementation of project. He / She shall interact with the Seminar supervisor during the instruction period and prepare weekly report. At the end of semester, He / She shall present a SEMINAR on the Project.

CE 1535 *w.e.f. 2017-18*

PROJECT SEMINAR

Instruction	**: 4 Periods per week**
Sessionals	**: 50 Marks**
Credits	**: 8**

Course Objectives:

- Define the statement of research problem.
- Update the literature in chosen area of research and establish scope of work.
- Develop the study methodology.
- Carryout basic theoretical study/experiment.

Course Outcomes:

- Identify the statement of research problem.
- Conduct the literature review and establish scope of work.
- Comprehend the study methodology.
- Conduct basic theoretical study/experiment.

Each student will be attached to a faculty member, (guide) for Mini Project during the Second Semester. The student will carry out the project which may be the development of Software - Hardware - Simulation Studies - Design - Analysis - Experimental related to the specialization. The work will be monitored regularly by the guide. At the end of the Semester, Student will write the report on the work done and submit to the guide. Student has to present the work before two faculty members (one guide and other to be appointed by Chairman BOS) on a fixed day during the last week of the semester in which mini project is offered. The sessional marks will be awarded jointly by these two examiners based on the report, the presentation and viva voce.

CE 1536 *w.e.f. 2017-18*

DISSERTATION

Instruction	**: 6 Periods**
University Examination	**: Viva Voice**
Marks	**: 200**
Credits	**: 16**

Course Objectives:

- Expand on the defined research problem in dissertation.
- Conduct laboratory/analytical studies.
- Analyse data, develop models , offer solutions and give conclusions.

Course Outcomes:

- Develop on the defined research problem in dissertation.
- Carry out laboratory/analytical studies.
- Evaluate data, develop models offer solutions and give conclusions.

Each student will be attached to a faculty member who will monitor the progress of the student. The student is required to submit a technical write-up, presentation of their study (about 20 minutes) followed by a discussion.

The dissertation shall be internally scrutinized by a Viva-Voce committee consisting of the Head of the Department, Chairman Board of Studies, Supervisor and Examiner.

The Dissertation will be scrutinized by an external examiner as per the institute guide lines applicable.

Filename: IE-latest_syllabus_1-8-17
Directory: C:\Documents and Settings\Administrator\Desktop\syllabus pdf
Template: C:\Documents and Settings\Administrator\Application Data\Microsoft\Templates\Normal.dotm
Title:
Subject:
Author: B.VIJAYA LAKSHMI
Keywords:
Comments:
Creation Date: 6/20/2017 12:41:00 PM
Change Number: 65
Last Saved On: 8/14/2017 2:10:00 PM
Last Saved By: Vasu
Total Editing Time: 254 Minutes
Last Printed On: 8/14/2017 2:10:00 PM
As of Last Complete Printing
Number of Pages: 73
Number of Words: 13,501 (approx.)
Number of Characters: 76,957 (approx.)