PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018

UG – B.E. - CIVIL ENGINEERING

CURRICULUM AND SYLLABUS – R2016

(CHOICE BASED CREDIT SYSTEM)

SEMESTER VII

S. No	Category	Course Code	Course Title	L	T	P	C
1	PC	CE16701	Estimation, Costing and Valuation Engineering	3	0	0	3
2	PC	CE16702	Structural Dynamics and Earthquake Engineering	3	0	0	3
3	PC	CE16703	Irrigation Engineering	3	0	0	3
4	PC	CE16704	Prestressed Concrete Structures	3	0	0	3
5	PE	******	Professional Elective II*	3	0	0	3
6	OE	CE169**	Open Elective II**	3	0	0	3
7	PC	CE16705	Environmental and Irrigation Engineering Drawing	0	0	4	2
8	EE	CE16706	Design Project	0	0	4	2
			Total	**18**	**0**	**8**	**22**

SEMESTER VIII

S. No	Category	Course Code	Course Title	L	T	P	C
1	HS	BA16254	Principles of Management	3	0	0	3
2	PE	******	Professional Elective III*	3	0	0	3
3	PE	CE1645*	Professional Elective IV*	3	0	0	3
4	EE	CE16801	Project Work	0	0	12	6
			Total	**9**	**0**	**12**	**15**

*** Professional Elective of UG programmes**

**** Course from the curriculum of other UG programmes**

PROFESSIONAL ELECTIVES (PE)

ELECTIVE II

Category	Course Code	Course Title	L	T	P	C
PE	CE16251	Industrial Waste Water Engineering	3	0	0	3
PE	CE16252	Traffic Engineering and Management	3	0	0	3
PE	CE16253	Municipal Solid Waste Management	3	0	0	3
PE	CE16254	Railways, Airports and Harbour Engineering	3	0	0	3
PE	MA16751	Operations Research	3	0	0	3

ELECTIVE III

Category	Course Code	Course Title	L	T	P	C
PE	CE16351	Power plant Structures	3	0	0	3
PE	CE16352	Bridge Structures	3	0	0	3
PE	CE16353	Maintenance, Repair And Rehabilitation of Structures	3	0	0	3
PE	BA16253	Total Quality Management	3	0	0	3
PE	BA16151	Professional Ethics And Human Values	3	0	0	3

ELECTIVE IV

Category	Course Code	Course Title	L	T	P	C
PE	CE16451	Ground Improvement Techniques	3	0	0	3
PE	CE16452	Prefabricated Structures	3	0	0	3
PE	CE16453	Industrial Structures	3	0	0	3
PE	CE16454	Tall Structures	3	0	0	3
PE	CE16455	Introduction to Soil Dynamics and Machine Foundations	3	0	0	3

OPEN ELECTIVES (OE)

ELECTIVE II

Category	Course Code	Course Title	L	T	P	C
OE	CE16906	Computer Aided Design of Structures	3	0	0	3
OE	CE16907	Disaster Management	3	0	0	3
OE	CE16908	Finite Element Techniques	3	0	0	3
OE	CE16909	Engineering Economics and Cost Analysis	3	0	0	3
OE	CE16910	Environmental Impact Assessment	3	0	0	3

SEMESTER VII

CE16701 ESTIMATION, COSTING AND VALUATION ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- estimate the quantities of item of works involved in buildings, joineries and arches.
- prepare the estimation of water supply and sanitary works, road works and irrigation work.
- analyse the concept of tender and contract in detail.
- study the valuation of properties and buildings.
- know the methods of preparing reports for estimation of various items.

Prerequisite: Nil

UNIT I ESTIMATION OF BUILDINGS 9

Load bearing and framed structures – Calculation of earthwork excavation – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof ; Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for paneled and glazed doors, windows, ventilators, handrails.

UNIT II ESTIMATE OF OTHER STRUCTURES 9

Estimating of septic tank – soak pit – Sanitary and water supply installations – Water supply pipe line, Sewer line ; Tube well – Open well ; Estimate of bituminous and cement concrete roads ; Estimate of retaining walls ; Culverts – Estimating of irrigation works – Aqueduct.

UNIT III SPECIFICATION AND TENDERS 9

Data – Schedule of rates, Analysis of rates, Specifications – Sources, Preparation of detailed and general specifications – Tenders – TTT Act 1998 Rules 2000, E-tender – Preparation of Tender Notice and Document – Contracts – Types of contracts – Drafting of contract documents – Arbitration and legal requirements.

UNIT IV VALUATION 9

Necessity – Basics of value engineering – Capitalized value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease – Case study on Public Private Partnership in India.

UNIT V REPORT PREPARATION 9

Principles for report preparation – Report on estimate of residential building – Culvert – Roads – Water supply scheme and sanitary sewerage projects – Tube wells – Open wells.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- estimate the material quantities in buildings, joineries, arches and prepare a bill of quantities.
- estimate the material quantities in water supply & sanitary installation, road works and prepare a bill of quantities.
- gain the knowledge about specifications in schedule of rates and prepare tender documents.
- perceive the concepts and methods used in evaluating the properties of buildings.
- get an idea in the preparation of reports for estimation of various items.

TEXT BOOKS

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 28th Revised Edition, 2016.
2. Kohli, D. D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand &Company Ltd., 2004

REFERENCES

1. Tamil Nadu PWD Data Book- 2017.
2. Tamil Nadu Transparencies in Tender Act, 1998Tamil Nadu Transparency in Tenders Rules, 2000 and Tamil Nadu Transparency in Tenders (Public Private Partnership Procurement)Rules, 2012.
3. Arbitration and Conciliation Act, 1996

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	3	1	-	-	-	-	-	-	-	2	1	2
CO2	2	1	3	1	-	-	-	-	-	-	-	2	1	2
CO3	2	-	-	-	-	-	-	-	1	-	1	2	1	-
CO4	2	-	-	-	-	-	-	-	1	-	1	2	1	-
CO5	2	-	-	-	-	-	-	-	1	-	1	2	1	-

CE16702 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on SDOF earthquake response of linear system
- study the behaviour and response of MDOF structures with various dynamic loading
- gain a preliminary knowledge of seismology
- enhance awareness of earthquake effects on structures
- understand the codal provisions to design the structure as earthquake resistant

Prerequisite: Nil

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM 9

Definition of degree of freedom – Idealization of structure as Single Degree of Freedom (SDOF) system, Formulation of equation of motion for various SDOF system – D' Alemberts Principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

UNIT II MULTI DEGREE OF FREEDOM SYSTEM 9

Formulation of equation of motion for multidegree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING 9

Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters.

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES 9

Effect of earthquake on different types of structures – Behaviour of RCC, Steel and prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra – Lessons learnt from past earthquakes.

UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN 9

Causes of damage – Planning considerations/Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:1993).

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- analyze the earthquake response of SDOF linear systems.
- analyze the structures with MDOF system under dynamic loading
- perceive the knowledge of earthquake and its origin
- predict the effects of earthquake on structures
- design the structures for seismic loading as per code provisions

TEXT BOOKS

1. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2007
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.

REFERENCES

1. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.
2. Mario Paz, Structural Dynamics – Theory and Computations, Fourth Edition, CBS publishers, 1997.
3. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 1995.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1	1	1	-	-	-	-	-	-	2	1	1
CO2	2	1	1	1	1	-	-	-	-	-	-	2	1	1
CO3	2	-	-	-	1	-	-	-	1	-	-	2	1	1
CO4	2	-	-	-	1	-	-	-	1	-	-	2	1	1
CO5	2	-	-	-	1	-	-	-	1	-	-	2	1	1

CE16703 IRRIGATION ENGINEERING 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- impart the basic knowledge about crop water requirement
- familiar with different irrigation methods
- impart knowledge about various dam structures
- understand on components of canal irrigation works
- manage the water loss in irrigation

Prerequisite: Nil

UNIT I CROP WATER REQUIREMENT 9

Need and classification of irrigation- historical development and merits and demerits of irrigation types of crops-crop season - duty, delta and base period - consumptive use of crops - estimation of Evapo-transpiration using experimental and theoretical methods

UNIT II IRRIGATION METHODS 9

Tank irrigation - Well irrigation - Irrigation methods - Surface and Sub-Surface and Micro Irrigation, Merits and demerits –Irrigation scheduling - Water distribution system - Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Types of Impounding structures - Gravity dam - Forces on a Gravity dam, Earth dams, Arch dams - Diversion Head works - Weirs and Barrages

UNIT IV CANAL IRRIGATION 9

Canal regulations - Canal drop - Cross drainage works - Canal outlets - Canal alignments - Canal lining - Kennedy's and Lacey's Regime theory

UNIT V WATER MANAGEMENT IN IRRIGATION 9

Modernization techniques - Rehabilitation - Optimization of water use - Minimizing water losses - On form development works - Participatory irrigation management - Water resources associations – Changing paradigm in water management - Performance evaluation - Economic aspects of irrigation

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gather the basic knowledge about crop water requirements
- familiarize with methods and management of irrigation.
- gain knowledge on types of Impounding structures

- understood methods of irrigation including canal irrigation.
- update their knowledge on water management on optimization of water use.

TEXT BOOKS

1. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009
2. Punmia B.C.,"Irrigation and water power Engineering", Laxmi Publications, 16th Edition, New Delhi, 2009
3. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi,2008

REFERENCES

1. Sharma R.K.. "Irrigation Engineering", S.Chand & Co. 2007.
2. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
3. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.
4. Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co. New Delhi,1999

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO2	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO3	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO4	2	-	-	-	1	1	2	-	-	-	1	2	1	1
CO5	2	-	-	-	1	1	2	-	2	-	1	2	1	1

CE16704 PRESTRESSED CONCRETE STRUCTURES 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- impart knowledge on the basic principles of prestressed concrete structures
- understand the flexure and shear design for prestressed concrete beams
- gain knowledge of factors influencing deflection and anchorage zone design
- understand the performance of composite members
- gain knowledge on various prestressed concrete structural elements

Prerequisite: Nil

UNIT I INTRODUCTION 9

Historical developments – Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel, Lee-McCall and Gifford Udall anchorage systems – Analysis of sections of stresses by stress concept, strength concept and load balancing concept – Losses of prestress in post-tensioned and pre-tensioned members.

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post – tensioned and pre–tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post – tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections – Short term deflections of uncracked members, Prediction of long term deflections due to creep and shrinkage, Check for serviceability limit state of deflection – Determination of anchorage zone stresses in post-tensioned beams by Magnels method, Guyon's method and I.S. 1343 code – Design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Analysis and design of composite beams – Shrinkage strain and its importance ; Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELLANEOUS STRUCTURES 9

Design of tension and compression members – Design of tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- selection of various types of prestressing
- design for flexure and shear on prestressed concrete beams.
- design of anchorage zone reinforcement
- design of composite and continuous beams.
- design various prestressed concrete structural elements

TEXT BOOKS

1. Krishna Raju N., "Prestressed concrete", Tata McGraw Hill Company, Fifth Edition, 2012.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt Ltd., Second edition, 2014

REFERENCES

1. Sinha.N.C. and Roy.S.K., "Fundamentals of Prestressed Concrete", S.Chand and Co. Ltd., 2011
2. Lin T.Y. and Ned.H. Burns, "Design of prestressed Concrete Structures", John Wiley and Sons, 3rd Edition, 2010.
3. Rajagopalan.N, Prestressed Concrete, Narosa Publishing House, 2002.
4. IS1343 – 2012 – IS Code of Practice for Prestressed Concrete.
5. IS784 – 2001 – IS Specification for Prestressed Concrete Pipes
6. IS3370 – 1999 – Part III – IS Code of Practice for Concrete Structures for the storage of liquids
7. IS1678 – 1998 – Specification for Prestressed Concrete Pole for overhead Power Traction and Telecommunication lines.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO2	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO3	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO4	2	2	3	1	-	-	-	-	-	-	-	2	1	2
CO5	2	2	3	1	-	-	-	-	-	-	-	2	1	2

CE16705 ENVIRONMENTAL AND IRRIGATION ENGINEERING DRAWING 0 0 4 2

COURSE OBJECTIVES

To enable the students to

- design and draw the coagulation and sedimentation tank in detail which showing the plan, elevation and sections.
- design and draw the rapid sand filter in detail which showing the plan, elevation and sections.
- design and draw the canal drop, canal regulator in detail which showing the plan, elevation and sections.
- design and draw the siphon aqueduct in detail which showing the plan, elevation and sections.

Prerequisite: Water Supply & Waste Water Engineering

LIST OF EXPERIMENTS

PART A : ENVIRONMENTAL ENGINEERING

1. Design and Drawing of coagulation and sedimentation tank.
2. Design and Drawing of rapid sand filter
3. Design and Drawing of screen chamber and grit chamber.
4. Design and Drawing of septic tank.
5. Design and Drawing of trickling filter.

PART B : IRRIGATION ENGINEERING

6. Design and Drawing of canal drop.
7. Design and Drawing of canal regulator cum foot path.
8. Design and Drawing of syphon aqueduct.

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- design and draw coagulation and sedimentation tank structures.
- design and draw rapid sand.
- design and draw canal drop, canal regulator.
- design and draw syphon aqueduct.

REFERENCES

1. Mohanakrishnan. A, "A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu", Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy, 2011.
2. Raghunath, H.M. "Irrigation Engineering", Wiley India Pvt. Ltd., New Delhi, 2011.

3. Garg, S.K., "Irrigation Engineering and Design of Structures", New Age International Publishers, New Delhi, 1997.
4. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO2	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO3	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO4	2	1	2	-	-	2	3	-	-	-	-	2	1	2

CE16706 DESIGN PROJECT **0 0 4 2**

COURSE OBJECTIVE

To enable the students to

- Impart and improve the design capability of the student.
- design the various elements of structures.
- analysis the entire elements of structures.
- Design problem can solve by using software.

STRATEGY :

This course conceives purely a design problem in any one of the disciplines of Civil Engineering such as Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- attain knowledge in designing various design problems.
- attain knowledge in analysis various design problems.
- design calculations, specifications done by software.
- Design problems can be solved by manual or software.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	3	2	3	-	-	-	3	-	-	3	1	3
CO2	2	3	3	2	3	-	-	-	3	-	-	3	1	3
CO3	2	3	3	2	3	-	-	-	3	-	-	3	1	3
CO4	2	3	3	2	3	-	-	-	3	-	-	3	1	3

PROFESSIONAL ELECTIVE II

CE16251 INDUSTRIAL WASTE WATER ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart the basic knowledge about waste water
- know the prevention methods of industrial pollutions
- impart knowledge in various treatment process of industrial waste
- acquire knowledge on discharge of waste water
- understand various process of water management

Prerequisite: Nil

UNIT I INTRODUCTION 9

Industrial scenario in India – Uses of water by Industry – sources, generation rates and characteristics of Industrial wastewaters – Toxicity of Industrial Effluents and Bioassay Tests – Environmental Impacts of Industrial Wastewaters – Regulatory requirements for Industrial wastewaters

UNIT II INDUSTRIAL POLLUTION PREVENTION 9

Prevention versus Control of Industrial Pollution – Benefits and Barriers – Waste Minimization Strategies – Evaluation of Pollution Prevention Options – Cost benefit analysis – Payback period.

UNIT III TREATMENT OF INDUSTRIAL WASTEWATERS 9

Physico-Chemical Treatment Processes – Equalization, Neutralization, Oil Separation, Floatation , Precipitation, Aerobic and Anaerobic Biological Treatment Processes ; Sequencing batch reactors, membrane bio-reactors, Advanced oxidation and Tertiary Treatment processes for removal of dissolved organics and inorganics- Ozonation, photo catalysis, Evaporation and membrane Technologies.

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT 9

Individual and Common Effluent Treatment Plants – Zero Effluent Discharge Systems and Management of RO Rejects, Quality requirements for wastewater reuse – Industrial reuse, Disposal on water and land – Residuals of Industrial Wastewater treatment – Quantification and Characteristics of Sludge – Thickening, Digestion, Conditioning, Dewatering and Disposal of Sludge – Solidification – Incineration – Secured Landfills.

UNIT V CASE STUDIES 9

Industrial manufacturing process description – Wastewater characteristics, Pollution Prevention Options and Treatment Flow sheets for selected Industries – Tanneries – Textiles – Pulp and Paper – Metal finishing – Sugar and Distilleries.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gather the basic knowledge about industrial waste water
- understood the prevention and control of irrigation.
- retrieve the concepts of treatment process of industrial waste water
- gain knowledge on irrigation including canal irrigation.
- execute skills on water management on optimization of water use.

TEXT BOOKS

1. Eckenfelder, W.W. "Industrial Water Pollution Control", Mc-Graw Hill, 2000.
2. Mahajan, S.P.Pollution Control in Process Industries, Tata McGraw Hill Publishing Co., New Delhi, 1991.
3. S.C.Bhatia, Handbook of Industrial Pollution and Control, Volume I & II, CBS Publishers, New Delhi, 2003.

REFERENCES

1. Frank Woodard, "Industrial waste treatment Handbook", Butterworth Heinemann, NewDelhi, 2001.
2. Nelson Leonard Nemerow, "Industrial waste treatment – contemporary practice and vision for the future", Elsevier, Singapore, 2007.
3. Paul L. Bishop, "Pollution Prevention:- Fundamentals and Practice", Mc-Graw Hill International, Boston,2000.
4. Wang L.K., Yung-Tse Hung, Howard H.Lo and Constantine Yapijakis, "Handbook of Industrial and Hazardous Wastes Treatment", Marcel Dekker, Inc., USA, 2004.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	3	-	-	-	-	2	1	1
CO2	2	-	-	-	-	2	3	-	-	-	-	2	1	1
CO3	2	-	-	-	1	2	3	-	-	-	-	2	1	1
CO4	2	-	-	-	1	2	3	-	-	-	-	2	1	1
CO5	2	-	-	-	-	2	3	-	-	-	-	2	1	1

CE16252 TRAFFIC ENGINEERING AND MANAGEMENT 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- impart the fundamentals related to the traffic flow
- acquire knowledge on traffic surveys and its operation
- create awareness about the control measures for traffic signs and its regulations
- gain knowledge on accident risk and its management
- provide knowledge on traffic management measures.

Prerequisite: Nil

UNIT I TRAFFIC CHARACTERISTICS 9

Road Characteristics – Classification, Functions and standards – Road user characteristics –PIEV theory ; Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India.

UNIT II TRAFFIC SURVEYS 9

Traffic Surveys – Speed, journey time and delay surveys – Vehicle Volume Survey – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – level of service – Concept, application and significance.

UNIT III TRAFFIC ENGINEERING REGULATION AND CONTROL 9

Capacity of Rotary intersection and Design – Capacity of signalized intersections – Traffic signals, warrants, type – Design and coordination – Intersection channelisation – Grade separation ; Traffic signs and road markings.

UNIT IV TRAFFIC SAFETY AND ENVIRONMENT 9

Road accidents – Causes, effect, prevention and cost – street lighting – Traffic and environment Hazards; Air and Noise Pollution, causes, health effects and abatement measures.

UNIT V TRAFFIC MANAGEMENT 9

Area Traffic Management System – One way street system, exclusive traffic lanes, tidal flow operation, staggering of work hours and road pricing – Non road pricing options – Parking charges, Public transport, Subsidies, Vehicle License fees, Road Building, Permit system, Physical Traffic Management Transport System Management (TSM) and Transport Demand Management (TDM) – Introduction to Intelligent Transportation Systems (ITS) – ITS Applications in Traffic Management.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- analyse the various types of traffic flow
- understand traffic survey and its methods
- practice the traffic engineering regulations and its control measures
- analyse the causes and report the accident
- manage the traffic congestion using the available management measures

TEXT BOOKS

1. Kadiyali. L.R. Traffic Engineering and Transport Planning, Khanna Publishers, Delhi, 2010.
2. Khanna .K and Justo C.E.G. and Veeraragavan, A Highway Engineering, Nem Chand Bros., Roorkee, Revised 10th Edition, 2014.

REFERENCES

1. ParthaChakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2005.
2. Salter. R.I and Hounsell N.B, Highway Traffic Analysis and design, Macmillan Press Ltd.1996.
3. Roger P.Roess, William R.Mcshane and Elena S.Prassas, Traffic Engineering-Second Edition, Prentice Hall Publishers,Upper Saddle River, New Jersey 1998.
4. Indian Roads Congress (IRC) Specifications: Guidelines and special publications on Traffic Planning and Management.
5. C. JotinKhisty, Kent Lall, Transportation Engineering: An Introduction, Prentice Hall, 1998.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO3	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO4	2	-	-	-	1	-	-	-	-	-	-	1	1	1
CO5	2	-	-	-	3	-	-	-	-	-	-	1	1	1

CE16253 MUNICIPAL SOLID WASTE MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- discuss the source, types and characterization of municipal solid wastes.
- know the storage methods and the processing of solid wastes.
- discuss the methods of collection and transfer stations with option under Indian condition.
- gain knowledge on the processing techniques equipment used for processing.
- understand the disposal methods of solid waste and discuss leachate collection and treatment

Prerequisite: Nil

UNIT I SOURCES AND CHARACTERISTICS 9

Sources and types of solid wastes – Quantity – factors affecting generation of solid wastes – Characteristics ; Methods of sampling and characterization ; Effects of improper disposal of solid wastes – Public health effects; Principle of solid waste management – Social and economic aspects – Public awareness ; Role of NGOs, Legislation.

UNIT II ON-SITE STORAGE AND PROCESSING 9

On-site storage methods – Effect of storage, materials used for containers – Segregation of solid wastes – Public health and economic aspects of open storage – Waste segregation and storage options under Indian conditions – Reduction, Reuse and Recycling.

UNIT III COLLECTION AND TRANSFER 9

Methods of Collection – Types of vehicles – Manpower requirement – Collection routes – Transfer stations – Selection of location, operation & maintenance – Case study under Indian conditions.

UNIT IV OFF-SITE PROCESSING 9

Processing techniques and Equipment – Resource recovery from solid wastes – Composting, incineration, Pyrolysis – case study under Indian conditions.

UNIT V DISPOSAL 9

Dumping of solid waste – sanitary landfills – Site selection – design and operation of sanitary landfills – Landfill bio reactors – Leachate collection & treatment.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- perceive the nature and characteristics of municipal solid wastes.

- attain knowledge about the regulatory requirements regarding municipal solid waste management.
- confess the waste minimization.
- evaluate the design systems for storage, collection, transport, and processing.
- attain the knowledge about the disposal of municipal solid waste.

TEXT BOOKS

1. William A. Worrell, P. AarneVesilind, "Solid Waste Engineering", Cengage Learning, 2012
2. George Tchobanoglous and FrankKreith, "Handbook of Solid waste Management", McGrawHill, New York. 2002.

REFERENCES

1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization", Government of India, New Delhi, 2014.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO2	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO3	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO4	2	-	-	-	-	2	3	-	-	-	-	1	1	-
CO5	2	-	-	-	-	2	3	-	-	-	-	1	1	-

CE16254 RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain knowledge on planning of geometric design of railway
- illustrate proficiency in Railway construction & maintenance
- impart knowledge on components of Airport & Airport Authority
- understand the design concepts & orientation of Runway
- acquire knowledge on Harbour Engineering & Coastal regulation

Prerequisite: Nil

UNIT I RAILWAY PLANNING AND CONSTRUCTION 9

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges – Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods – Geometric design of railway, gradient, super elevation, widening of gauge on curves – Level Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE 9

Earthwork – Stabilization of track on poor soil – Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying – Construction and maintenance of tracks –Railway Station and yards and passenger amenities.

UNIT III AIRPORT PLANNING 9

Air transport characteristics – airport classification – airport planning – objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations – typical Airport Layouts – parking and Circulation Area.

UNIT IV AIRPORT DESIGN 9

Runway Design – Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING 9

Definition of Basic Terms – Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours – Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities – Coastal Structures – Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Environmental concern of Port Operations – Coastal Regulation Zone 2011.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- plan and design of permanent way
- execute construction of Railway elements
- understood the terminologies in Airport & Authorities
- execute the design and orientation of Runways
- plan and design of Harbour and Coastal regulation

TEXT BOOKS

1. Subramanian.K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
3. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels. Universities Press (India) Private Limited, Hyderabad, 2015.

REFERENCES

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2013
2. Bindra S P, "A Course in Docks and Harbour Engineering", DhanpatRai and Sons, New Delhi, 2013
3. SaxenaSubhash, C.andSatyapalArora, ACourse in Railway Engineering, DhanapatRai and Sons, Delhi, 1998
4. Khanna.S.K. Arora.M.G and Jain.S.S, Airport Planning and Design, Nemachand and Bros, Roorkee, 1994

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO2	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO3	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO4	3	-	-	-	1	-	-	-	-	-	-	2	1	1
CO5	3	-	-	-	1	-	-	-	-	-	-	2	1	1

MA16751 OPERATIONS RESEARCH 3 0 0 3

COURSE OBJECTIVE

To enable the students to

- provide the concept and an understanding of basic concepts in Operations Research.
- understand, develop and solve mathematical model of Transport and assignment problems.
- Know the techniques for Analysis and Modeling in Computer Applications.
- understand, develop and solve mathematical model of linear programming problems.
- understand network modeling for planning and scheduling the project activities.

Prerequisite: Nil

UNIT I LINEAR PROGRAMMING MODELS 9

Mathematical Formulation – Graphical Solution of linear programming models – Simplex method – Big M-Method – Two phase methods.

UNIT II TRANSPORTATION AND ASSIGNMENT MODELS 9

Mathematical formulation of transportation problem – Methods for finding initial basic feasible solution – optimum solution – degeneracy – Assignment models – Balanced and unbalanced problems – Solution by Hungarian and Branch and Bound algorithms.

UNIT III INVENTORY MODELS 9

Inventory Models – EOQ and EBQ Models (With and without shortages) – Quantity Discount Models .

UNIT IV NETWORKING MODELS 9

Network construction – Critical path method – Project evaluation and review technique – Replacement models – Individuals replacement models (With and without time value of money) – Group replacement models.

UNIT V QUEUEING MODELS 9

Queuing Theory – Single and multi-channel models – Infinite number of customers and infinite calling source.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- understand and apply linear, integer programming to solve operational problem with constraints.

- apply transportation and assignment models to find optimal solution in warehousing and travelling.
- use optimization concepts in real world problems.
- prepare project scheduling using PERT and CPM
- identify and analyze appropriate queuing model to reduce the waiting time in queue.

TEXT BOOKS

1. R.Panneerselvam, "Operations research", Second edition prentice hall –USA-2007.
2. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, "Operations Research", Pearson Education,Asia, 2005.

REFERENCES

1. Taha H.A, "Operations Research: An Introduction", 8th Edition, Pearson Education, 2008.
2. Prem Kumar Gupta, D.S. Hira, "Operations Research", S.Chand & Company Ltd, New Delhi, Third Edition , 2008.
3. John W. Chinneck, "Feasibility and Infeasibility in Optimization Algorithms andComputational Methods", Springer, 2008.
4. Ravindran, Phillips, Solberg, "Operations Research: Principles and Practice", Second Edition,John Wiley & Sons, 2007.
5. Gross, D. and Harris, C.M., "Fundamentals of Queuing Theory", Wiley Student, 3rd Edition, New Jersy, 2004.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	-	-	-	-	-	-	-	1	3	2
CO2	3	3	2	1	-	-	-	-	-	-	-	1	3	2
CO3	3	2	3	2	-	-	-	-	-	-	-	1	3	2
CO4	3	2	2	2	-	-	-	-	-	-	-	1	3	2
CO5	3	3	2	2	-	-	-	-	-	-	-	1	3	2

OPEN ELECTIVE II

CE16906 COMPUTER AIDED DESIGN OF STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the fundamental concepts for implementing computer aided design
- ensure that students begin to understand the concepts of computer graphics and modeling
- enrich a knowledge on analysis of structures using software packages
- enhance the design of structures using software's and to optimize the structural components
- develop the artificial intelligence on knowledge based systems

Prerequisite: Nil

UNIT-I INTRODUCTION 9

Fundamental reason for implementing CAD – Software requirements ; Hardware components in CAD system – Design process – Applications and benefits.

UNIT-II COMPUTER GRAPHICS 9

Graphic Software – Graphic primitives ; Transformations – 2 Dimensional and 3 Dimensional transformations – Concatenation – Wire frame modeling – Solid modeling – Graphic standards – Drafting packages – Auto CAD.

UNIT III STRUCTURAL ANALYSIS 9

Principles of structural analysis – Fundamentals of finite element analysis – Concepts of finite elements – Stiffness matrix formulation – Variational Method – Weighted residual method – Problems – Conditions of convergence of functions – Analysis packages and applications.

UNIT IV DESIGN AND OPTIMIZATION 9

Principles of design of steel and RC structures – Beams and Columns – Applications to simple design problems – Optimization techniques – Algorithms – Linear programming.

UNIT V EXPERT SYSTEMS 9

Introduction to artificial intelligence – Knowledge based expert systems – Applications of KBES – Rules and decision tables – Inference mechanisms – simple applications

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- acquire the knowledge in fundamentals of computer aided design.
- gain the skills on computer graphics and modeling

- retrieve the concepts of structural analysis by using analysis packages
- design and optimize the structural components by using software's
- access the artificial intelligence on knowledge based expert systems

TEXT BOOKS

1. Mikell.P.Groover. and Emory.W.Zimmers.Jr., "CAD / CAM, Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi, 2008.
2. Krishnamoorthy.C.S, Rajeev.S, Rajaraman.A "Computer Aided Design: Software and Analytical Tools" Narosa Publishing House, New Delhi, 2012.

REFERENCES

1. B.H.V. Topping "Developments in computer aided design and modeling for Structural Engineering" Civil comp press UK, 1995
2. Harrison H.B, "Structural Analysis and Design" Part I and II Pergamon Press, Oxford, 1990

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	-	3	-	-	-	-	-	-	2	1	1
CO2	2	2	2	-	3	-	-	-	-	-	-	2	1	2
CO3	2	2	2	-	3	-	-	-	-	-	-	2	1	1
CO4	2	2	2	-	3	-	-	-	-	-	-	2	1	2
CO5	2	2	2	-	3	-	-	-	-	-	-	2	1	2

CE16907 DISASTER MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- provide students an exposure to disasters, their significance and types.
- ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- gain a preliminary understanding of 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 they live, with due sensitivity

Prerequisite: Nil

UNIT-I INTRODUCTION TO DISASTERS 9

Definition - Disaster, Hazard, Vulnerability, Resilience, Risks ; Disaster - Types of disasters - Earthquake, Landslide, Flood, Drought, Fire ; Classification, 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 ; Do's and Don'ts during various types of Disasters

UNIT-II APPROACHES TO DISASTER RISK REDUCTION 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR- Structural - non-structural measures; Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders ; Institutional Processes and Framework at State and Central Level - State Disaster Management Authority (SDMA) ; Early Warning System - Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use ; Climate Change Adaptation ;IPCC Scenario and Scenarios inthe context of India ; Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India; Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, and Waste Management, Institutional arrangements (Mitigation, Response and Preparedness; Disaster Management Act and Policy - Other related policies, plans, programs and legislation ; Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster ; Disaster Damage Assessment

UNIT V DISASTER MANAGEMENT:CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation - Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure - Case Studies; Drought Assessment - Case Studies; Coastal Flooding: Storm Surge Assessment, Floods - Fluvial and Pluvial Flooding - Case Studies ; Forest Fire - Case Studies, Man Made disasters - Case Studies; Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- differentiate the types of disasters, causes and their impact on environment and society
- assess vulnerability and various methods of risk reduction measures as well as mitigat
- draw the hazard and vulnerability profile of India and Scenarios in the Indian context
- retrieve disaster damage assessment and management.
- gain the skills on disaster management case studies and field works

TEXT BOOKS

1. A.K Gupta, Sreeja S. Nair, SandhyaChatterji. "Disaster Management and Risk Reduction", Narosa Public House, 2013.
2. Singhal J.P. "Disaster Management", Laxmi Publications, 2010.

REFERENCES

1. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.
2. KapurAnu "Vulnerable India: A Geographical Study of Disasters", IIAS and Sage Publishers, New Delhi, 2010.
3. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
4. Government of India, National Disaster Management Policy, 2009.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	2	3	-	1	-	-	1	1	-
CO2	2	-	-	-	-	2	3	-	1	-	-	1	1	-
CO3	2	-	-	-	-	2	3	-	1	-	-	1	1	-
CO4	2	-	-	-	2	2	3	-	1	-	-	1	1	-
CO5	2	-	-	-	-	2	3	-	1	-	-	1	1	-

CE16908 FINITE ELEMENT TECHNIQUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- equip with the finite element analysis fundamentals.
- understand the direct stiffness matrix method to solve civil engineering problems.
- give exposure to select suitable mathematical model for complex problems.
- form and solve two dimensional problems.
- introduce the advanced topics in FEM.

Prerequisite: Nil

UNIT I FUNDAMENTAL CONCEPTS 9

Concept of an element – Various element shapes – One, two and three-dimensional elements – Finite element procedure – Stresses and equilibrium – Boundary conditions – Strain displacement relations – Stress strain relations – Potential energy and equilibrium – Weighted residual and weak formulations – Variational approach – Rayleigh Ritz method.

UNIT II DIRECT STIFFNESS METHOD 9

Steps in direct method of FEA – Element stiffness matrix – Global stiffness matrix – Boundary conditions – Simple problems on beams and trusses.

UNIT III ELEMENT SHAPES, NODAL UNKNOWNS AND COORDINATE 9

Discretisation – Basic element shapes – Element properties – Node numbering procedure – Convergence requirements – Generalized co-ordinates – Natural co-ordinates – Shape functions for linear & quadratic models – stiffness matrix – Nodal load factor – Static condensation – Simple problems.

UNIT IV TWO DIMENSIONAL PROBLEMS 9

Introduction – Finite element modeling – Constant strain triangle – Isoparametric representation – Potential energy approach – Element stiffness – Force terms – Stress calculations – Introduction to beam element – Application of FEM Software

UNIT V ISOPARAMETRIC ELEMENTS AND NUMERICAL INTEGRATION 9

Introduction – Higher order elements and its applications – Concept of sub, iso and super parametric elements – Shape Functions – Gaussian quadrature – Examples in one and two – dimensional elements.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- perceive the fundamentals of Finite Element Analysis
- use the direct stiffness matrix method for solving civil engineering problems.

- declare suitable mathematical model for complex problems
- form and solve two dimensional problems
- apply the various vibration control techniques in structures.

TEXT BOOKS

1. Chandrupatla, R.T. and Belegundu, A.D., "Introduction to Finite Elements in Engineering", Prentice Hall of India, 2012 .
2. Krishnamoorthy C. S., "Finite Element Analysis Theory and Programming", Tata McGraw Hill Education, 2011 .

REFERENCES

1. Rao S.S, "The Finite Element Method in Engineering", Pergaman Press, 2010
2. Zienkiewicz, O.C. and Taylor, R.L., "The Finite Element Method", McGraw – Hill, 2005.
3. Rajasekaran, S., "Finite Element Methods in Engineering Design", Wheeler, 2006

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	1	1	-	-	-	-	-	-	2	1	2
CO2	2	2	2	1	1	-	-	-	-	-	-	2	2	2
CO3	2	2	2	1	1	-	-	-	-	-	-	2	1	2
CO4	2	2	2	1	1	-	-	-	-	-	-	2	2	2
CO5	2	2	2	1	1	-	-	-	-	-	-	2	1	2

CE16909 ENGINEERING ECONOMICS AND COST ANALYSIS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on basic economic principles.
- know about the law of demand and supply schedule.
- gain knowledge on business organization.
- understand the financial terms.
- know the concept of cost and break even analysis.

Prerequisite: Nil

UNIT I BASIC ECONOMICS 9

Definition of Economics – Nature and scope of economic science – Nature and scope of managerial economics – Basic terms and concepts – Goods, Utility, Value, Wealth – Factors of production – Land and its peculiarities – Labour – Economics of large and small scale – Consumption wants – characteristics and classification – Law of diminishing marginal utility – Relation between economic decision and technical decision.

UNIT II DEMAND AND SCHEDULE 9

Demand – Demand schedule, Demand curve, Law of demand – Elasticity of demand – Types of elasticity – Factors determining elasticity, Measurement, significance, Supply, Supply schedule, Supply curve – Law of supply – Elasticity of supply – Time element in determination of value Market price and normal price – perfect competition – Monopoly – Monopolistic competition.

UNIT III ORGANISATION 9

Forms of business – Proprietorship – Partnership – Joint stock company – Cooperative organization – State enterprise – Mixed economy – Money and banking – Banking – kinds – Commercial banks – Central banking functions – Control of credit– Monetary policy – Credit instrument.

UNIT IV FINANCING 9

Types of financing – Short term borrowing – Long term borrowing – Internal generation of funds External commercial borrowings – Assistance from government budgeting support and international finance corporations– Analysis of financial statement – Balance sheet – Profit and loss account – Funds flow statement.

UNIT V COST AND BREAK EVEN ANALYSES 9

Types of costing – Traditional costing approach – Activity based costing – Fixed cost – Variable cost Marginal cost – Cost output relationship in the short run and in long run – Pricing practice – Full

cost pricing – Marginal cost pricing – Going rate pricing – Bid pricing – picking for a rate of return Appraising project profitability – Internal rate of return – Payback period – Net present value – Cost benefit analysis Feasibility reports – Appraisal process – Technical feasibility – Economic feasibility Financial feasibility – Break even analysis – Basic assumptions – Break even chart – Managerial uses of break-even analysis.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- define the economic principles.
- draw the demand and supply curves based on the laws.
- identify the various banking types and organize a business team.
- understand the fund flow statement based on generation of funds.
- apply the concept of break-even analysis.

TEXT BOOKS

1. Dewett K K and Varma J D "Elementary Economic Theory", S Chand & Co. Publications, 2006
2. Khan MY and Jain PK, "Financial Management" McGraw Hill Publishing Co Ltd., 2006.

REFERENCES

1. SatyaPrakashan ,Sharma J C "Construction Management and Accounts" New Delhi, 2004.
2. Barthwal R R, "Industrial Economics – An Introductory Textbook", New Age Publications, 2000.
3. Samuelson P A, "Economics An Introductory Analysis" McGraw – Hill Publications, 2000

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	-	-	-	1	1	-	1	1	1	2	1	1	-
CO2	1	-	-	-	1	1	-	1	1	1	2	1	1	-
CO3	1	-	-	-	1	1	-	1	1	1	2	1	1	-
CO4	1	-	-	-	1	1	-	1	1	1	2	1	1	-
CO5	1	-	-	-	1	1	-	1	1	1	2	1	1	-

CE16910 ENVIRONMENTAL IMPACT ASSESSMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge on Environmental management and Environmental Impact Assessment.
- know about the methodologies of Environmental Impact Assessment.
- learn about the prediction and assessment of Impact on land, water, air.
- understand the Environmental Management Plan based on the adverse impact.
- gain knowledge on various case studies.

Prerequisite: Nil

UNIT I INTRODUCTION 9

Impact of development projects – Sustainable development- Need for Environmental Impact Assessment (EIA) – Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA - Stages of EIA – Types of EIA

UNIT II METHODOLOGIES 9

Methods of EIA – Check lists – Matrices – Networks – Cost benefits - Analysis of alternatives

UNIT III PREDICTION AND ASSESSMENT 9

Assessment of Impact on land, water, air, social and cultural activities and on flora and fauna – Mathematical models – Public participation.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to the Project affected people – Post project monitoring

UNIT V CASE STUDIES 9

EIA for infrastructure projects – Dams – Highways – Multi-storey Buildings, Water Supply and Drainage Projects – Waste water treatment plants, STP.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment.

- identify the assessment of Impact on land, water and air.
- plan environmental adverse impact assessments.
- evaluate environmental impact assessment reports.

TEXT BOOKS

1. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.

REFERENCES

1. John G. Rau and David C Hooten, "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990.
2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	-	-	-	2	3	-	-	-	-	1	1	-
CO2	2	1	-	-	-	2	3	-	-	-	-	1	1	-
CO3	2	1	-	-	2	2	3	-	-	-	-	1	1	-
CO4	2	1	-	-	-	2	3	-	-	-	-	1	1	-
CO5	2	1	-	-	-	2	3	-	-	-	-	1	1	-

SEMESTER VIII

BA16254 PRINCIPLES OF MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand history and development of management thought.
- know the planning activities in management.
- understand organizing, dimensions of organization structure, and choosing the right structural form.
- know how to manage human resources.
- understand various methods and techniques of control

Prerequisite: Nil

UNIT I INTRODUCTION TO MANAGEMENT 9

Management - Meaning, Scope, Managerial Roles - Management - Science, Art or Profession - Universality of Management - Ancient roots of management theory - Classical schools of management thought - Behavioral School - Quantitative School - Systems Approach - Contingency Approach - Contemporary Management thinkers and their contribution

UNIT II PLANNING 9

Characteristics of planning - Planning Process - Types of plans - Decision making - Decision making tools - Group decision making - Forecasting and MBO.

UNIT III ORGANIZING 9

Organizational structure and design - types of organizational structures - authority, delegation, decentralization and reengineering - Organization Size, Technology, Environment, Power- control - choosing the right structural form.

UNIT IV MANAGING HUMAN RESOURCES 9

Human resource planning – Recruitment, selection, training and development - performance appraisal - managing change - compensation and employee welfare - Leadership theory - Motivation Theory - Communication

UNIT V CONTROLLING 9

Nature of organizational control - control process - Methods and techniques of control - Designing control systems.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- demonstrate history and development of management thought.
- exhibit the planning activities in management.
- know organizing, dimensions of organization structure, and choosing the right structural form.
- gain knowledge how to manage human resources.
- develop various methods and techniques of control.

TEXT BOOKS

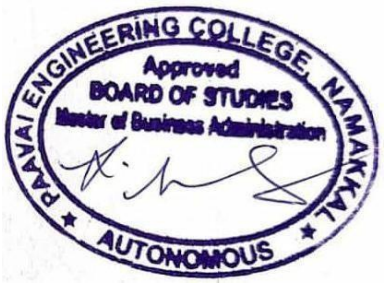
1. Management a Global & Entrepreneurial Perspective, Heinz Weihrich, Mark V. Cannice, Tata McGraw-Hill Education, 2010.
2. Management, James A.F. Stoner & R. Edward Freeman, Prentice-Hall of India Private Limited, New Delhi, 5/e, 2010.

REFERENCES

1. Management, John R. Schermerhorn, Jr., Daniel G. Bachrach, Wiley India, 13/e, 2015.
2. Essentials of Management, Joseph L Massie, Prentice-Hall India, New York, 4/e, 2013.
3. Management, S.A.Sherlekar, Himalaya Publications, Mumbai, 1/e, 2012.
4. Principles of Management, L.M. Prasad, Sultan Chand & Sons, New Delhi, 9/e, 2015.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	1	1	2	2	2	2	2	-	-
CO2	-	-	-	-	1	1	1	3	2	2	2	2	-	-
CO3	-	-	-	-	1	1	1	3	2	2	2	2	-	-
CO4	-	-	-	-	1	1	1	3	2	2	2	2	-	-
CO5	-	-	-	-	1	1	1	3	2	2	2	2	-	-



CE16801 **PROJECT WORK** **0 0 12 6**

COURSE OBJECTIVES

To enable the students to

- make use of the knowledge gained by the student at various semester.
- understand the various procedures for validation of the project and
- the degree course and formulate a real world problem and project's goals.
- analyse for the cost effectiveness.

STRATEGY:

The student works on a topic approved by the Head of the Department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

TOTAL PERIODS 180

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- formulate a real world problem.
- identify the requirement and develop the design solutions.
- test and validate through conformance of the developed prototype
- analysis the cost effectiveness.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	1	1	2	-	1	-	3	-	2	1	3	2
CO2	3	1	1	1	2	-	1	-	3	-	2	1	3	2
CO3	3	1	1	1	2	-	1	-	3	-	2	1	3	2
CO4	3	1	1	1	2	-	1	-	3	-	2	1	3	2

PROFESSIONAL ELECTIVE III

CE16351 POWER PLANT STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- impart knowledge in principle, layout and resources of power plant generation.
- gain knowledge in essential elements and structural requirements of hydroelectric power plant.
- understand planning, analysis of thermal power plant.
- gain knowledge in characteristics of nuclear power plant and its safety measures.
- understand miscellaneous power plant and its principle.

Prerequisite: Nil

UNIT I FUNDAMENTALS OF POWER PLANTS 9

Introduction – Classification of Power Plants, Principles of Power Plant, Lay out of Power Plant Building – Selection of type of generation – Resources for power generation – Machine foundation.

UNIT II HYDRO ELECTRIC POWER PLANTS 9

Elements of hydro-electric power plants – Advantages and disadvantages of water power – General and essential elements of Hydroelectric Power Plant – Structural requirements – Selection of site for hydroelectric plant – Penstocks and surge Tanks in Power Station.

UNIT III THERMAL POWER PLANTS 9

Planning, Analysis of thermal power plants – Layout – Ash handling – Dust collection – Induced draught and natural cooling towers – Air/water pollution by thermal power plants.

UNIT IV NUCLEAR POWER PLANTS 9

General characteristics of Nuclear Power Plants – Classification of reactors – Pressurized Water Reactor, Boiling Water Reactor, Fusion Power Reactor, Heavy Water Reactor – Selection criteria of materials for different systems – Containment structures – Nuclear power plant safety measures – Safety systems and support systems

UNIT V NON CONVENTIONAL POWER PLANTS 9

Types – Wind power plants – Selection of wind mill – Tidal power plants – Solar thermal power plants – Geothermal power plants – Principles and essential features.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- know the fundamentals of power plant
- understand structural requirements of hydropower plant
- plan and analyse the layout of thermal power plant
- select general criteria and safety measures of nuclear power plant
- design various power plant systems

TEXT BOOKS

1. S.C. Sharma and G.R. Nagpal, Power Plant Engineering, Khanna Publishers,2013
2. Raja A.K, AmitPrakashSrivastava and Manish Dwivedi, Power Plant Engineering, New Age International Publishers, 2006.

REFERENCES

1. Lewis.E.E. Nuclear Power Reactor Safety, Willey Inter Science, 1977.
2. Srinivasasulu.P and Vaidyanathan.C.V. Hand book on Machine Foundations, Tata McGraw Hill Publishing Co. Ltd., 2007.
3. Gilbert Gedeon.P.E., Planning and Design of Hydro Electric Power Plants, CECW-ED Engineer Manual, 1110-2-3001 Manual No.1110-2-3001, 1995.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	1	-	1	1	1	-	-	-	1	2	1	1
CO2	2	-	1	-	1	1	1	-	-	-	1	1	1	1
CO3	2	-	1	-	1	1	1	-	-	-	1	2	1	1
CO4	2	-	1	-	1	1	1	-	-	-	1	2	1	1
CO5	2	-	1	-	1	1	1	-	-	-	1	1	1	1

CE16352 BRIDGE STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- introduce the basic fundamentals of bridge design.
- familiarize with design of slab culverts, the beam and slab bridges
- explain the Principles of continuous bridges and composite bridges
- gain knowledge on fundamentals of bearings used in bridges.
- get exposure on the conceptual knowledge on bridge maintenance.

Prerequisite: Nil

UNIT I INTRODUCTION TO BRIDGE ENGINEERING 9

Historical background of bridges and types – Bridge aesthetics and proportioning – Design process – Review of applicable design codes – Loads on bridges and force distribution – Bridge geometry – Conceptual design – Classification of bridges – Bridge hydrology – Determination of design discharge, linear water way, economical Span, location of piers and abutments, afflux, scour depth.

UNIT II SLAB AND T- BEAM BRIDGES 9

Design of slab bridges – Skew slab culverts – Box culverts – T-beam bridges – Pigeaud curves – Courbon's theory – Hendry Jaegar method – analysis and design of T-beam bridges.

UNIT III LONG SPAN BRIDGES 9

Hollow girder bridges – Balanced cantilever bridges – Continuous girder bridges – Rigid frame bridges – Arch bridges – Bow string girder bridges – Pre-stressed concrete bridges – Composite pre-stressed concrete super structures – Erection of precast girders – Continuous construction – Recent trends.

UNIT IV BEARINGS AND SUBSTRUCTURE 9

Design of bearings for slab, girder, skew bridges – Design of piers – Abutments – Trestles, Joints – expansion joints. Materials for substructures – Bridge inspection – Caissons – Cofferdams – Spread and pile foundation.

UNIT V BRIDGE MAINTENANCE 9

Bridge failures – Case studies – Maintenance of bridges – Detailed inspection – Routine inspection – Posting of bridges – Rating of existing bridges – Rebuilding of bridges – Retrofitting and rehabilitation of bridges.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- analyse various design codes on bridges and execute reconnaissance of the bridge design.
- be proficient in Substructure of bridges.
- design Superstructure components of bridges.
- evaluate the types of bearings used in bridges.
- execute bridge maintenance and analyze case studies on bridges

TEXT BOOKS

1. KrishnaRaju.N, "Design of Bridges ", Oxford and IBH, 2009.
2. Ponnuswamy.S, "Bridge Engineering", Tata McGraw-Hill, 2008

REFERENCES

1. Jagadeesh T.R. and Jayaram M.A., "Design of Bridge Structures", Prentice Hall of India Pvt Ltd., 2013
2. Johnson Victor.D, "Essentials of Bridge Engineering", Oxford & IBH, 2007.
3. IRC:6-2010 Standard Specifications and Code of Practice for Road Bridges, Section II - Loads and Stresses (Fifth Revision).
4. IRC:24-2010 Standard Specifications and Code of Practice for Road Bridges, Steel Road Bridges (Limit State Method) (Third Revision).

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	1	2	1	-
CO2	2	3	2	2	2	-	-	-	-	-	1	2	2	2
CO3	2	3	2	2	2	-	-	-	-	-	1	2	2	2
CO4	2	3	2	2	2	-	-	-	-	-	1	2	2	2
CO5	3	-	-	-	-	-	-	-	-	-	1	2	1	-

CE16353 MAINTENANCE, REPAIR AND REHABILITATION OF STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the maintenance and repair strategies.
- identify an overview of quality assurance for concrete construction and explain the serviceability and durability properties of concrete under various exposure conditions.
- explain the repair materials and techniques used in the Construction Industry.
- identify the repair, rehabilitation and retrofitting techniques to overcome the structural damage due to various exposure conditions.
- explain the demolition techniques of broken-down structures.

Prerequisite : Nil

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance-Repair and Rehabilitation - Facets of Maintenance, importance of Maintenance - Various aspects of inspection ; Assessment procedure for evaluating a damaged structure - causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE 9

Quality assurance for concrete - Strength, Durability and Thermal properties of concrete ; Cracks, different types, causes ; Effects due to climate, temperature, Sustained elevated temperature; Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETE 9

Polymer concrete ;Sulphur infiltrated concrete ; Fibre reinforced concrete ; High strength concrete ; High Performance concrete ; Vacuum concrete ; Self compacting concrete ;Geopolymer concrete - Reactive powder concrete - Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9

Non-destructive Testing Techniques - Epoxy injection, Shoring, Underpinning, Corrosion protection techniques ;Corrosion inhibitors, Corrosion resistant steels - Coatings to reinforcement, Cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Strengthening of Structural elements - Repair of structures distressed due to corrosion, fire, leakage, and Earthquake demolition techniques - Engineered demolition methods - Case studies.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- apply knowledge about the quality of concrete.
- attain knowledge about the durability aspects of concrete.
- perceive the causes of deterioration of concrete structures..
- evaluate the assessment of distressed structures.
- attain knowledge about repairing of structures and demolition procedures.

TEXT BOOKS

1. P.C.Varghese, Maintenance Repair and Rehabilitation & Minor works of building, PrenticeHall India Pvt Ltd 2014.
2. B.Vidivelli, Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2009
3. Santhakumar. A.R "Concrete Technology", Oxford Higher Education, 2006.

REFERENCES

1. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008
2. Ravishankar.K.,Krishnamoorthy. T.S, Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Allied Publishers, 2004
3. DovKominetzky.M.S., - Design and Construction Failures, Galgotia Publications Pvt. Ltd., 2001
4. Hand Book on "Repair and Rehabilitation of RCC Buildings" – Director General works CPWD , Govt of India New Delhi – 2002

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO2	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO3	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO4	2	-	-	-	-	-	-	-	1	-	1	1	1	-
CO5	2	-	-	-	-	-	-	-	1	-	1	1	1	-

BA16253 TOTAL QUALITY MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- describe the basic concepts in Quality Management, Customer orientation and retention.
- facilitate the understanding of Quality Management principles and process.
- discuss the techniques in Six Sigma, Bench marking and FMEA.
- understand the basic concepts in Quality Function Development and TPM.
- become familiar with Quality System, Quality Auditing in manufacturing.

Prerequisite : Nil

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT II TQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) – Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- discuss the basic concepts in Quality Management, Customer orientation and retention.
- describe the principles and process of Quality Management.
- implement the quality control techniques in Six Sigma, Bench marking and FMEA.
- explain the basic concepts in Quality Function Development and TPM.
- understand the elements in Quality System, Quality Auditing in manufacturing.

TEXT BOOKS

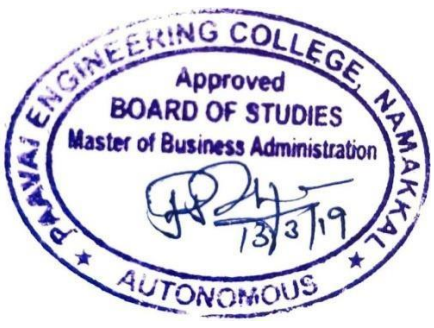
1. Dale H. Besterfiled, et at., "Total quality Management", Third Edition, Pearson EducationAsia, Indian Reprint, 2006.
2. D.R Kiran, "Total quality Management", Butterworth-Heinemann, 2016.

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
4. Dennis AuBuchon, Understanding the Concept of Quality, Pronoun, 2017.
5. Donna C. S. Summers, Quality, Pearson, 5th edition, 2009.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	3	-	-	-	3	-	3	1	-	-
CO2	-	-	-	-	3	-	-	-	3	-	3	1	-	-
CO3	-	-	-	-	3	-	-	-	3	-	3	1	-	-
CO4	-	-	-	-	3	-	-	-	3	-	3	1	-	-
CO5	-	-	-	-	3	-	-	-	3	-	3	1	-	-



BA16151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the basic human values for a professional.
- discuss the significance of ethics in engineering and the theories related to it.
- familiarize oneself with the role of engineer as responsible experimenters.
- expose the students to their roles and responsibilities in assessing safety and reducing risks.
- describe the global issues in ethics and role of engineers as manager and consultants.

Prerequisite :Nil

UNIT I HUMAN VALUES 9

Morals - Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment - Empathy - Self-Confidence - Character - Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories - about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk, risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality- conflicts of interest - occupational crime - professional rights, employee rights, Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers - consulting engineers - engineers as expert witnesses and advisors - moral leadership - sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

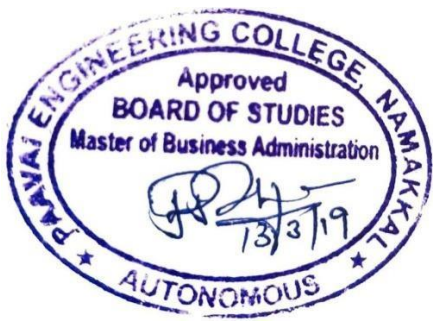
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York(2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists andEngineers",
4. Oxford University Press, (2001).
5. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, New Delhi, (2004).
6. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO2	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO3	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO4	-	-	-	-	-	2	2	2	2	2	2	1	-	-
CO5	-	-	-	-	-	2	2	2	2	2	2	1	-	-



PROFESSIONAL ELECTIVE IV

CE16451 GROUND IMPROVEMENT TECHNIQUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to,

- develop an awareness of problematic soils and selection of ground improvement techniques
- understand drainage and dewatering methods.
- know about the compaction and consolidation behaviour of the soils.
- study the concepts and applications of earth reinforcement.
- know about the suitable grouting techniques for various types of soils.

Prerequisite: Nil

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 9

Role of ground improvement in foundation engineering – methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II DEWATEREING 9

Dewatering Techniques – Well points – Vacuum and electro osmotic methods – Seepage analysis for two – dimensional flow for fully and partially penetrated slots in homogeneous deposits.

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

In-situ densification of cohesionless soils and consolidation of cohesive soils – Dynamic compaction Vibro flotation, Sand compaction piles and deep compaction. Consolidation – Preloading with sand drains, and fabric drains, Stone columns and Lime piles-installation techniques – simple design – relative merits of above methods and their limitations.

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – simple design – applications of reinforced earth – Role of Geotextiles in filtration, drainage, separation, road works and containment.

UNIT V GROUT TECHNIQUES 9

Types of grouts – Grouting equipment and machinery – injection methods – Grout monitoring – stabilization with cement, lime and chemicals – stabilization of expansive soil.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- identify the problematic soil and select the suitable ground improvement techniques.
- determine the seepage analysis of the soil.
- get knowledge on in-situ treatment of cohesionless and cohesive soil.

- understand the concept of earth reinforcement and design of reinforced earth.
- gain knowledge about the various grouting techniques.

TEXT BOOKS

1. Purushothama Raj. P, "Ground Improvement Techniques", Firewall Media, 2005.
2. Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill, 1994.
3. Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, 2013.

REFERENCES

1. Moseley, M.P., "Ground Improvement Blockie Academic and Professional", Chapman and Hall, Glasgow, 1998.
2. Jones J.E.P. "Earth Reinforcement and Soil Structure", Butterworths, London, 1985.
3. IS 13094: Selection of ground improvement techniques for foundation in weak soils – Guidelines -1992

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	1	1	-	-	-	-	2	1	-
CO2	2	-	-	-	-	1	1	-	-	-	-	2	1	-
CO3	2	-	-	-	-	1	1	-	-	-	-	2	1	-
CO4	2	-	-	-	-	1	1	-	-	-	-	2	1	-
CO5	2	-	-	-	3	1	1	-	-	-	-	2	1	-

CE16452 PREFABRICATED STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to,

- impart the basic knowledge about prefabrication
- familiar with prefabricated components
- acquire the basic concepts design principles of prefabrication
- update their knowledge about joints in structural members
- design the prefabricated components for abnormal loads.

Prerequisite: Nil

UNIT I INTRODUCTION 9

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS 9

Behavior of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

UNIT III DESIGN PRINCIPLES 9

Disuniting of structures – Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV JOINTS IN STRUCTURAL MEMBERS 9

Joints for different structural connections – Dimensions and detailing – Design of expansion joints.

UNIT V DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- gather the basic knowledge about prefabrication
- familiarize with prefabricated components
- get the basic concepts design principles of prefabrication
- update their knowledge about joints in structural members
- design the prefabricated components for abnormal loads.

TEXT BOOKS

1. "Precast Concrete Structures", Second Edition by Kim S. Elliott, CRS Publishers, 2016
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 2012.
3. "Precast Concrete Structures", Second Edition by Kim S. Elliott, CRS Publishers, 2016

REFERENCES

1. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8th Edition, Tata McGraw Hill Edition, 2011
2. Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd Edition, USA 2010.
3. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	1	-	1	2	2	-
CO2	2	-	-	-	-	-	-	-	1	-	1	2	2	-
CO3	2	-	-	-	-	-	-	-	1	-	1	2	2	-
CO4	2	-	-	-	-	-	-	-	1	-	1	2	2	-
CO5	2	-	-	-	-	-	-	-	1	-	1	2	2	-

CE16453 INDUSTRIAL STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the planning and layout requirements, guidelines of factories act.
- gain knowledge on design of corbels, Nibs and Staircase.
- know about the various power plant structures.
- learn about the analysis and design of transmission line structures and chimneys.
- gain knowledge on various types of foundations.

Prerequisite: Nil

UNIT I PLANNING AND FUNCTIONAL REQUIREMENTS 9

Classification of Industries and Industrial structures - planning for Layout Requirements regarding Lighting, Ventilation and Fire Safety - Protection against noise and vibration - Guidelines of Factories Act.

UNIT II INDUSTRIAL BUILDINGS 9

Steel and RCC - Gantry Girder, Crane Girders - Design of Corbels and Nibs - Design of Staircase.

UNIT III POWER PLANT STRUCTURES 9

Types of power plants - Containment structures - Cooling Towers - Bunkers and Silos - Pipe Supporting structures.

UNIT IV TRANSMISSION LINE STRUCTURES AND CHIMNEYS 9

Analysis and design of steel monopoles, transmission line towers - Sag and Tension calculations, Methods of tower testing - Design of self-supporting and guyed chimney - Design of Chimney bases.

UNIT V FOUNDATION 9

Design of foundation for Towers - Chimneys and Cooling Towers - Machine Foundation - Design of Turbo Generator Foundation

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- classify the industries and plan the layout requirements based on the guidelines factory act.
- design the Gantry Girder, Crane Girders, Corbels, NIBS and Staircase.
- understand the various power plant structures.
- prepare the design for various chimneys.
- design the foundation for Chimneys, Cooling Towers, Machines and Turbo Generators.

TEXT BOOKS

1. Santhakumar A.R. and Murthy S.S., Transmission Line Structures, Tata McGraw Hill,1992
2. Srinivasulu P and Vaidyanathan.C, Handbook of Machine Foundations, Tata McGraw Hill, 2014.

REFERENCES

1. Jurgen Axel Adam, KatharriaHausmann, Frank Juttner, Klauss Daniel, Industrial Buildings: A Design Manual, Birkhauser Publishers, 2004.
2. Manohar S.N, Tall Chimneys - Design and Construction, Tata McGraw Hill, 1985

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	-	-	1	-	-	-	-	-	-	-	2	-
CO2	2	1	-	-	1	-	-	-	-	-	-	-	2	-
CO3	2	3	3	3	1	-	-	-	-	-	-	-	2	3
CO4	2	1	-	-	1	-	-	-	-	-	-	-	2	-
CO5	2	1	-	-	1	-	-	-	-	-	-	-	2	-

CE16454 TALL STRUCTURES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- design and analyse the various methodologies of tall structures
- perform stability analysis of tall structures.
- impose the knowledge on the control of failures in structures.
- know the concepts behind the analysis and design of buildings.
- study on controlling the buckling of column.

Prerequisite: Nil

UNIT I DESIGN CRITERIA AND MATERIALS 9

Development of High Rise Structures – General Planning Considerations – Design philosophies Materials used for Construction – High Strength Concrete – High Performance Concrete – Self Compacting Concrete – Glass – High Strength Steel.

UNIT II LOADING 9

Gravity Loading – Dead Load – Live Load – Live load reduction technique – Impact Load Construction Load – Sequential Loading, Lateral Loading – Wind load – Earthquake Load – Combination of Loads.

UNIT III BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS 9

Factors affecting growth – Height and Structural form – High rise behaviour of various structural systems – Rigid frames – braced frames – Infilled frames – shear walls – coupled shear walls – wall frames – tubular structures – cores, Outrigger – Braced and hybrid mega systems.

UNIT IV ANALYSIS AND DESIGN 9

Modeling for approximate analysis –Accurate analysis and reduction techniques – Analysis of buildings as total structural system considering overall integrity and major subsystem interaction – Analysis for member forces, drift and twist, computerized general three dimensional analysis.

UNIT V STABILITY OF TALL STRUCTURES 9

Overall buckling analysis of frames, wall-frames – Approximate methods, second order effects of gravity of loading – Simultaneous first-order and P-Delta analysis – Translational, Torsional instability, out of Plumb effects – Stiffness of member in stability, effect of foundation rotation.

45

TOTAL PERIODS

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- perceive the behaviour of tall buildings subjected to lateral building.
- design and evaluate tall building project alternatives on basis of chosen selection criteria
- attain knowledge about principles of designing tall buildings.
- aware with the effects and control of damaged structure.
- perform site specific response analysis to torsion stability

TEXT BOOKS

1. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2012
2. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc.,2011

REFERENCES

1. Lin.T.Y, StotesBurry.D, "Structural Concepts and systems for Architects and Engineers" John Wiley, 2008
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 2006.
3. Wolfgang Schueller, "High Rise Building Structures", John Wiley and Sons, New York 1997

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	1	1	-	-	-	-	-	-	2	2	1
CO2	2	2	2	2	1	-	-	-	-	-	-	2	2	1
CO3	2	2	2	2	1	-	-	-	-	-	-	2	2	1
CO4	2	2	2	2	1	-	-	-	-	-	-	2	2	1
CO5	2	2	2	1	1	-	-	-	-	-	-	2	2	1

CE16455 INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS **3 0 0 3**

COURSE OBJECTIVE

To enable the students to

- study about the theory of vibration.
- equip themselves familiar with wave and wave propagation.
- assess the dynamic properties of soil.
- get familiarized with the procedure used for machine foundation design.
- learn the concept of the vibration isolation and screening techniques.

Prerequisite: Nil

UNIT I THEORY OF VIBRATION **9**

Vibration of elementary systems – Vibratory motion – single degree freedom system – Free vibration with and without damping – Forced vibration with and without damping – Principles of vibration measuring instruments.

UNIT II WAVES AND WAVE PROPAGATION **9**

Wave propagation in an elastic homogeneous isotropic medium – Rayleigh, shear and compression waves – Waves in elastic half space (no theoretical treatment or derivation).

UNIT III DYNAMIC PROPERTIES OF SOILS **9**

Elastic properties of soils – Coefficient of elastic uniform and non-uniform compression and shear – Effect of vibration dissipative properties of soils – Determination of dynamic properties of soil – codal provisions – IS:5249- 1992.

UNIT IV DESIGN PROCEDURES FOR SIMPLE MACHINE FOUNDATION **9**

Design criteria – Dynamic – simple design procedures for foundations of reciprocating type machines (Treated single degree freedom only) – simple design procedures for foundations of impact type machines (Treated single degree freedom only).

UNIT V VIBRATION ISOLATION AND SCREENING **9**

Vibration isolation technique – Foundation isolation, isolation by location, Isolation by barriers active and passive isolation.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of this course, the students will be able to

- evaluate the dynamic properties of soil.
- demonstrate various tests to find the soil properties.
- create the design of machine foundation based on the criteria.
- demonstrate the ability to design machine foundations.
- gather the various methods to reduce the isolation.

TEXT BOOKS

1. Swamisaran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt.Ltd.2010.
2. Prakash.S, and Puri,V.K., "Foundation for Machines", McGraw Hill Publishing Company, Newyork, 1988.

REFERENCES

1. Kameswara Rao, "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003.
2. Kamaswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.
3. Moore.P.J, "Analysis and Design of Foundation for Vibration", Oxford and IBH, 2005.
4. IS 5249 Code of Practice for "Method of test for determination of dynamic properties of soil" Bureau of Indian Standards, New Delhi.
5. IS 2974 Code (Part I to IV) of Practice for "Design and Construction of Machine Foundations", Bureau of Indian Standards, New Delhi.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	**Programme Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	-	1	-	-	-	-	-	-	2	2	1
CO2	2	1	2	-	1	-	-	-	-	-	-	2	2	1
CO3	2	1	2	-	1	-	-	-	-	-	-	2	2	1
CO4	2	1	2	-	1	-	-	-	-	-	-	2	2	1
CO5	2	1	2	-	1	-	-	-	-	-	-	2	2	1