8th Semester

CE 14 801: Environmental Engineering II

Teaching scheme Credits: 4
3hours lecture and 1 hour tutorial per week

To expose students to the area of waste treatment – with emphasis on domestic liquid wastes – its characterisation, collection, treatment and disposal at individual household level to community level - rural and urban. To impart the basic concepts of solid waste management and air pollution control.

Module I (14 Hours)
Systems of sewerage – separate, combines and partially combined systems, quantity of storm
Sewage, source of sewage, relation to water consumption, ground water infiltration, fluctuations of sewage flow, quantity of storm sewage , factors affecting storm water sewage, determination of storm water flow, time of concentration, sewers and sewer appurtenances, materials used in the construction of sewers, shape of sewers, hydraulics of sewers, design of sewers, manholes, inlets, catch basins, grease traps, regulators, leaping weirs, side weirs, siphon spillway, inverted siphons,sewage pumps, pumping stations, ejectors, sewer junctions, outlets, maintenance of sewers, cleaning of sewers, ventilation of sewers.

Module II (12 Hours)
Characteristics of sewage – physical, chemical and biological characteristics – physical and chemical analysis –sampling – population equivalent – characteristics of industrial wastes – treatment of wastewater – screens – grit chambers – detritus tank – skimming tanks – sedimentation tanks – oxidation ponds – design, construction and operation of trickling filters, activated sludge treatment units – disinfection of sewage.

Module III (12 Hours)
Sewage disposal, dilution disposal into stream – pollution assimilation capacity of streams,
disposal by irrigation – surface and subsurface irrigation.Sludge treatment and disposal- quality of sludge, characteristics of sludge, sludge elutriation,sludge conditioning, vacuum filtration, sludge digestion, disposal of sludge.
House drainage-system and prctice of plumbing, plumbing fixtures – closets, urinals, wash basins, sinks,baths and cysterns.principles of house drainage – inspection chambers,ventilation,testing of drains, connection of house drains and street sewer.Rural sanitation – conservancy and water carriage systems, sanitary latrines, septic tanks –(Design as per I.S. specification)

Module IV (14Hours)
Solid waste management – solid waste collection – transportation and processing - types and sources of solid waste – solid waste characteristics – automation and mechanism of refuse collection – vehicles for solid waste collection and transportation - solid waste disposal – composting – incineration – sanitary landfill – prevention of malaria incidental to engineering construction. Gaseous waste management (air pollution and control) – air pollution and health – types of pollutants and their source – air pollution control strategy – basic approaches – areas of legal responsibility – source identification – particulate control and control of gases and vapors.

Text Books
1. Birdie G.S and Birdie J.S, Water Supply and Sanitary Engineering, DhanpatRai& Sons.
2. Duggal K N, Elements of Environmental Engineering, S Chand & Co Ltd.
3. Garg S K, Environmental Engineering Vol II, Khanna Publishers.

Reference Books
1. Elhers and Steel, Municipal and Rural Sanitation, McGraw Hill.
2. Sawer and McCarty, Chemistry for Environmental Engineering, McGraw Hill.
3. Fair, Gayer and Okun, Water and Waste water Engineering Vol. II, John Wiley.

4. Metcalf and Eddy, Waste Water Engineering, Treatment, Disposal & Reuse, Tata McGraw Hill.

Internal Continuous Assessment *(Maximum Marks-50)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.

10% - Regularity in the class

University Examination Pattern

PART A: Analytical/problem solving SHORT questions 8x 5 marks=40 marks

Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.

PART B: Analytical/Problem solving DESCRIPTIVE questions 4 x 15 marks=60 marks

Two questions from each module with choice to answer one question.

Maximum Total Marks: 100

CE 14 802: Quantity Survey and Valuation

Teaching scheme Credits: 4

3 hours lecture and 1 hour tutorial per week

Objectives

After studying the subject, the student should be able

1. To set out any civil engineering work which is the primary duty that is to be performed by a civil engineer in the construction field
2. To prepare detailed exact as well as approximate estimates to meet a number of requirements and also to have a clear picture of the project expenditure.
3. To have a thorough idea regarding the quality and quantity of materials, quantity and classes of skilled and unskilled labours and tools and plants required for the project.
4. To calculate the exact quantities of items of work done for affecting payment especially when direct measurements are difficult and also to determine the quantities of different materials required for various items of work.
5. To draw up specifications for the different items of civil engineering project and also to prepare the schedule of programming of the project.
6. To prepare valuation report of real and landed property

To mould themselves as entry level graduate engineers competent to manage any civil engineering project confidently either alone or jointly.

Module I (14 Hours)

Basic terms – Administrative sanction, expenditure sanction, technical sanction, contingencies, work charged establishment, provisional sum, lump sum items, centage charges etc. Esimate-Types of estimate - Revised estimate, supplementary estimate, maintenance estimate, detailed estimate, approximate estimate - plinth area method, cubic rate method, unit rate method, bay method, approximate quantity from bill method, comparison method, cost from materials and labour etc. preparation of detailed estimate for buildings - centre line method and long wall - short wall method .

Module II (12 Hours)

Methods of measurements of different items of work - Preparation detailed estimate for sanitary and water supply works –septic tank and pit, water tank, pipe lines and fixtures. Roads, culverts, bridges and retaining walls. Irrigation structures. Steel/woden structures –roofs, doors and windows. R C C Structures - Preparation of bar bending schedule. Detailed specifications for common building materials and items of work as per I.S specifications.

Module III (12 Hours)
Preparation of conveyance statement - Calculation of quantities of materials for various items of work-rubble work, brick work, PCC, RCC, plastering, pointing etc. Introduction to data book and schedule of rate. Analysis of rate for various items of civil engineering works-rubble work, brick work, PCC,RCC beams and slabs, plastering, pointing, doors, windows etc. Preparation of abstract of estimate of civil engineering works.

Module IV (14 Hours)
Valuation - Explanation of terms, types of values, sinking fund, years purchase, Depreciation - Straight line method, constant percentage method, S.F method .Obsolescence. Valuation tables. Valuation of real properties-rental method, profit based method, depreciation method. Valuation of landed properties -belting method, development method, hypothecated building scheme method. Rent calculation. Lease andLease hold property.

Text books
1. M.Chakraborthi, Estimating costing & Specification in Civil Engineering
2. B.M.Dutta, Estimating and costing in civil engineering
3. S.C. Rangawala, Valuation of real properties

References
1. I.S.1200-1968 Methods of measurements of buildings and Civil Engineering works
2. Latest schedule of rates of P.W.D
3. Latest Data book of P.W.D

Internal Continuous Assessment *(Maximum Marks-50)*
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PWD Data book and schedule of rate permitted in the examination hall

PART A: Analytical/problem solving SHORT questions 8x 5 marks=40 marks
Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.

PART B: Analytical/Problem solving DESCRIPTIVE questions 4 x 15 marks=60 marks
Two questions from each module with choice to answer one question.
Maximum Total Mark 100 mark

CE14 803: Construction Engineering and Management

Teaching scheme Credits: 4
3 hours lecture and 1 hour tutorial per week

Objective:
To make the students familiar with the various facets of construction and its planning like project scheduling, resource and material management, construction procedures and professional ethics

Module I (14 hours)
Construction planning and management: Network Techniques: Introduction – Bar charts – Use of CPM and PERT for planning – Drawing network diagrams – time estimates – slack – critical path –

Crashing and time-cost trade off - resource smoothing – resources levelling - construction, equipment, material and labour schedules. Preparation of job layout.
Codification of the planning system : Codification approach- Work package and activities identification code – Resource codes – Cost and Finance accounting codes – Technical document codes.

Module II (12 hours)
Construction methods and equipment: Factors for selection of equipment – equipment for excavation and transportation of earth – hauling equipment – piles and pile driving equipment – cranes.
Construction disputes and settlement : Types of disputes – Modes of settlement of disputes – Arbitration- Arbitrator - Advantages and disadvantages of arbitration – Arbitration Award.

Module III (13 hours)
Construction procedures: Different methods of construction – types of contract - tenders – prequalification procedure - earnest money deposit – security deposit - contract document – general and important conditions of contract - measurement and measurement book . Inspection and quality control - need, principles and stages.
Construction cost and budget : Construction cost – Classification of construction cost – Unit rate costing of resources- Budget – Types of budget – Project Master budget.

Module IV (13 hours)
Concept of materials management – Inventory – inventory control – Economic order quantity- Safety stock – ABC analysis.
Safety in construction – Safety measures in different stages of construction – implementation of safety programme.
Concept of ethics – Professional ethics – ethical problems – provisions of a professional code – Role of professional bodies.
Project management information system : - PMIS Concept – Information system computerization – Acquiring a system – Problems in information system management - Benefits of computerized information system.

Text books
1. L.S.Srinath – PERT and CPM –Principles and Applications, Affiliated East-West Press
2. Peurifoy and Schexnayder – Construction Planning, Equipment, and Methods, Tata McGraw Hill
3. S.Seetharaman , Construction engineering and management , Umesh publications.

Reference Books
1. Shrivastava, Construction Planning and Management, Galgotia Publications
2. Gahlot and Dhir, Construction Planning and Management, New Age International
3. F. Harris, Modern Construction and Ground Engineering Equipment and Methods, Prentice Hall.
4.K.K. Chitkara, Construction project management , Tata McGraw Hill
5. P.P. Dharwadkar, Management in Construction Industry, Oxford and IBH
6. Charles D Fledderman, Engineering Ethics, Prentice Hall
7. BIS, National Building Code
8. Khanna, O.P., Industrial Engineering and Management., Dhanapat Rai Publications
9. V.N.Vazirani and S.P.Chandola, Heavy Construction
10. Patil B.S., Civil Engineering Contracts and Estimates, 3rd Edition, University Press, 2006

Internal Continuous Assessment *(Maximum Marks-50)*
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern
PART A: Analytical/problem solving SHORT questions 8x 5 marks=40 marks
Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.
PART B: Analytical/Problem solving DESCRIPTIVE questions 4 x 15 marks=60 marks
Two questions from each module with choice to answer one question.
Maximum Total Marks: 100

CE 14 806 (P): Seminar

Conducting schedule **Credits: 2**
3 hours presentations per week

Objective
To measure as well as flourish the ability of the student to study a topic, in Civil Engineering, of current relevance, from technical literature and present a seminar on that topic. Individual students should be asked to choose a topic in any field of civil engineering, preferably from outside the B. Tech syllabus and give a seminar on that topic for about thirty minutes. It enables the students to gain knowledge in any of the technically relevant current topics and acquire the confidence in presenting the topic. The student will undertake a detailed study on the chosen topic under the supervision of a faculty member, by referring papers published in reputed journals and conferences. Each student has to submit a seminar report (in two copies), based on these papers; the report must not be reproduction of any original paper. A committee consisting of three/four faculty members (preferably specialized in various sub-fields of Civil Engineering) will evaluate the seminar. One of the two copies submitted by the student should be returned to him/her after duly certifying it by the staff in charge of the seminar and Head of the department and the other copy shall be kept in the departmental library.

Internal Continuous Assessment
20% - Relevance of the topic and literature survey
50% - Presentation and discussion
20% - Report
10% - Regularity in the class and Participation in the seminar

CE 14 807 (P): Project

Teaching scheme **Credits:4**
7 hour per week

The project work started in the seventh semester will continue in this semester. The students should complete the project work in this semester and present it to the assessing committee (as constituted in the seventh semester). The performance of the students in the project work shall be assessed on a continuous basis by the project evaluation committee through „progress seminars. And demonstrations conducted during the semester. Each project group should maintain a log book of activities of the project. It should have entries related to the work done, problems faced, solution evolved etc.There shall be at least an Interim Evaluation and a final evaluation of the project in the 8th semester. Each project group has to submit an interim report in the prescribed format for the interim evaluation. Each student is expected to prepare a report in the prescribed format, for final evaluations based on the project work. Members of the project group will present the relevance, design, implementation, and results of the project to the project evaluation committee. Each group will submit the copies of the completed project report signed by the guide to the department. The head of the department will certify the copies and return them to the students. One copy will be kept in the departmental library and one by the respective guide. The assessment committee and project guides will award the marks for the individual students in a project as follows: 50% of the marks is to be awarded by the guide and 50% by the evaluation committee.

Internal Continuous Assessment
40% - Data collection, Planning/ Design and detailing/Simulation and analysis
30% - Presentation & demonstration of results
20% - Report
10% - Regularity in the class

CE 13 808 (P): Viva Voce

Credits: 4

Objective
To examine the knowledge acquired by the student during the B.Tech. course, through an oral examination

The students shall prepare for the oral examination based on the theory and laboratory subjects studied in the B.Tech. course, seminar, and project. There is only university examination for viva voce. The university will appoint two external examiners and an internal examiner for conducting the viva voce examination. These examiners shall be senior faculty members having minimum five years of teaching experience at engineering degree level. For final viva-voce, candidates should produce certified reports of seminar and project (two interim reports and main report). If he/she has undergone industrial training/industrial visit/educational tour or presented a paper in any conference, the certified report/technical paper shall also be brought for the viva-voce. The examiners shall ask questions from subjects studied for the B.Tech course, project, seminar and reports of industrial visits/trainings conducted by the student. Allotment of marks for viva-voce shall be as given below.
Pass minimum is 50%
Note: A student failed in viva voce but had passed in all other subjects shall be given with an additional chance for appearing the viva voce examination with in three months from the date of examination.
Assessment in Viva-voce *(Maximum Marks – 100)*
40% - Subjects
30% - Project
20% - Seminar
10% - Industrial training/industrial visit/educational tour or Paper presented at National-level

ELECTIVES

CE 14 -804(A): Advanced Structural Design II

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objective:
To familiarize the students with analysis & design aspects of some advanced structures like shell roofs, tall buildings and pre-stressed concrete structures

Module 1 (13 Hours)
Shell Roof – Introduction-Classification of shells, types of stresses, Analysis of cylindrical shells, Design of simply supported circular cylindrical shells using membrane theory, Beam theory and ASCE Manual No.31

Module II (13 Hours)
Folded Plates – Introduction- Analysis using Iteration Method and using equation of three shears. Introduction to analysis using Simpson's Method (principles and steps only) - Design using Beam Method

University Examination Pattern

PART A:	*Analytical/problem solving SHORT questions* Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.	*8x 5 marks=40 marks*
PART B:	*Analytical/Problem solving DESCRIPTIVE questions* Two questions from each module with choice to answer one question.	*4 x 15 marks=60 marks*

Maximum Total Marks: 100

Internal Continuous Assessment *(Maximum Marks-50)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

CE 14 804 (E) Remote Sensing and GIS (G)

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Module I (13 Hours)

Remote sensing: definition – components of remote sensing- energy sensor, interacting body – active and passive remote sensing – platforms – arial and space platforms – balloons ,helicopters, aircrafts and satellites – synoptivity and repeativity – electromagnetic radiation (EMR) – EMR spectrum – visible, infrared (IR) near IR, middle IR, thermal IR and microwave – black body radiation – Planck's Law – Stefan –Boltzmann law.

Atmospheric characteristics – scattering of EMR – Raleigh, Mie, Non-selective and Raman scattering – EMR interaction with water vapor and ozone – atmospheric windows – significance of atmospheric windows – EMR interaction with earth surface material, radiance, irradiance, incident, reflected, absorbed and transmitted energy – reflectance – specular and diffused reflection surfaces – spectral signature – spectral signature curves – EMR interaction with water, soil and earth surface.

Module II (13 Hours)

Opticaa and Microwave Remote sensing:

Satellites – classification – based on orbits – sun synchronous and geo synchronous – based on purpose – earth resources satellites , communication satellites, weather satellites, spy satellites – satellite sensors – resolution – spectral, spatial, radiometric and temporal resolution – description of multi-spectral scanning – along and across track scanners- description of sensors in IRS series – current satellites – radar – speckle – back scattering- side looking air borne radar – synthetic aperture radar – radiometer radar – geometrical characteristics. Principles of thermal remote sensing - Principles of microwave remote sensing.

Module III (13 Hours)
Geographic information system – components of GIS – hardware, software and organizational context – data – spatial and non-spatial maps – types of maps – projection- types of projection – data input-digitizer, scanner, editing – raster and vector data structures – comparison of raster and vector data structure – analysis using raster and vector data – retrieval, reclassification, overlaying, buffering - data output – printers and plotters.

Module IV (13 Hours)
Miscellaneous topics: interpretation of satellite images- elements of interpretation – visual interpretation – digital image processing techniques – image enhancement – filtering – image classification – FCC composites - supervised and unsupervised integration of GIS and remote sensing –application of remote sensing and GIS – urban applications – water resources – urban analysis – watershed management – resources information system – hazard mitigation.

Text books:
1. Anji Reddy, Remote sensing and Geographical systems, BS Publications
2. M G Srinivas (Edited by), remote sensing applications, Nerusa publishing house
3. Lillesand T M and Kuefer R W., Remote sensing and image interpretation, John Wiley and sons
4. Jensan J R, Introductory digital image processing, Prentice Hall of India
5. Sabins, Flyod, F., Remote sensing principles and Interpretation, W H Freman and Co., NewYork

References:
1. Janza F J, Blue H M and Johnston, J E., Manual of remote sensing vol. I., American Society of Photogrammetry, 1975
2. Burrough P A., Principles of GIS for land resource assessment, Oxford
3. Star Jeffrey L (Ed), EstsJoh E and McGwire Kenneth, Integration of geographical systems and remote sensing, Cambridgeuniversity.
4. De Merse, Michael N., Fundamentals of geographic information system, 2nd edn., John Wiley and sons.

Internal ContinuousAssessment*(Maximum Marks-50)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Analytical/problem solving SHORT questions* *8x 5 marks=40 marks*

Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.

PART B: *Analytical/Problem solving DESCRIPTIVE questions* *4 x 15 marks=60 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 100

Shore Protection works: description and effects of break waters-sea walls-groynes of various types-beach nourishment, break waters, tetrapod, tribar etc. Hudson's formula and simple design problem.

Text Books:

Ippen A.T, R, Estuary and Coastline Hydrodynamics
.Sarpkaya, T.,Isaacson,M., Mechanics of Wave Forces on Offshore Structures, Van NostrandRenhold Company

Reference Books:

1 Chakrabarti,S.K., Hydrodynamics of Offshore structures, Computational Mechanics Publications, Southampton, Boston
2. Wiegel R.L, Oceanographical Engineering, Prentice Hall.
3. Coastal Engineering Manual (CEM-Department of the Army-US Army Corps of Engineers-2001 or latest revision)

Internal assessment: Maximum marks:50

60% - Tests (Minimum 2)
30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term project, software exercise etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Analytical/problem solving SHORT questions* Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.	*8x 5 marks=40 marks*
PART B:	*Analytical/Problem solving DESCRIPTIVE questions* Two questions from each module with choice to answer one question.	*4 x 15 marks=60 marks*

Maximum Total Marks: 100

CE 14 805 (D) Ground Improvement Techniques

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Objective of ground improvement-In-situ ground improvement methods-Introduction to soil improvements without the addition of many material - surface compaction –compaction piles in sand-impact compaction/dynamic compaction of sands – vibratory compaction in sand-vibroflotation in

sand–explosions in sand- Terra probe method- replacement process - vibroflotation in clays--preloading techniques- sand drains-stone columns-introduction to soil improvement by thermal treatment- introduction to bio technical stabilization

Module II(14 hours)

Introduction to soil improvement by adding materials - lime stabilization –Mechanism-optimum lime content-lime fixation point-effect of lime on physical and engineering properties of soil- lime column method - stabilization of soft clay or silt with lime – stabilization with cement-suitability for soils-effect on properties of soils

Grouting-types-desirable characteristics of grouts-grouting methods-grouting pressure-grouting materials - grouting technology-permeation grouting- compaction grouting- soil fracture grouting-jet grouting - application and limitations - slab jacking, grouted columns-application to dams.

Module III (12 hours)

Geosynthetics–Types-applications (only general applications)- types of geotextiles and geo grids - physical and strength properties of geotextiles and geogrids - behaviour of soils on reinforcing with geotextiles and geogrids- - design aspects with geotextiles and geogrid for clay embankments, retaining walls and unpaved roads.

Module IV (12 hours)

Soil improvement using reinforcing elements - introduction to reinforced earth - load transfer mechanism and strength development - soil types-reinforcing materials - Reinforced earth retaining walls- reinforced embankments-soil nailing -improvement using natural materials (introduction only).

Reference books:

1. Moseley, Text Book on Ground Improvement, Blackie Academic Professional, Chapman & Hall
2. Purushotham S. Raju, Ground Improvement Technique,Laxmi Publications
3. Shashi K. Gulhati and ManojDutta, Geotechnical Engineering, Tata McGraw-Hill Publishing CompayLimited,New Delhi.
4. Boweven R., Text Book on Grouting in Engineering Practice, Applied Science Publishers Ltd
5. Jewell R.A., Text Book on Soil Reinforcement with Geotextiles, CIRIA Special Publication, Thomas Telford
6. Donald .H. Gray &Robbin B. Sotir, Text Book On Bio Technical & Soil Engineering Slope Stabilization, John Wiley
7. Rao G.V. &Rao G.V.S., Text Book On Engineering With Geotextiles, Tata McGraw Hill
8. Korener, Construction & Geotechnical Methods In Foundation Engineering, McGraw Hill

Internal ContinuousAssessment*(Maximum Marks-50)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A:	*Analytical/problem solving SHORT questions* Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.	*8x 5 marks=40 marks*
PART B:	*Analytical/Problem solving DESCRIPTIVE questions* Two questions from each module with choice to answer one question.	*4 x 15 marks=60 marks*

Maximum Total Marks: 100

CE 14 805 (E) Environmental Pollution Control Engineering (G)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objective:

- To provide students with balanced information regarding different elements of pollution and its control measures
- To make students aware of statutory controls for pollution control.

Module I (13 Hours)

Environmental pollution – interrelationship between various forms of pollution – surface water pollution surveys – integrated river basin water management – restoration of water bodies – water quality parameters and optimization of treatment – water quality changes by domestic use – radioactive materials – thermal pollution and underground disposal – types of water pollutants and their effects – instrumentation for water quality and treatment – role of wastewater treatment as pollution control measure.

Module II (13 Hours)

Air pollution control strategy – basic approaches – areas of legal responsibility – source identification – particulate control and control of gases and vapours – factors affecting control approach selection – air pollution control technology – settling chambers – filters – electrostatic precipitators – wet scrubbers – entrainment separators – gas adsorption, gas absorption and combustion.

Module III (12 Hours)

Land pollution – pollution cycle – ecological factors in plant site selection – ecological aspects of vegetation control – noise pollution – the physics of sound and hearing – effects of noise – sources – instruments and techniques for noise measurements – light and glare pollution – light and its characteristics - glare – outdoor lighting and glare sources – corrective procedures.

Module IV (14Hours)

Environmental impact analysis – physical, social, aesthetic and economic assessment of highway project, mining and power plants – legislative control – water pollution laws and regulations – Air pollution control act of India – chimney heights – land pollution laws and regulations.

Reference Books:

1. Rao C S, Environmental Pollution Control Engineering, New Age International (P) Ltd.
2. Goel P K, Water Pollution Causes, Effects and Control, New age International (P) Ltd.
3. Birdie G.S & Birdie J.S, Water Supply and Sanitary Engineering, DhanpatRai& Sons.
4. Bethea R.M, Air Pollution Control technology, Van Nostrand Reinhold Co.

5. Flintoff F, Management of solid waste in developing countries, WHO.
6. LiptekBela G &Bouis P.A., Environmental Engineers Handbook Vols I, II, III, Chilton Book Company.
7. Water Pollution Act (1974) passed by Govt. of India.
8. Air pollution Control act of India.
9. Relevant Indian Standards & factory Acts.

Internal ContinuousAssessment*(Maximum Marks-50)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Analytical/problem solving SHORT questions* *8x 5 marks=40 marks*

Candidates have to answer EIGHT questions out of TEN. There shall be minimum of TWO and maximum of THREE questions from each module with total TEN questions.

PART B: *Analytical/Problem solving DESCRIPTIVE questions* *4 x 15 marks=60 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 100