|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Exam slot** | **Course no** | **Name** | **L-T-P** | **Internal marks** | **End semester marks** | | **Credits** |
| MARKS | DURATION(hrs) |
| A | 08CEE6301 | Applied Statistics | 3-0-0 | 40 | 60 | 3 | 3 |
| B | 08CEE 6303 | Environmental Chemistry | 3-0-0 | 40 | 60 | 3 | 3 |
| C | 08 CEE6305 | Environmental Microbiology | 4-0-0 | 40 | 60 | 3 | 4 |
| D | 08 CEE6307 | Physicochemical methods in Environmental Engineering | 3-0-0 | 40 | 60 | 3 | 3 |
| E | 08 CEE6309 | Elective | 3-0-0 | 40 | 60 | 3 | 3 |
|  | 08 CEE6311 | Research methodology | 0-2-0 | 100 | 0 | 0 | 2 |
|  | 08CEE6313(P) | Seminar |  | 100 | 0 | 0 | 2 |
|  | 08 CEE315(P) | Advanced Environmental Engineering Lab-I | 0-0-2 | 100 | 0 | 0 | 1 |
| Total | | | | | | | 21 |

**SEMESTER I**

**ELECTIVES**

08 CEE 6309A Industrial Water Pollution Control

08 CEE 6309BSolid and Hazardous Waste Management

08 CEE 6309C Instrumental Methods in Environmental Engineering

**SEMESTER II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | 08CEE6302 | Biological methods in Environmental Engineering | 4-0-0 | 40 | 60 | 3 | 4 |
| B | 08CEE6304 | Air Quality Management and Meteorology | 3-0-0 | 40 | 60 | 3 | 3 |
| C | 08 CEE6306 | Environmental Impact Assessment | 3-0-0 | 40 | 60 | 3 | 3 |
| D | 08 CEE6308 | Elective I | 3-0-0 | 40 | 60 | 3 | 3 |
| E | 08 CEE6310 | Elective II | 3-0-0 | 40 | 60 | 3 | 3 |
|  | 08 CEE6312 | Mini project | 0-0-4 | 100 | 0 | 0 | 2 |
|  | 08 CEE6314 | Lab | 0-0-2 | 100 | 0 | 0 | 1 |
| Total | | | | | | | 19 |

**Elective I**

08 CEE 6308A Water Pollution Control and Stream Sanitation 08 CEE 6308B Environmental Health and Hygiene

08 CEE 6308C Environmental Systems Analysis

**Elective II**

08 CEE 6310 A Advanced Hydrology and water resources engineering

08 CEE 6310B Groundwater Contamination and Pollution Transport

08 CEE 6310C Environmental Geology

**SEMESTER III**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | 08CEE7301 | Elective I | 3-0-0 | 40 | 60 | 3 | 3 |
| B | 08 CEE7303 | Elective II | 3-0-0 | 40 | 60 | 3 | 3 |
|  | 08 CEE 7305 | Seminar | 0-0-2 | 100 | 0 | 0 | 2 |
|  | 08 CEE 7307 | Master Research Project Phase-I | 0-0-12 | 50 | 0 | 0 | 6 |
| Total | | | | | | | 14 |

**ELECTIVE I**

08 CEE 7301A GIS and Remote Sensing

08 CEE 7301B Numerical Methods

**ELECTIVE II**

08 CEE 7303 A Planning and Design of Environmental  
Facilities  
08 CEE 7303B Environmental Legislation  
08 CEE 7303C Urban Environmental Quality Management

08 CEE 7303D Envirionmental Biotechnology

SEMESTER IV

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 08CEE 7302 | Master Research Project Phase-II | 0-0-21 | 70 | 30 | 0 | 12 |

**08 CEE6305: ENVIRONMENTAL MICROBIOLOGY**

Credits: 4

Hours per week: Lecture-3 and Tutorial-1

Objective: To understand the fundamentals of biological treatment process in environmental engineering

MODULE1

Introduction to microbiology - microorganism and their characteristics- classification and application in sanitary engineering. General characteristics of the bacteria, algae, fungi, protozoa, viruses, rickettsiae, chlamydiae.

MODULE 2

Principles and use of light microscopes-dark field, bright field, phase contrast and fluorescent. Electron microscopes- Scanning and Transmission type.Characteristics of bacteria -observation of wet and stained preparation - Grams stain.

MODULE 3

Growth of bacteria, growth curve factors influencing growth aerobic and anarobic growth- role of enzymes, mechanism of action and factors influencing enzyme action-basic concepts of metabolism.

Culture media, composition, classification.

MODULE 4

Microbiology of water, wastewater, soil and air - water borne diseases and their causativeorganisms, bacteriological analysis of water and sewage, test for coliforms, their significance,

bacteriological standards, MPN and membrane filter technique.

MODULE 5

Importance of sterilization, factors influencing sterilization, principles and methods, Microbial production of industrial products, principles of bio technology applied to wastetreatment, waste utilization, bio-energy conversion

MODULE 6

Biogeochemical cycling, diary microbiology-diseases transmitted through milk,

**References**

1.Rose E Mckanney. Microbiology for sanitary engineers-

2. Gamey and Lord. Microbiology for waste water and sewage

3. Pelczhar and Reid. Test book of microbiology.

4. Standard methods . APHA.

5. Roger T Stainer and Michael Dandroff. General Microbiology.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suit best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08 CEE6307: PHYSICOCHEMICAL METHODS IN ENVIRONMENTAL**

**ENGINEERING**

Credits: 3

**Objectives**

1. To study about the solid- liquid- gas interactions

2. To understand about process kinetics

3. To deal with the microbial applications in environmental engineering

**Outcomes**

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

1. understand the mass transfer and transport of impurities in system

2. apply the concepts of oxidation- reduction equilibra

3. study and applying practically about microbial kinetics

**Contents**

• Fundamentals of water chemistry and its forms

• Chemical reactions and kinetics

• Ecosystems and changes

• Biological components and cells

• Microbiological principles and degradation processes

**MODULE1**

Process dynamics-Reactions and Reactors- Mechanics of mass transport-reactions andenergetics-kinetics and reaction rates-reactor engg. and process design.

**MODULE 2**

Screenings-types of screens-head loss in screens

Equalization process-types of equalization process-volume of equalization basins

**MODULE 3**

Sedimentation-sedimentation processes- types of settlings- tube settlers-design of sedimentation tanks

Coagulation and flocculation- coagulation processes-stability of colloids-destabilisation of colloids in water and wastewater treatment-transport of colloidal particles

Floatation and aerosol separation-methods of floatation-gas particle contact-dissolved air floatation.

**MODULE 4**

Filtration-filtration processes-filter media- types of filters-mechanisms of filtration-hydraulics of filtration-filter problems -effluent quality-design of filters

**MODULE 5**

Disinfection-processes-methods of disinfection-factors influencing-nonchemical methods-details of chlorination-other disinfectants.

Adsorption-adsorption process-adsorption isotherm-adsorption kinetics-factors influencing-design of adsorption units

Ion exchange- process-materials-exchange reactions-application in water and wastewater treatment-design of units

Membrane process-Reverse osmosis-electrodialysis-ultra filtration-membrane properties-process design

Chemical oxidation-principles and theories-generation and application of chemical methods

**MODULE 6**

Sludge treatment-characteristics of sludge-dewatering methods-conversion process-anaerobicand aerobic digestion-combustion-disposal, of sludge.

**References**

1.Weber W. J. Physico-chemical processes for water quality control (Wiley Inter-

science,1972)

2.Rich L. G. Unit operations of sanity engineers (Wiley Topan)

3.Fair G. M Etal- Water and wastewater engg

4.Stermm,W & Morgan J. J.-Aquatic chemistry

5.Halfferic F.- Ion Exchange

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

emester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module I

Question 1 : 20 marks

Question 2 : 20 marks

Module II

Question 3 : 20 marks

Question 4: 20 marks

Module III

Question 5 : 20 marks

Question 6: 20 marks

Module IV

Question 7 : 20 marks

Question 8: 20 marks

08 CEE6309: ELECTIVE

**08 CEE6309A INDUSTRIAL WATER POLLUTION CONTROL**

Credits: 3

Hours per week: Lecture-3 and Tutorial-1

**Objectives**

To enable a comprehensive understanding of:

1. Understand the industrial process, water utilization and waste water generation

2. Characteristics of industrial waste water and treatment options of industrial waste water

**Outcomes**

Clearly, the outcomes directly relate to the objectives, and upon completion of the course, the

students shall be able to:

1. Analyze the waste water from different industries

2. Design suitable units for industrial waste water treatment

3. Select the suitable residue disposal options

**MODULE 1**

Damages caused by industrial pollution- Effects of industrial waste on stream- Effects of industrial waste on sewage treatment plants- Study of some typical problem caused byindustrial pollution in India – Need for environment impact assessment for major industries.

**MODULE 2**

Volume reduction of industrial waste- strength reduction of industrial waste- neutralization-equalization and proportioning

Joint treatment of raw industrial waste with domestic sewage- Joint treatment of partially treated industrial waste with domestic sewage – Discharge of treated waste to municipalsewers- Stream protection measures.

**MODULE 3**

Industrial manufacturing process of the following industries-Textile mills, Dairy plant, Canneries, Distilleries, Fishing industry, Sugar mills , Pulp and paper mills, Rubber industry,Metal plating industry, Oil refineries, Petrochemicals, Fertilizer plant, steam power plant-

**MODULE 4**

Origin of radioactive wastes.Treatment and disposal of radio active wastes

**MODULE 5**

Characteristics of waste, waste management and treatment methods in the following industries-Textile mills, Dairy plant, Canneries, Distilleries, Fishing industry, Sugar mills ,Pulp and paper mills, Rubber industry

**MODULE 6**

Characteristics of waste, waste management and treatment methods in the following industries Metal plating industry, Oil refineries, Petrochemicals ,Fertilizer plant, steam power plant-

**References**

1. N.L. Nemerrow –Theories and practices of Industrial Waste Engineering.

2. C.G. Gurnham –Principles of Industrial Waste Engineering.

3. M.N. Rao and Dutta – Industrial Waste.

4. Berne F. – Industrial Waste Treatment

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08 CEE6309B SOLID AND HAZARDOUS WASTE MANAGEMENT**

Credits: 3

Objective: To provide information regarding different elements of land pollution, various

hazardous wastes, their origin, characteristics and treatment.



**MODULE 1**

Legal and Organizational foundation: Definition of solid waste-waste generation in a technological society- major legislation, monitoring responsibilities,

sources and types of solid waste- sampling and characterization- Determination of composition of MSW- storage and handling of solid waste- Future changes in waste composition.

**MODULE 2**

Collection and transport of solid waste: Collection of Solid waste: type of waste collection systems, analysis of collection system- alternative techniques for collection system.

Separation and Processing and Transformation of Solid Waste: unit operations used forseparation and processing, Materials Recovery facilities, Waste transformation throughcombustion and anaerobic composting, anaerobic methods for materials recovery and

treatment- Recycling of pastic materials and metals. Energy recovery – Incinerators.

**MODULE 3**

Transfer and Transport: need for transfer operation, transport means and methods, transfer stationtypes and design requirements. Landfills: Site selection, design and operation, drainage and leachate collection systems – requirements and technical solutions, designated waste landfill remediation – Integrated waste management facilities.

**MODULE 4**

Hazardous waste management: Definition and identification of hazardous wastes- sources and characteristics- hazardous wastes in Municipal Waste- Hazardous waste regulations –minimization of Hazardous Waste – compatibility, handling and storage of hazardous waste-collection and transport.

**MODULE 5**

Hazardous waste treatment and design: Hazardous waste treatment technologies – Design and

operation of facilities for physical, chemical and thermal treatment of hazardous waste

**MODULE 6**

Biomedical waste disposal.Solidification, chemical fixation and encapsulation, incineration.

Hazardous waste landfills: Site selection, design and operation – remediation of hazardouswaste disposal sites.

**References**

Technobanoglous et al –Integrated Solid Waste Management, McGraw- Hill

Charles A. Wentz – Hazardous Waste Management, McGraw- Hill

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6311 RESEARCH METHODOLOGY**

Credits:2

Hours per week: Lecture-3 and Tutorial-1

Objective: To impart knowledge about various methodologies followed in engineering

research, formulation of research problems and to apply the same in project work. To

make students aware of the problems faced by Indian researchers.

**MODULE 1**

Research Concepts – concepts – meaning – objectives – motivation.

Types of research – descriptive research – conceptual research –

theoretical research – applied research – experimental research.

Research process – Criteria for good research – Problems encountered

by Indian researchers.

**MODULE 2**

Formulation of Research Task – Literature Review – Importance &

Methods – Sources – Quantification of Cause Effect Relations –

Discussions –

**MODULE 3**

Field Study – Critical Analysis of Generated Facts –

Hypothetical proposals for future development and testing,

selection of Research task

**MODULE 4**

Mathematical modelling and simulation – Concepts of modelling – Classification of mathematical models – Modelling with – Ordinary differential equations – Difference equations – Partial differential equations

**MODULE 5**

Graphs – Simulation – Process of formulation of model based on simulation.Interpretation and report writing – Techniques of interpretation – Precautions in interpretation –

**MODULE 6**

Significance of report writing – Different steps in report writing –

Layout of research report – Mechanics of writing research report – Layout and format – Style of writing – Typing – References – Tables – Figures – Conclusion – Appendices.

**References:**

1. J.W. Bames, Statistical Analysis for Engineers and Scientists, McGraw Hill, N.York

2. Schank Fr., Theories of Engineering Experiments, Tata Mc Graw Hill Publication.

3. C. R. Kothari, Research Methodology, New Age Publishers.

4. Willktnsion K. L, Bhandarkar P. L, Formulation of Hypothesis, Himalaya Publication.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6309C INSTRUMENTAL METHODS IN ENVIRONMENTAL ENGINEERING**

**Course Objectives**

* To provide information regarding principles and details of quantitative analysis of different parameters present in water and air.
* Teach the students about the principles and techniques of instrumental analysis which are utilized to support decision making in environmental engg.
* To provide a fundamental understanding of the principles, capabilities and limitations of modern chemical analysis used in environmental field.
* To provide a practical experience of the use of analytical instruments for the analysis of environmental samples
* To provide the necessary background for understanding the scientific literature that pertains to environmental chemical analysis.
* Develop an understanding of experimental, calibrational and analytical errors and the significance of statistical and quality assurance methods

**Course outcome**

**The student will be**

* Ability to design experiments and conduct lab works pertinent to environmental analyses confidently, efficiently and in a safe manner.
* Ability to interpret results from laboratory tests, and analyse data and suggest remedies to common analytical problems encountered in the environmental engg
* Able to analyze waters and wastewaters for a wide range of advanced chemical characteristics like specific organic and inorganic contaminants, TOC,

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| |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | |  | | **MODULE 1**  Basic Principles, Instrumentation and application of solvent extraction, ion exchange,  electrophoresis, Limitations of analytical methods Accuracy and precision classification and minimization of errors.  Instrumental methods in environmental engineering, analytical methods, chemical, instrumental and biological methods. Analytical instruments and process instruments, | | **MODULE2**  Sensors, body of the instrument, read out, accuracy, precision, sensibility, range, resolution.  Transducers- measurement of nonelectrical quantities like pressure,temperature,displacement,velocity,accelerationetc.strain gauge and its applications, use of microprocessors in instrumentation.  Potentiometer:pHmeter,ionselectiveelectrodes,redoxpotential.Polarographicanalysis,photometry, DO meter, conductivty, coulometry and its applications. | |  | | **MODULE 3**  Optical methods of analysis:absorption and emission methods, interaction of radiation with different types of molecular energy Basic principles, Instrumentation and Applications of visible spectrum photometer, Spectrophotometry- U.V. Spectrometer,infraredspectrometer,flame photometer, atomic absorption spectrophotometer.X-ray diffraction method,massspectrometer,methods using microscopy,refractrometric method. | | **MODULE 4**  Dispersion and scattering:turbidimetry and nephelometry,fluorimetry.Thermal conductivity method ,radioactivity methods,sound absorption method. | |  | | **MODULE 5**  Chromatography:general principles and specific techniques-thin layer,column,liquid, high performance, ion etc. | | **MODULE 6**  Air and water pollution control instrumentation,computer aided analysis,process instrumentation and control in lab and pilot experiments.  Process Control Instrumentation:basic design concepts for air ,water and waste water treatment process instrumentation | |  | | |

**References:**

1. D.A. Skoog, D.M. West and T.A. Nieman, Principles of Instrumental Analysis,5th Ed. Thomson Asion (P) Ltd. Singapore, 2004
2. Daniel C Harris, Quantitative chemical analysis, 8th edn (2011)
3. H.H, Willard, L.L. Merit, J.A. Dean and F.A. Settle, Instrumental Methods of Analysis, 7th Ed. CBP Publishers and Distributors, New Delhi, 1986
4. Keith A Smith, Malcalm S Cressar, Soil & Environment Analysis, Modern Instrumental Techniques, Marcel Dekker, inc.
5. Kemmer-The NALCO Water Handbook, Tata McGraw Hill
6. Prdyot Patnaik, Hand bok of envtl analysis:chemical pollutants in air, water soil and solid wsats, 2nd edn.
7. Principles of instrumentsal abnalysis, 6th edn Skog, Holler and Nieman

8.Sawyer and McCarty-

**08CEE6313(P) SEMINAR**

Credits:2

Hours per week 2

Objective: To assess the debating capability of the student to present a technical topic. Also

to impart training to students to face audience and present their ideas and thus creating in

them self esteem and courage that are essential for engineers.

Individual students are required to choose a topic of their interest from Environmental Engineering related topics preferably from outside the M.Tech syllabus and give a seminar on that topic about 30 minutes. A committee consisting of at least three faculty members (preferably specialized in Environmental Engineering) shall assess the presentation of the seminar and award marks to the students. Each student shall submit two copies of a write up of his/her seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation.

Internal continuous assessment: 100 marks

**08CEE6315(P): ADVANCED ENVIRONMENTAL ENGINEERING LAB –I**

Credits: 2

Hours per week: 2

Objective To analyse the characteristics of water/wastewater samples

Sampling - Taking Grab and composite samples.

Physical characteristics of water/wastewater – Turbidity, electrical conductivity, solids

Chemical analysis of water – determination of ions by colorimetric, volumetric analysis,

preparation of standards BOD, COD

Analysis of soil for organic content, chloride, sulphate, pH, conductivity

References

1.Standard methods for the examination of water and waste water, American public

health association 1996, NewYork.

2.F.W. Fifield and P.J. Haives Blackie, Environmental Analytical Chemistry, Academic

and professional glasgow.

Internal continuous assessment: 100 marks

**SEMESTER 2**

**08CEE6302: BIOLOGICAL METHODS IN ENVIRONMENTAL**

**ENGINEERING**

Credits 4

Hours per week: Lecture-3 and Tutorial-1

Objective: To familiarize the students with collection and characterization of wastewater

samples, their treatment and disposal and advanced wastewater treatment process and

their applications

**MODULE 1**

Objectives of biological treatment – Role of microorganisms in waste water treatment – Types of biological processes for waste water treatment – Different microbial metabolisms – Bacterial growth patterns –

**MODULE 2**

Microbiological treatment kinetics and flow regimes – Michaelis-Menten and Monod models – Rate of biomass growth with soluble substrates – Kinetic coefficients – Effect of temperature – Oxygen requirements – Biomass yield – Observed yield

– Kinetic constants evaluation of biological treatment.

**MODULE 3**

Aerobic biological treatment – Attached growth and suspended growth treatment systems –Modeling suspended growth treatment process – Activated sludge process – Description – Various types – Methods of aeration – Microbiology – Process analysis – Process design

considerations – Operational difficulties – Modifications.

**MODULE 4**

Sequencing Batch Reactor – Process description and operation.

Trickling filter – Filter classifications – Microbiology – Process design considerations –Design of physical facilities – Recirculation – NRC Equation – Operational difficulties.

**MODULE 5**

Aerated lagoons – Types – Process design considerations.

Stabilisation ponds – Classification – Design considerations.

Sludge treatment and disposal – Characteristics of sludge – Sludge processing – Preliminary operations – Thickening – Stabilizatio - Aerobic digestion - Anaerobic digestion – Composting – Conditioning – Dewatering - Heat drying - Incineration- Wet air oxidation – Land application

**MODULE 6**

Advanced biological treatment processes – Nitrogen removal – Nitrification and Denitrification -Stoichiometry – Process analysis – Operational and environmental variables.

Economics of biological treatment – Constructional cost, capital cost, operational cost – Total cost.

References

.Metcalf and Eddy Inc. - Waste Water Engineering: Treatment, disposal and reuse,

Tata McGraw Hill

.Benefield and Randall- Biological treatment Process – Design for waste water

Treatment Prentice Hall of India, New Delhi.

Hammer- Water and Waste Water Technology, John Wiley and Sons

.Quano- Principles of Waste Water Treatment, Vol. I, Oxford and IBH

.Eckenfelder and Conner – Biological waste Treatment

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6304: AIR QUALITY MANAGEMENT AND METEOROLGY**

Credits 4

Hours per week: Lecture-3 and Tutorial-1

**Aims & Objectives**

This course explores the aspects of the science of atmospheric pollution, looking at issues such

as atmospheric composition, monitoring, acidic deposition, urban air quality and global changes

in the atmosphere. The use of models in air pollution studies will be reviewed. Effects based

approaches to air pollution control practices will be assessed. The public health implications of

air and noise pollution at a range of spatial scale will be outlined.

**Expected Outcome**

After taking this course the student will be able to :

• To describe the main chemical components and reactions in the atmosphere and examine

the factors responsible for perturbing these.

• To review established methods for monitoring and modeling spatial and temporal

patterns of pollution.

• To explore air pollution issues at a range spatial scales and how these are relaxed.

• To assess the environmental impacts of atmospheric pollution.

• To evaluate the scientific basis underlying in controlling of air pollutants.

**MODULE 1**

Air pollution – sources and effects – Definition and concentrations, classification and properties of air pollutants, emission sources, major emissions from global sources,importance of Anthropogenic sources, behaviour and fate of air pollutants. Photochemicalsmog, Effects of air pollution on health, vegetation and materials damages.

**MODULE 2**

Meteorological aspects of air pollutant dispersion – Temperature lapse rates and stability,

wind velocity and turbulence, plume behaviour, dispersion of air pollutants, solutions to the atmospheric dispersion equation, The Gaussian plume model.

**MODULE 3**

Air pollution sampling and measurement – Types of pollutant sampling and measurement, ambient air sampling, collection of gaseous air pollutants, collection of particulate pollutants,stack sampling, analysis of air pollutants – sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and ozone, hydrocarbons, particulate matter.

**MODULE 4**

Air pollution control methods and equipment – Control methods, source correction methods, cleaning of gaseous effluents, particulate emission control – gravitational settling chambers,

cyclone separators, fabric filters, electrostatic precipitators, wet scrubbers, selection of a particulate collector, control of gaseous emissions, absorption by liquids, adsorption by solids, combustion, biological methods

**MODULE 5**

Control of specific gaseous pollutants – Control of sulphur dioxide emission, desulphurisation of flue gases, Dry methods, wet scrubbing methods, control of nitrogen oxides, Modification of operating conditions, modification of design conditions, effluent gas

treatment methods, Carbon monoxide control, control of hydrocarbons, mobile sources.

**MODULE 6**

Air pollution laws and standards.

References:-

1.C.S.Rao. Environmental Pollution Control Engineering, Wiley Eastern Ltd, Delhi

2.Stern A. Air pollution Control vols 1, 2, 3. Academic press, Newyork

3.Magill. P. L. Air pollution hand book McGraw -Hill.

4.De Nevers Air Pollution Control Engineering McGraw-Hill.

5.Chhatwal G.R. Encyclopedia of Environmental Pollution and Control. Vol 1,2,3

Anmol Publications

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6306: ENVIRONMENTAL IMPACT ASSESSMENT**

Credits 3

Hours per week: Lecture-3 and Tutorial-1

**Objectives:**

1. To understand the environmental concept and processes by which normative rules are

adopted and to introduce the relevant policies and legal systems related to environmental

management systems (EMS) including their strengths and weaknesses.

2. To develop an understanding the application of EIA procedures during pre, postappraisals

and long-term mitigation to promote ecosustainable developments.

3. To inculcate the effective use of EMS and implementation of recently developed

management concepts and strategies like environmental auditing, waste auditing, life cycle

assessment (LCA), and introduction to ISO 14000 series

4. To improve technical writing skills so that students may be to create a basic

environmental assessment report.

5. To learn the integrative approaches for environmental management systems (EIA, EA,

LCA) for cleaner production and sustainable development

**Outcome:** Students will be able to

1. Explain the philosophy and art of environmental management systems

2. Apply the mechanics of EIA for Project Appraisal, Decision making and Implementation

3. Work as a professional member of a team conducting environmental assessments and

auditing, and LCA.

MODULE 1

Concept of environmental impact analysis –Legislations, laws and Acts relevant to Environmental protection in India – Factors for consideration in assessing environmental impacts- Measurement of environmental impacts – Short term and long term effects.

MODULE 2

Socioeconomic impact analysis- Types of socioeconomic impacts – Outline of the basic stepsin performing socioeconomic impact assessment.

MODULE 3

Air quality impact analysis - Air pollutants-sources - Atmospheric interaction- Environmentalimpact assessment methodology

Noise impact analysis- typical considerations- Environmental impacts and effects of noise on people- control of noise pollution.

MODULE4

Water quality impact analysis – water quality criteria and standards –Environmental setting- modelling - water quality impacts by projects like highways, power plants, mining, agriculture and irrigation, forest management.

MODULE 5

Energy impact analysis- Energy impact considerations, organization and methodology. Vegetation and wildlife impact analysis

MODULE6

Environment assessment – assessment methodologies

Summarization of Environmental Impact –Checklist method, Matrix method, Network method.

References:-

1. John G. Rau and David C. Wooten –Environmental Impact Analysis Handbook.

2. Canter –Environmental Impact Assessment.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6308A: WATER POLLUTION CONTROL AND STREAM SANITATION**

Credits 3

Hours per week: Lecture-3 and Tutorial-1

Objective: To make the students aware about the sources of surface water pollution, their control and stream quality standards

MODULE 1

Introduction-importance of water sources-socio-economic importance-sources of pollution-types of waste-waste products of man’s activities-sources of stream pollution-types of waste

products-location and management of waste loads-projecting waste loadings

Water quality and stream quality standards

MODULE 2

Eutrophication-organic pollution-oil pollution-radioactive pollution-marine pollution-thermal

pollution-pesticide pollution-heavy metal pollution

Organic self purification-quantitative definition-reoxygenation-oxygen balance and stream dissolved oxygen profile-oxygen sag curve-Streeter Phelp’s equation-Critical deficit-problems

MODULE 3

Microbial self purification-pathogenic microorganisms of sewage origin-indices of contamination-enumeration-percapita contribution-seasonal variations-death rate survival in the stream environment

MODULE 4

Classification of streams-natural self purification process-disposal of wastewater-Rational stream sanitation practices-dual objectives of stream sanitation practices-the science and art of applied stream sanitation-stream survey-types of stream survey-execution of stream

surveys

MODULE 5

Purification in estuaries-evaluation of self purification in estuaries-tides and currents- distribution of waste loads by tidal translation-sea water intrusion-waste assimilation capacity

of estuaries-bacterial contamination-stable wastes

MODULE 6

Impacts of river developments on waste assimilation capacity-detrimental and beneficial effects-hydroelectric power-navigation works-flood control works-irrigation and other diversions

References:-

1.Phelps E. Stream Sanitation

2.Viez Applied stream sanitation

3. P. K. Goel Water pollution, causes, effects and control

4.Todd G. K. Applied Groundwater hydrology

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6308B: ENVIRONMENTAL HEALTH AND HYGIENE**

Credits 3

Hours per week: Lecture-3 and Tutorial-1

Objective: To make the students aware about environmental issues like adverse effect of

pollutants on health and control methods for mitigating the effects

MODULE 1

Dimensions of environmental health, causative agents of diseases, social factors, urbanproblems, housing and health, economy and health, climate and other atmospheric elements,violence, crime and mental health, family health practice, health care planning and delivery, chronic and communicable disease, worldwide nutrition and population control.

MODULE 2

Industrial and agricultural pollutants, occupational health, epidemiological data, occupationalhealth hazards, environmental exposure and diseases,

MODULE 3

industrial toxicants, hazardous wastes,

preventing exposure to unhealthy and unsafe working conditions ,vector control.

MODULE 4

Disease control, disease prevention, morbidity and mortality, diseases and progressive deterioration, controlling diseases and disability. Foodborne and waterborne diseases outbreaks, controlling stress of life, epidemiology

MODULE 5

Nuclear energy and environmental health, concerns and uncertainties about nuclear power,nuclear power plants, safety.

MODULE 6

Environmental health planning, need for planning, the planning process. Environmentalhealth services, various agencies, International efforts, role of industry, voluntary health

agencies, Law and human welfare, constitutional right to healthy environment, environmental education.

References:-

Willgoose-Environmental Health

Morgan-Environmental Health

Cairncross and Feachem-Environmental Health engineering in tropics

The world bank-Appropriate technology for water supply and sanitation

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

08 CEE6308 C: ENVIRONMENTAL SYSTEMS ANALYSIS

Credits 3

Hours per week: Lecture-3 and Tutorial-1

Objective: To introduce modern tools like expert systems, neural networks, genetic algorithm etc. in environmental systems design .

MODULE 1

Significance of Systems Engineering: Systems Analysis, Systems Design and system synthesis.

Scope of applications to environmental engineering Systems addressing to specificenvironmental problems.

MODULE 2

Water pollution and transport and atmospheric processes.

MODULE 3

Role of optimization models: Deterministic models/Linear programming, Dynamic programming, separable and nonlinear programming models.

MODULE4

Formulation of objective functions and constraints for environmental engineering planning and design. Applications to environmental systems analysis.

MODULE 5

Introduction to modern tools: Expert systems, Neural networks, Genetic Algorithm

References:

1.Douglas A Haith Environmental systems optimization, John Wiley &Sons, Newyork

2. B.S.Goel, S.K.Mittal Operation research, Pragathy prakasham

3. Singiresu.S.Rao Engineering Optimization, New Age international(P) Ltd.

4. James A. Anderson An introduction to neural networks Prentice Hall of India, New Delhi

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE 6310A ADVANCED HYDROLOGY AND WATER RESOURCES**

**ENGINEERING**

Credits 3

Hours per week: Lecture-3 and Tutorial-1

Objectives .

• To impart knowledge of the various ways in which water is important in the development of catchments • To provide training in computer modeling of catchment processes, such as inflow, infiltration, flooding etc.,

• To develop the numeric skills required to analyze and present environmental data

• To provide support for the production of the Independent Geographical Study, through data collection, data presentation, data analysis, report writing and oral presentation of methods

Expected Outcome

By the end of the module, the students will have acquired knowledge in several key areas of the subject. These include: • the reasons why water is important for catchment development; • the ways in which water enters catchments and moves through them; • the ways in which rivers are important for landscape development; and • the significance of catchment hydrology to flooding.

MODULE 1

Fundamental hydrology-Hydrological cycle-components of hydrologic cycle –Rainfall- atmospheric circulation –types and forms of precipitation-Rainfall data and its processing- frequency analysis-probability distribution and its application hydrology.-IDF

Curves and DAD curves and its derivation and uses.

MODULE 2

Water losses-Infiltration-Hortans’ and Green Ampt model runoff-Indices.

Hydrograph-components- base flow separation- unit hydrograph- S and synthetic hydrograph.

Ground water flow and well hydraulics-Aquifer parameters-land subsidence due to overpumping- steady radial flow in to a well-well in uniform flow-steady flow with uniformcharge-and steady flow in to a well confined, unconfined and leaky aquifers-well near aquifer

boundaries-multiple well systems-partially penetrating wells –-pumping tests. Nonequilibrium for pumping test-Theis method.-Jacob’s method-Chow’s method.

MODULE 3

Salt water intrusion, ground water basin development, and Artificial recharge.

Open wells – Design of open well –yield test.- Methods of construction-dug wells.

Tube wells –design-screened wells-gravel packed wells- -selection of screen size-yield of a well

MODULE 4

Well loss- determination of well loss by step pumping method.

Test holes-well logs - shallow tube wells -deep wells - -drilling in rocks-screen installation-well completion- well development-testing wells for yield-failure of tube wells.

Collector of radial wells. cavity wells and Infiltration galleries

MODULE 5

Yield estimation: flow duration curve and mass curve –reservoir capacity and design.

Hydrologic equation and water balance studies- flood routing studies.

Floods-estimation: Empirical -Rational formula- hydrograph method- flood frequencyanalysis- Gumbel’s and Log-pearson type III.

Regression – Linear and non-linear - correlation- Methods of assessing error in hydrologic data and hydrologic computation.

MODULE 6

Modelling – Classification of models based various criteria – Physically based models –Classification of PDEs- Methods for solution – FDM –Explicit and Implicit equation-solution procedure for Laplace and Unsteady ground water flow equation- and FEM (Basic

concepts only)

**References:**

Singh, V.P. Elementary Hydrology. Prentice Hall of India, New Delhi, 1994.

Chow , V.T., D.R. Maidment and L.W. Mays, Applied Hydrology, McGraw Hill Book

company, Singapore, 1988.

McCuen, R. H. Hydrologic analysis and design, Prentice Hall, Eaglewood Cliffs, New Jersey,

1989.

Subramanya, K. Engineering Hydrology, Tata Mcgraw Hill, Newdelhi,1994

Raghunath H.M..-Hydrology H.M Wiley Eastern Ltd Newdelhi,1985

Raghunath H.M..- Groundwater , New Age International, 2007

Ciriani T.A -Mathematical models for surface water hydrology

Tood D. K.-Ground water hydrology, Wiley Eastern

Viessman,L and Knapp.-Introduction to hydrology

Duggal and Soni, Elements of Water Resources Engineering, New Age International, 1996

Garg S.P, Ground water and tube wells, Oxford &IBH Newdelhi, 1982.

Chapra, S.C and Canale, R .P. Numerical methods for Engineers, Mcgraw hill Int.1990.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6310B GROUND WATER CONTAMINATION AND POLLUTION**

**TRANSPORT**

Credits 3

Hours per week: Lecture-3 and Tutorial-1

Objective: To learn the principles of pollution transport, and estimation of extent of

contamination by modelling

MODULE 1

Ground water and the hydrologic cycles-Ground water as a resource-Ground water contamination-Ground water as a geotechnical problem-Ground water and geologic processes. Physical properties and principles-Darcy's law-Hydraulic head and fluid potential-

piezometers and nests. Hydraulic conductivity and permeability-homogenicity and anisotropy-porosity and voids ratio-Unsaturated flow and the water table-steady state flow and transient flow-compressibility and effective stress-transmissivity and storativity-

Equations of ground water flow -Limitations of Darcian Approach-hydro dynamic dispersion.

MODULE 2

Resource evaluation: development of ground water resources-Exploration of Aquifers-theresponse of ideal aquifers to pumping-Measurement of parameters-Laboratory tests-Numerical simulation for aquifer yield prediction-Artificial recharge and induced infiltration-land subsidence - sea water intrusion

MODULE 3

Chemical properties and principles: constituents -chemical equilibrium-association and dissociation of dissolved species-effects of concentration gradients-mineral dissolution and

solubility-Oxidation and reduction process-Ion exchange and adsorption-environmental isotopes-field measurement of index parameters.

MODULE 4

Chemical evolution: ground water in carbonate terrain-ground water in crystalline rocks-ground water in complex sedimentarysystems -geotechnical interpretation of 14C dates-process rates and molecular diffusion.

MODULE 5

Solute transport: water quality standards-transport process-non reactive constituents in homogeneous media-transport in fracture media-hydrochemical behaviour of contaminants-trace metals-nitrogen-trace non metals-organic substances-

MODULE 6

measurement of parameters – velocity-dispersivity-chemical partitioning- sources of contamination-land disposal of solid waste-sewage disposal on land.

USGS-Moc model: modelling principles-MOC modelling.

References

Randall J. Charbeneau-Ground water Hydraulics and Pollutant Transport

Allen Freeze R. and John A. Cherry -Ground water. Prentice Hall.Inc

Internal continuous assessment: 100 marks

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combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE6310C ENVIRONMENTAL GEOLOGY**

**Course Objectives:**

**The purpose of this course is:-**

* To provide students with improved understanding of environmental geology.
* Integrated understanding of various systems and their interconnectedness with the geosphere, biosphere, atmosphere and hydrosphere.

**Course Outcomes:**

* Develop the ability to critically discuss the issues related to geology that impact society and planet Earth.
* Capable them to think about the importance of environmental hazards and their remediation related to geology.

|  |
| --- |
|  |
| **MODULE 1**  Fundamental concepts of environmental geology-concepts of ecology-flood and impact on environment-Hydel projects and environment-depositional environments-resources and silting-lakes-lagoons and estuarine environments-coastal erosion and impact on beach environment-  Aeolian deposits and their environmental consequences-wind erosion and related environmental problems |
| **MODULE 2**  Geology and urban planning-problems of urbanization. Environmental analysis in planning of rural and urban areas. Environmental consequences of natural calamities like volcanic activity, earth quakes and landslides. |
|  |
| **MODULE 3**  Disposal of waste from nuclear and thermal stations and factories. Impact of waste disposal in the quality of ground water. Vulnerability of ground water to pollutants. Ecologist’s role in management of waste disposal. |
| **MODULE 4**  Natural resources utilization and the environment. Green house effect and global warming. Chlorofluorocarbons and holes in the ozone layer. Problems in mining environment. Environmental legislation in India. Marine pollution-marine base sources-oil spills-processes of oil water interface-effects of ecosystems. |
| **MODULE 5**  Definition and scope of medical geology-environmental and health. Heavy metal pollutants (Cd,Hg,Pb,Re,Ra,As).Problems relating health and geology. Man-environment relationship. Trace elements in human biology. Goiter and iodine, fluorosis, fluorite, multiple sclerosis and Pb, As poisoning, Cesium and heart disease, radiation hazards |
| **MODULE 6**  Geology and Environmental Health, Contemporary Climate Change, Sea Level Rise and the Future – review of the modern carbon cycle |

**References:**

1. Blaine Metting.F (Jr.,) Soil Microbiology Ecology, Marcel Dekker Inc., 1993
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Prentice-Hall of India Pvt. Ltd., Newdelhi
3. Mitchell, J.K and Soga, K Fundamentals of soil behavior, John Wiley and sons Inc., 2005.
4. Pacyna J.M. and Ohar B. -Control and fate of atmospheric trace metals.
5. Park J.E. and Park K.-Textbook of preventive and social medicine
6. Raiz Akhtar - Environment and health
7. Strahler A.N and Strahler A.H.-Environmental geosciences. Wiley International
8. Fang, H-Y, Introduction to Environmental Geotechnology, CRC Press, 1997.
9. Daniel, D.E, Geotechnical practice for waste disposal, Chapman and Hall, 1993.
10. Rowe, R.K, Quigley, R.M and Booker, Clay Barrier systems for Waste disposal facilities, J.R., E & FN Spon, 1995.
11. Rowe, R.K, Geotechnical and Geoenvironmental Engineering Handbook , Kluwer Academic publishers, 2001.
12. Reddi, L.N. and Inyang H.F, Geoenvironmental Engineering –Principles and Applications,

**08CEE7301A GIS AND REMOTE SENSING**

Credits:3

Hours per week: Lecture-3 and Tutorial-1

**Objectives**

This subject explains the basic concepts of Remote Sensing and Geographic Information

Systems with its applications.

**Outcome**

Students shall be able to understand

1. the basic remote sensing concepts and its characteristics

2. GIS and its requirements

3. data management with GIS

4. and carry out analysis and interpretation of GIS results

MODULE 1

Introduction to remote sensing – Electro magnetic spectrum – Physics of remote sensing – Effects of atmosphere – Atmospheric windows – Interaction of earth surface featureswith EMR – Spectral characteristics of vegetation, water, soil, etc. –

MODULE 2

Various types of platforms– Airborne and space based platforms - Different types of aircraft – Manned and unmanned spacecraft used for data acquistion – Characteristics of different types of platforms –

Characteristics of Remote Sensors –Multi spectral

sensors – Multi Spectral Scanners – Microwave remote sensing- Factors affectingMicrowave measurement-Radar wave bands- SLAR and SAR.

MODULE 3

Sensors- Satellite system parameters- sensor parameters-spatial, spectral and radiometric resolution – False colour composite (FCC) – Multi spectral photographs – Thermal and microwave imaging system-Earth Resources satellite and Meteorological satellites

MODULE 4

Different types of data products and their characteristics – Image Interpretation - Basicprinciples of visual interpretation – Elements of image interpretation - Equipment for visual interpretation – Activities of image interpretation – Ground truth - Basic

principles of digital image processing – filtering

MODULE 5

Geographic Information system – History and development of GIS – GIS definitions

and Terminology -Architecture– System concepts – Coordinate systems – Standard GISpackages

Type of data – Spatial and non- spatial data – Data structure – Points – Lines – Polygon– Vector and raster – Files and data formats – Spatial data modeling –Raster GIS model and Vector GIS models.-GIS data file management and Database models

Data input and data editing-Input methods –GPS as data capture-data editing.

MODULE 6

Spatial analysis – Data retrieval – Query – Simple analysis – Record – Buffering and

Overlay – Vector data analysis – Raster data analysis – Modelling in GIS – Digital

elevation model – DTM – Modelling Networks

Integration of RS and GIS – Need and Facilities for integration. Application of these to

water resources and environmental engg-Cadestral records and LIS

References:

1.Lillesand T.M. and Kiefer R.W., Remote sensing and Image Interpretation,

Second Edition, John Wiley and Sons, 1987.

2.AnjiReddy, M. Remote Sensing and Geographical Information System, BSP

Publications., 2001.

3.Chang, K (2005). Introduction to Geographic Information Systems, Tata Mc

Graw Hills Edition, NewDelhi.

4.Manual of Remote Sensing, American Society of Photogrammetry and Remote

Sensing, 1993.

5.Paul Curran P.J., Principles of Remote Sensing , ELBS, 1983.

6.Sabins F.F. Jr., Remote Sensing Principles and Interpretation, W.II. Freeman

and Company, 1978.

7.Geo Information Systems – Applications of GIS and Related Spatial Information

Technologies, ASTER Publication Co., Chestern (England), 1992.

8.Burrough P.A., Principles of GIS for Land Resources Assessment, Oxford

Publication, 1980.

9.Jeffrey Star and John Estes, Geographical Information System – An

Introduction, Prentice – Hall Inc., 1990.

10.Marble D.F., Galkhs H.W. and Pequest, Basic Readings in Geographic

Information System, Sped System Ltd., New York, 1984.

11.Clarke, K.C. Parks B.O., and Crane M.P. (2006) Geographic Information

systems and environmental modeling- PHI of India , New Delhi.

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

08 CEE7301B NUMERICAL METHODS

Credits:3

Hours per week: Lecture-3 and Tutorial-1



MODULE 1

Solution of algebraic and transcendental equations- Review and comparison of various

iterative methods, convergence- Generalized Newton- Raphson method for multiple

roots-

Higher order methods- Newton’s method for non-linear systems.

MODULE 2

Solution of simultaneous equations-Direct & indirect methods-Gauss elimination and

Gauss Jordan methods- ill conditioning- pivoting – Jacobi, Gauss-Seidel and relaxation

methods- convergence-Eigen value problems-Vector iteration method

MODULE 3

Interpolation- Newton’s Divided difference, Lagrange, Aitken, Hermite and Spline

techniques – Inverse interpolation –Error estimates-Double interpolation-Trigonometric

interpolation.

MODULE 4

Numerical differential-Numerical integration-Newton–Cote’s integration formula-

Gauss quadrature –Error estimates-Double integration.

Curve fitting-method of least squares – nn-linear relationships – Correlation and

Regression – Linear Correlation – Measure of correlation – Standard error of estimate

– Coefficient of correlation – Multiple linear regression.

MODULE 5

Solution of ordinary differential equations-Single step & multi step methods-stability of

solution – simultaneous first order differential equations - higher order different

equations. Numerical solution of integral equations.

MODULE 6

Partial differential equations – classification – Laplace equation, ID wave equation, ID

heat equation – Finite difference method – Relaxation methods. Stability and

convergence of solution.

References:

1.Jain M.K., Numerical methods for Scientific and Engineering Computation

2.Conte and Carl DeBoor, Elementary Numerical Analysis

3.Gupta A and Bose S C, Introduction to Numerical Analysis

4.Hilderbrand FB, Introduction to Numerical Analysis

5.Fjorberg C E, Introduction to Numerical Analysis

6. Kendall E Atkinson, An Introduction to Numerical Analysis

7. Murrey R Spiegel, Statistics

8. James B. Scarborough, Numerical Mathematical Analysis

9. C F Gerald & P O Wheatley, Applied Numerical Analysis

10.E V Krishnamurthy & S K Sen , Numerical algorithms

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

08CEE303A PLANNING AND DESIGN OF ENVIRONMENTAL FACILITIES

Credits:3

Hours per week: Lecture-3 and Tutorial-1

Objective: Students are expected to know in detail the various water and wastewater

treatment systems and their layout and design.

MODULE 1

Environmental Engineering hydraulic design: Water distribution systems- Design of

Distribution systems- Hydraulic analysis – Distribution system components – Storage tanks

-Analysis – Hardy Cross method – Equivalent Pipe method – Computer Programmes

Pumps – Design of water and waste water pumping system.

MODULE 2

Theory and Design of Advanced Unit Operations used in Water Treatment: Membrane

processes, Ion Exchange, Aeration/stripping, Precipitation, Adsorption, Oxidation-reduction and

advanced oxidation processes; Water Treatment Plant Design; Selection of raw water source,

Planning and siting of water treatment plant, Chemical requirement and residuals management.

Module3

Types of sewerage system – Hydraulics of sewers –Design of various sewer

appurtenances - Design of sanitary and storm water sewers – Structural requirement of

sewer under various conditions – Design of surface and subsurface drainage –

Roadways and Airport drainage

MODULE 4

Design of water treatment units – Design of sedimentation tanks, Mixing basins, Flash

Mixer,

Clariflocculator, Slow sand filter, Rapid sand filter, Spray and Cascade aerator,

Chlorinator

MODULE 5

Design of waste water treatment units – Design of screens, Grit chamber, Sedimentation

tank, Activated sludge process, Trickling filter, Aerated lagoons, Stabilization ponds,

Oxidation ditch, Septic tank, Imhoff tank, Sequencing batch reactor, Sludge digestion

tank.

Module6

Wastewater Disposal; disposal to inland waters such as lakes reservoirs, rivers and streams,

disposal to sea, disposal on Land.

References:

1.Metcalf and Eddy Inc. - Waste water Engineering: Treatment, disposal & reuse,

Tata McGraw Hill

2.Peavy- Environmental Engineering, McGraw Hill

3.Rodger Walker- Water supply Treatment and distribution

4.Sinero- Environmental Engineering: A Design Approach, Prentice Hall of India,

Delhi

5.Wilson- Design calculations in waste water treatment, McGraw Hill Kogakusha

Internal continuous assessment: 100 marks

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combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE7303B ENVIRONMENTAL LEGISLATION**

Credits:3

Hours per week: Lecture-3 and Tutorial-1

Objective: Students are expected to know the various legal acts formulated to control and

protect the environment.

MODULE 1

The water ( prevention and control of pollution) Act-Definitions, Constitution of central

and state boards, Constitution and composition of joint boards, functions, prevention

and control of water pollution, Penalties, Central and state water laboratory, power of

supersession, power to make rules.

MODULE 2

The water (P&CP) rules - power and duties of the

chairman and member- secretary, Temporary association of persons with central board,

Consulting engineer, Annual report, Report of central board analyst, central water lab,

powers and function of the central boar in U.T

MODULE 3

The Air (prevention and control of pollution) Act- Definition, powers and functions of

boards, prevention and control of pollution, Penalties and procedure, Miscellaneous.

The Air (P&CP) Rules- procedure of transaction of business of the board and its

committees, Temporary Association of the board and its committees, Temporary

association of the persons with the Central board, Annual Report of Central Board,

persons with central boards.

MODULE 4

The Environmental (Protection) Act- Definition, General powers of the Central Govt.,

Prevention, Control and abatement of environmental pollution, miscellaneous. The E(P)

Rules- recipient system, standards for emission or discharge of environmental

pollutants, Prohibition and restriction on location of industries, Procedure for taking

samples, notice and submission for analysis, functions of Env. Lab., furnishing

information to authorities and agencies, prohibition and restriction on handling

hazardous substances.

MODULE 5

Hazardous Wastes (Management and handling) Rules- Definition, esp, hazardous

wastes, hazardous waste site. Transboundary movement, Responsibility of the occupier,

grant of authorization, power to respond or cancel, packaging, labeling, transport,

disposal or import, Accident reporting, appeal. Manufacture, storage and important of

hazardous chemicals rules- Definitions- Mitigation of the major accident, safety reports.

MODULE 6

Preparation of on- site & off -site emergency plans, Information to vulnerable public,

collection and dissemination of information like MSDS.

The Bio-medical waste (Management and handling) rules. The ozone depleting

substances (Regulations & Control) rules. The recycled plastics manufacture and usage

rules. Noise pollution rules.

References:

The water (P& CP) Act and Rules.

The Air (P & CP) Rules.

The Env(Protection )Act and various rules.

Internal continuous assessment: 100 marks

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combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**08CEE7303C URBAN ENVIRONMENTAL QUALITY MANAGEMENT**

Credits:3

Hours per week: Lecture-3 and Tutorial-1

**Aims & Objectives**

There is currently an inability to fully integrate the various disciplines of science and engineering

into Urban Environmental Quality Management strategies. We aim to develop a suite of models

for estimating the pollutant loads from different source areas, defining their impacts and

predicting the performance of Management practices.

**Expected Outcome**

By the end of the course the student will have knowledge of the following topics:

• have a knowledge of the nature and effects of environmental pollutants and energies

• have a detailed knowledge of the techniques involved in the efficient management of the

environment

• be able to measure and assess the effects of noise, air, water, terrestrial pollution and

noise pollution on human activity and health

• have an awareness of the need for integrated pollution control

• have the skills to plan and to execute monitoring programmes for the detection and

control of environmental pollutants, including water, air and noise terrestrial pollution

**MODULE 1**

**Urbanisation & Pollution**

Consequences of urbanization, demand of resources by the public - Sources of Pollution to the

urban environment: Status of pollution levels in major cities- Slum formation: Impact of slum on

general quality of life on Urban elite – status of slum settlements in major cities.

MODULE 2

**Air & Noise Pollution in Urban Environment**

Air Pollution Sources: Nature of air pollution in the Urban environment due to human activities

of industrialization, effect of air pollution on Urban Environment. Air pollution Indices for

Assessment of status of Urban air quality. - Sources of noise pollution in Urban areas, effect of

noise pollution on Urban environment, status of noise pollution in major cities.

MODULE 3

**Water and Land pollution in Urban Environment**

Water Demands and Pollution in Urban areas: Nature of water pollutants and assimilative

capacity of natural Urban aquatic systems. Urban water quality indices - Sources of land

pollution in urban areas: Impact of urban soil pollution on quality of living system – prediction

of soil pollution indices.

MODULE 4

**Management of Urban Environment Quality**

Land use planning – traffic management. Safe municipal water supply and planning of safe

municipal water supply and drainage system – solid waste management including disposal –

abatement of noise pollution – Provision of zones – regulation of settlements.

MODULE 5

**Conservation and Disaster Management**

Natural Conservation: Planning of urbanization on ecological basis, preservation and

development of green recovery areas. - Urban Disaster Management: Management of Industrial

explosions, land slides, earthquakes, Floods and Management of epidemics.

MODULE 6

Introduction & Dimensions of Natural & Anthropogenic Disasters, Principles/Components of

Disaster Management, Organizational Structure for Disaster Management, Disaster Management

Schemes/SOPs, Natural Disasters and Mitigation Efforts, Flood Control, Drought Management,

Cyclones, Avalanches, Mangroves, Land Use Planning, Inter-Linking of Rivers,

**Reference Books**

1. Varshney, C.K., “Water Pollution and Management”, Wiley Eastern Ltd., New Delhi, 1998.

2. Plowden, S., “The Cost of Noise”, London, Metra, 1996.

3. Fallion, A.B. & E. Simon, “The Urban Pattern”, Van Nistrand, New York.

4. M.J. Suess & S.R. Craxford, “Manual on Urban Air Quality”, WHO, Copenhagen.

**Mode of Evaluation :** Written Examination/ Assignment/ Seminar

08CEE7303D ENVIRONMENTAL BIOTECHNOLOGY

Credits:3

Hours per week: Lecture-3 and Tutorial-1

Objective: Students are expected to know the principles of biotechnology and its

application in environmental engineering

MODULE 1

Introduction to microbial genetics; mutation, genetic code, protein synthesis, regulation

of gene expression- operon concept, reverse transcription, DNA repair.Introduction to

DNA technology- cloning, vectors, restriction enzymes, plasmids, recombination in

prokaryotes. Genetic engineering and gene therapy.

MODULE 2

Bioengineering of microorganisms for industrial purposes.Techniques used in molecular

biology- PCR, DNA fingerprtinting, DNA sequencing. Industrially important microbial

products. Immobilization of microbial cells and enzymes- immobilized cells and

enzymes for waste water treatment.

MODULE 3

Microbial aggregation, idealized biofilm, the concept of completely mixed boifilm

reactor. Nitrification and denitrification; biochemistry and physiology, activated sludge

nitrification, biofilm nitrification, denitrification process.

MODULE 4

Anaerobic treatment- process chemistry and microbiology, upflow and down flow

reactors, upflow anaerobic sludge blanket reactor. Microbiology of various waste water

treatment processes.

MODULE 5

Waste treatment and reuse; bio energy conversion, methanogenisis, biotechnology of

composting, vermicomposting.

Microbes and organic pollutants; Relationship between contaminant structures, toxicity

and biodegradability, environmental factors affecting biodegradation, biodegradation of

organic pollutants.

MODULE 6

Problems of toxic chemicals- sources and categories, halogenated and non-halogenated,

petroleum hydrocarbons, metals, human health effects caused by toxic chemical pollutions;

Biodegradation of toxic pollutants, mechanisms of detoxification- oxidation reactions,

dehalogenation, biotransformation of metals; Xenobiotic Compounds- types, sources and its

hazards; Recalcitrance of xenobiotic compounds and leading factors; Biodegradation of

xenobiotic compounds;

References:

.Bruce. E. Rittmann & Perry.L.McCarty Environmental Biotechnology

Principles and applications, published by Mc Graw Hills International edition

.S.S.Purohit Biotechnology - published by Agrobios (India), Agro House,

Chopasani Road, Jodhpur

.Albert L. Lehninger Principles of Biochemistry - CBS publishers &

disributors,485 Jain Bhavan, Delhi-32

.Prescott & Dunn's Industrial microbiology- CBS publishers & disributors

4596/1 A 11 Darya Ganj, New Delhi- 110 002

.Raina M. Maier, Ian Lpepper & Charles P. Environmental Microbiology

published by Elsevier India pvt ltd, 17-A/1, Main Ring Eoad, Lajpat Nagar- IV,

New Dehi- 24

Internal continuous assessment: 100 marks

Internal continuous assessment is in the form of periodical tests, assignments, seminars or a

combination of all whichever suits best. There will be minimum of two tests per subject. The

assessment details are to be announced to students’ right at the beginning of the semester by

the teacher.

End semester Examination:100 marks

Question pattern

Answer any 5 questions by choosing at least one question from each module.

Module 1

Question 1 : 20 marks

Question 2 : 20 marks

Module 2

Question 3 : 20 marks

Question 4: 20 marks

Module 3

Question 5 : 20 marks

Question 6: 20 marks

Module 4

Question 7 : 20 marks

Question 8: 20 marks

**SEMESTER 4**

**08CEE7307: MASTERS RESEARCH PROJECT PHASE 2**

Credits: 12

Hours per week: 30

Objective: To improve the professional competency and research aptitude by touching the

areas which otherwise not covered by theory or laboratory classes. The project work aims

to develop the work practice in students to apply theoretical and practical tools/techniques

to solve real life problems related to industry and current research.

Master Research project phase 2 is a continuation of project phase 1 started in the

third semester. Towards the end of the semester there would be a pre submission presentation

before the evaluation committee to assess the quality and quantum of the work done. This

would be a pre qualifying exercise for the students for getting approval by the departmental

committee for the submission of the thesis. At least one technical paper is to be prepared for

possible publication in journal or conference. The technical paper is to be submitted along

with the thesis. The final evaluation of the project will be external.

Internal Continuous assessment:

Guide

Evaluation

committee

First review

50

50

Second review

100

100

End Semester Examination:

Project Evaluation by external examiner: 150 marks

Viva Voce by external / internal examiner: 150 marks( 75 each)

Total: 600 marks