Syllabus
of
2\textsuperscript{nd}, 3\textsuperscript{rd} & 4\textsuperscript{th} Year
(Subject related to Environmental Engg.)
[Effective from session 2009-10]
U P TECHNICAL UNIVERSITY, LUCKNOW
Study & Evaluation Scheme
[Effective from session 2009-10]
Second Year, III Semester

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**Note:** The syllabus of Subject with code ECE are Common to B.Tech. Civil Engineering.
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** This will be done during Winter Break for one weeks
Note: 4 weeks Industrial Training after VI Sem. to be evaluated in VII Semester.
# Study & Evaluation Scheme
## B Tech Environmental Engineering
### Effective from session 2011-12
#### Final Year, VII Semester

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** 4 weeks Industrial Training after VI sem. to be evaluated in VII semester.
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** Science Based Open Elective**

EOE-031/EOE-041 Introduction to soft computing (Neural Network, Fuzzy Logic and Genetic Algorithm)
EOE-032/EOE-042 Nanoscience
EOE-033/EOE-043 Laser Systems and Applications
EOE-034/EOE-044 Space Science
EOE-035/EOE-045 Polymer Science & technology
EOE-036/EOE-046 Nuclear Science
EOE-037/EOE-047 Material Science
EOE-038/EOE-048 Discrete Mathematics

Open Elective**-I
EOE-071 Entrepreneurship Development
EOE-072 Quality Management
EOE-073 Operation Research
EOE-074 Introduction to Biotechnology

Open Elective**-II
EOE-081 Non Conventional Energy Resources
EOE-082 Nonlinear Dynamic System
EOE-083 Product Development
EOE-084 Automation and Robotics

Elective Papers
Elective-I
EEV-011 Earth and Environment
EEV-012 Ecological and Biological Principles and Processes
EEV-013 Environmental Biotechnology

Elective II
EEV-021 Science and Policy of climate change
EEV-022 Environmental Policy & Legislation
EEV-023 Environmental Economics

Elective III
EEV-031 Disaster Management
EEV-032 Integrated Impact Assessment
EEV-033 Environmental Risk Assessment

Elective-IV
EEV-041 Process Engineering Costing and Plant Design
EEV-042 Chemical Reaction Engineering
EEV-043 Heat Transfer and Operation

Elective-V
EEV-051 Sustainable Agriculture, Building and Sanitation
EEV-052 Ground water hydrology & management
EEV-053 Design of structure

Elective-VI
EEV-061 Water Power Engineering
EEV-062 Integrated Watershed Management
EEV-063 Transport Phenomena
EEV-401: Environmental Chemistry & Microbiology

Unit I:
Introduction to environmental chemistry: concept and scope of environmental chemistry, components of environment, natural cycles of matter in the environment.
Introduction to microbiology: Concept and scope of microbiology, kinds of microorganisms, major characteristics and the role of microorganisms, microorganisms in nature.

Unit II:
Chemistry of water and waste water: Hydrological cycle, structure of water molecule, water as a solvent principles of equilibrium chemistry, pH, oxidation - reduction and the applications of principles of chemistry for solving Environmental Engineering Problems.

Unit III:
Chemistry of the air environment: Chemistry of the atmosphere, combustion related air pollution, global environmental problems - chemistry of CFC, ozone depletion, greenhouse effect, acid rain, La Nino etc.
Chemistry of pollution due to detergents, pesticides, polymers, trace organics, metals, petroleum and radioactive compounds.

Unit IV:
Environmental Microbiology: Basic principles of microbial transformation of organic matter, biodegradation, acclimatization of wastes and microbial inhibition mechanisms. Structure and function of cell constituents.

Unit V:
Pure and mixed cultures, Aerobic and anaerobic metabolism, microbial growth and dynamics, Microbial taxonomy, classification and morphological aspects of bacteria, fungi, protozoa, algae and other higher aquatic life forms.
Bioassay tests for toxicity evaluation, Pathogens and indicator organisms.
Role of microorganisms in water and waste water engineering. Microbiology applied to air pollution control (Bio scrubbers and bio-filters).

References:
A.K. De: Environmental Chemistry
1. Sawyer, McCarty, and Parkin: Chemistry for Environmental Engineering
2. Manahan: Environmental Chemistry
3. Pelczar, Chan, and Krieg: General Microbiology
4. Stannier – General Microbiology
5. Larinzar – General Biochemistry
6. Sharma: Microbiology
7. Krueger and Johansson: Microbiology
8. Tortora, Funke and Case: Microbiology
9. McKinney: Microbiology for Sanitary Engineers
Unit-I
Characteristics of water: Physical, chemical and biological standards. Theory, Operation and design of aeration system, sedimentation, coagulation, and clariflocculation. Design of clariflocculator (8)

Unit-II

Unit-III
Adsorption, ion-exchange, membrane processes. O and M of water treatment plants, Industrial water treatment. (7)

Unit-IV
Water Supply Engineering: Water demand, design period, population forecasting, sources of water; hydrological concepts, ground-water and its development. (7)

Unit-V
Conveyance of water; pipe materials, corrosion, laying of pipes, pipe appurtenances, pumps for water supply, distribution system, planning of water supply projects. Design of water distribution network. Rural water supply distribution system. (9)

References:
3. Peavy, Rowe and Tchobanoglous: Environmental Engineering
5. Garg: Water Supply Engineering (Environmental Engineering Vol.-I)
6. Raju: Water Supply and Wastewater Engineering
7. Kshirsagar: Water Supply and Treatment
8. Punmia: Water Supply and Wastewater Engineering
EEV-451: Microbiology Lab

Use of microscope: Bacterial morphology and staining methods.
Biological examination of water: Algae, bacteria and Protozoa.
Quantitative plating method.
Bacterial water quality: Measuring quality of water by using coli form organisms (MPN method and membrane filter).
Indicator and Indices: Faecal streptococci, anaerobic bacteria
Estimation of sugars, proteins, lipids.
Biochemical activities of bacteria: hydrolysis of polysaccharides,
Bacteria in waste water.
Determination of Biodiversity index.

Reference:
1. Sirockin and Cullimore: Practical Microbiology

EEV-452: Water Treatment and Supply Engineering Lab

Analysis of water for colour, turbidity, solids, hardness, alkalinity, acidity, iron, sulphate, chloride, fluoride, nitrate etc.
Sampling Techniques
Jar test for coagulation studies.
Application of laboratory and pilot plant scale units for evaluation of design criteria.
i. Settling analysis studies.
ii. Water treatment by slow sand filter / rapid gravity filter.

References:
1. Sawyer, McCarty and Parkin: Chemistry for Environmental Engineering
2. Mathur: Water and Wastewater Testing

EEV-501: Air Pollution and Control Engineering

Unit I:
Air pollution: composition and structure of atmosphere, global implications of air pollution.
classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photochemical oxidants. Indoor air pollution. Effects of air pollutants on humans, animals, property and plants.
Unit II:
Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion. (8)

Unit III:
Ambient air quality and standards, air sampling and measurements; Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling. Design of gravitational settling chamber, cyclone separator, fabric filter, electrostatic precipitator, (8)

Unit IV:
Introduction to air pollution control, control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP). (8)

Unit V:
Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons. Automotive emission control, catalytic converter, Euro-I, Euro-II and Euro-III specifications, Indian specifications. (8)

References:
1. Peavy, Rowe and Tchobanoglous: Environmental Engineering.
2. Martin Crawford: Air Pollution Control Theory.
5. Nevers: Air Pollution Control Engineering.
6. Mycock, McKenna and Theodore: Handbook of Air Pollution Control Engineering and Technology.
8. C.S. Rao, Air pollution and control

EEV-502: Solid Waste Management

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Unit-1
Solid waste: Public health and ecological impacts, Sources and types of solid wastes, material flow and waste generation in a technological society, factors affecting the generation rates, projections for futures, future challenges and opportunities. Functional elements: Waste generation, storage, collection, Transfer and transport, processing and recovery, disposal.

Unit-2
Physical and chemical composition of municipal solid waste, integrated solid waste management, hierarchy of waste management options, different methods for generation rates. **Storage:** movable bins, fixed bins. **Collection:** home to home collection, community bin system. Theory and design of hauled container system, stationary container system.
Unit-3
Transportation: handcart, tri-cycle, animal cart, tripper truck, dumper placer, bulk refuse carrier, railroad transport, water transport, conveyors, layout of routes. Engineering system for on-site handling and processing of solid waste: separators, size reduction equipments, screening equipments, densification, baling, cubing, pelleting equipments.

Unit-4:
Landfilling: Site selection criteria, landfill layout, landfill sections, Occurrence of gases and leachate in landfills: composition and characteristics, generation factors, initial adjustment phase, transition phase, acid formation phase, methane formation phase, maturation phase of gases and leachate.

Unit-5:
Composting, types of composting, process description, design and operational consideration of aerobic composting, process description, design and operational consideration of anaerobic composting. Thermal conversion technologies: incineration and pyrolysis system, energy recovery, system, Electronic waste and Biomedical waste. Overview of solid waste management practices in India.

References:
2. Solid Waste Engineering, Principle & Management issues by Ven Te Chow
3. Bhide, A.D., B.B. Sundaresan, Solid Waste Management in developing countries.
4. Manual on Municipal solid Waste Management, CPHEEO, Govt. of India.
5. Guidelines for Management and Handling of Hazardous wastes MOEF (1991), Govt. of India.

EEV-503: Soil and Water Conservation Engineering

Unit-1
Definition and scope of soil conservation, cause of soil erosion, Mechanism of erosion, universal soil loss equation, soil erosion due to wind and its control, vegetation management, i.e., strip cropping, stubble mulching and other practices,

Unit-2
Types of soil erosion due to water- sheet erosion, rill erosion, gully erosion, sediment transport in channels, sediment deposition in reservoirs. Methods of soil erosion control: bounding and terracing on agriculture land for gully control, bench terraces, vegetated water ways, chute spillways, drop inlet spillways, check dams, river training works.

Unit-3
Biological methods of soil erosion control, grass land management, forest management. Soil quality management, drainage works, reclamation of salt affected soils. Water conservation: water harvesting, rainfall- run off relation, water storage in ponds, lakes, reservoirs and aquifers, groundwater recharge through wells, check dams and storage works.
Unit-4
Water losses: filtration, seepage and evaporation losses, pollution/ contamination of water quality due to agricultural practices i.e., fertilizers and pesticides, self purification of surface water, sources of agricultural water pollution, pollutant dispersion in ground water.

Unit-5
Need of planned utilization of water resources, economics of water resources utilization. Flood plain zones management, modifying the flood, reducing susceptibility to damage, reducing the impact of flooding.

References
1. Alam Singh – Modern Geotechnical Engineering
3. N. C. Brady – Principles of Soil Sciences
4. B. C. Punmia – Soil Mechanics and Foundation Engineering

EEV-504: Health Safety and Environment

Unit-1

Unit-2
Fire hazards: Classification of fire, Grades of fire hazard, Classification of buildings/structures/materials/chemicals according to fire load. Fire hazard analysis, consequences & management. Mode of fire, fire fighting, Provision of buildings & Industrial structures from fire safety angle.

Unit-3
Different types of fire alarms/detectors/extinguishers, fire fighting requirements as per NBC 1983, Municipality water supply requirements for fire, required fire flow, storage, wet risers, sprinkler, fire fighting services etc.

Unit-4
General discussion on toxicology, Physiological effects of various compounds, Classification of hazardous chemicals/conditions. Occupational health & safety concepts. Classes of Explosive

Unit-5

Reference
1. National Safety Council Publication
3. CPCB Green Book
4. www.moef.gov.in
EEV-551: Air Pollution and Control Engineering Lab

Preparatory works for stack and ambient air monitoring.
Measurement of meteorology; lapse rate, wind velocity humidity, pressure etc.
Determination of SPM, Smoke Number, Gas Composition (HC, CO, NOx, SO\(_2\) and other pollutants).
Field monitoring by high volume and handy sampler.

References:
2. Pandey and Carney: Environmental Engineering

EEV-552: Solid Waste Management Lab

1. Sample preparation and sampling techniques,
2. Coning and quartering method,
3. Site description,
4. Profile sampling of municipal solid waste,
5. Analysis of solid waste/sludge for moisture content,
6. Analysis of solid waste/sludge for particle size,
7. Analysis of solid waste/sludge for calorific value,
8. Determination of N in the sample.

EEV-011-EEV-013: Departmental Elective-I

EEV-011: Earth and Environment

Unit-1
Understanding the Earth, atmosphere and processes governing environmental conditions; the biosphere, earth's energy budget, the atmosphere, climate and climate change, the geologic, tectonic, hydrological and biogeochemical cycles.

Unit-2
Study and significance of natural resources; renewable biological resources, wildlife conservation/management, fisheries, forestry, energy resources, energy consumption, scarcity and conservation;
Unit-3
Mineral resources, mineral availability and recycling; air, water and soil resources. World food supply; traditional agriculture, green revolution, aquaculture, modern agriculture, ecological impacts of modern agriculture, organic farming.

Unit-4
Major environmental concerns; natural hazards and processes, dams and environment, channelisation and environment, global climate and hazards,

Unit-5
Effect of population increase on environment, historical perspective of growing environmental concerns.

References:
1. Atmospheric Chemistry and Physics by John H Seinfeld and Spyros N.Pandis
4. Masters, G.M; Introduction to Environmental Engineering & Science, PHI, New Delhi

EEV-012: Ecological and Biological Principles and Processes

Unit-1
Ecosystems; biotic and abiotic components, production and consumption, trophic levels, productivity and energy flow.

Unit-2
Food webs, cycling of elements. Ecology of population; ecological niche, mortality and survivorship, community interactions. Changes in ecosystems; succession. Long range changes, long range stability.

Unit-3
The organization and dynamics of ecological communities. Description and study of typical natural and artificial ecosystems. Biochemistry; photosynthesis and respiration, important biological compounds, enzymes.

Unit-4
Microbiological concepts; cells, classification and characteristics of living organisms, characterization techniques, reproduction, metabolism, microbial growth kinetics.

Unit-5
Applications of microbiology to environmental engineering; assimilation of wastes, engineered systems, concepts and principles of carbon oxidation, nitrification, denitrification, methanogenesis, etc., concepts of quantification of degradable pollutants.
EEV -013-Environmental Biotechnology

Unit 1
Concept of Environmental Biotechnology and Environmental Engineering, scope and importance. Genetic engineering structure of DNA, RNA, Replication of DNA, genetic code, Transcription, Protein synthesis.

Unit-2

Unit-3

Unit 4
Air pollution and its control through biotechnology, Biotechnology in reduction of CO2 emission, Bioscrubbers, Biobeds, Biotrickling filters and their applications.

Unit 5
Microbiology of degradation of xeno biotic in environment – ecological considerations, decay behavior and degradative plasmids, hydrocarbons, substituted hydro carbons, oil pollution, surfactants, pesticides. Biological detoxification of cyanide, oxalate, urea, petrochemical industry effluents, toxic organics, phenols.

References:
3. Biotechnology : A Text Book of Industrial Microbiology, T. D.Brock,
4. Industrial Microbiology : Presscott and Dunn.
EEV-021-EEV-023: Departmental Elective-II

EEV-021: Science and Policy of climate change

Unit-I
The Energy Balance, Basic Concepts: Radiation, Albedo, Emissivity

UNIT-II
Paleo-indicators of climate, The Nature of Storms—cyclones and hurricanes
Expected changes with warming, Dynamics of storm generation and effects on ecosystems, Return to Secondary Circulations, El Nino, Atlantic Multidecadal Oscillation, Pacific-North American Pattern, Pacific Decadal Oscillation
Quantitative Analysis of Climate Change, Case Study: Hurricanes and Global Warming,

UNIT-III

Unit-IV
Class Legislative Proposals and Discussion, Hearings on subject matter chosen by leaders, Testimony by Staff, Continue Hearings and Testimony, Submission of Legislation, Active Federal Legislation on Climate Change

REQUIRED TEXT
(excerpts; assignments available online)
•Kuhn, T.S., 1962 and updates. The Structure of Scientific Revolutions (excerpts; no)
Current IPCC Assessment report

EEV022: Environmental Policy & Legislation

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UNIT 1
UNIT -II

UNIT-III

UNIT-IV

References:
1. Pollution control acts, rules and notifications issues, there under by CPCB [Ministry of and Environment and forest, Govt. of India] Paryavaran Bhawan, CGO Complex, New Delhi-110003.
4. EPA regulation on Test Procedures for the analysis of pollutants , “Environmental Reporter, section [136.3(a)]
5. Environmental Law by S.K. Mohanty (Universal Law Publications)
6. Environmental Law by Dharmendra S. Sengar (PHI)

EEV-023- ENVIRONMENTAL ECONOMICS

| Unit I  | Economy and Environment, Economic operation and environmental issues, environmental pollution and sources, adversities on the economy. Markets and Environmental Assets Incomplete markets, externalities, non-exclusion, non-rivalry and public good, nonconvexities, asymmetric information. | [8] |
| Unit II | Economic Incentive and Environmental Protection (i) Price rationing: Charges and subsidies (ii) Liability rules: Non-compliance fees, bonds and deposit refunds. (iii) Quantity rationing: Marketable permits. (iv) Evaluation criteria (v) Practical Conditions for use of economic incentives. | [8] |
| Unit III | Pollution Taxes Efficiency properties of a tax on emissions, problems with pollution taxes. | [8] |
Unit IV
 Tradable Pollution Permits, Basic theory of tradable pollution permits, issues in tradable permits. Transboundary pollution problem, international organizations for environmental protection. [8]

EEV-601: Wastewater Engineering

Unit-1
Introduction: Wastewater flows, and characteristics, Wastewater collection systems, Estimation and variation of wastewater flows. Treated wastewater reclamation and reuse, wastewater preliminary, primary, secondary and tertiary treatment processes. Screens, grit chambers & their design, sedimentation, coagulation, flocculation,

Unit-2
Theory of activated sludge process, extended aeration systems, trickling filters, aerated lagoons, stabilization ponds, oxidation ditches etc. Introduction to Duckweed Pond, Vermiculture and root zone technology for wastewater treatment, concept of anaerobic contact process, anaerobic Filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor.

Unit-3
Disposal of treated wastewater on land and in water bodies, ocean discharge, agricultural irrigation, ground water recharge, problems of industrial wastewaters, sampling protocol, Indian standards for disposal of treated wastewaters in natural streams, equalization, neutralization, proportioning processes, volume and strength reduction.

Unit-4
Physico-chemical and biological treatment strategies and their evaluation. Study on process flow sheets, wastewater characteristics, waste generation points, treatment scheme suggested for distillery, paper/pulp industry.

Unit 5
Study on process flow sheets, wastewater characteristics, waste generation points, treatment scheme suggested for the following industries
1. Tannery,
2. Sugar,
3. Textile,
4. Steel, and
5. Oil refinery.

References:
5. Fair & Geyer “Water supply and waste water disposal”.
6. Parker : Waste water system engineering
7. Wastewater Engineering by S.K.Garg, Khanna publication
8. Wastewater treatment by M.N.Rao & A.K.Dutta, PHI publication
EEV-602: Estimation and Project Management

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Unit-1

Unit-2
Analysis of rates, prime cost, work charge establishment, quantity of materials per unit of work for major civil engineering items, Resource planning through analysis of rates, market rates, PWD schedule of rates and cost indices for building material and labour. Introduction to valuation.

Unit-3
Project cycle, organization, planning, scheduling, monitoring, updating and management system in construction Bar chart, Milestone chart, Work down structure and preparation of networks. Application of network, Techniques like PERT, GERT,CPM,AON and AOA techniques.

Unit-4
Project monitoring; cost planning, resources allocation through network techniques. Time value of money, present economy studies, Equivalent concept, financing of projects, economic comparison, present worth method, equivalent annual cost method, discounted cash flow method, depreciation and break even cost analysis.

Unit-5
Legal aspects of contracts, their relative advantages and disadvantages, Different types of contracts, their relative advantages and disadvantages, Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tender preparation, process of tendering, Evaluation of tender, contract negotiation and award of work.

References:
2. PERT and CPM principle and application by L.S.Srinath.
3. PERT and CPM principle and application by B.C.punamia.
EEV-603: Environmental Impact Assessment and Audit

UNIT 1
Introduction to EIA & Audit, Environment & Industries, Input information, Plant operation, Environmental Management planning, Waste Streams impact on water bodies.

UNIT 2
Environmental Impact Assessment planning. Activities, Methodology for Environmental Impact Assessment, Role of Environmental Engineering firm, Role of Regulatory agencies & control boards, Role of the Public.

UNIT 3
Environmental Audit: Introduction, Environmental information Purpose & advantage of studies, General approach of environmental Auditing Environmental Audit, Audit programs in India, Auditing program in major polluting Industries, Reports of the Environmental audit studies.

UNIT 4
Pollution prevention and control laws & acts: Constitution of India & environment, Constitution protection to Environment laws, Administrative & legislative arrangement for Environmental production, Indian Standards, Pollution control acts in India, critical appraisal, fiscal incentives for environmental protection.

UNIT 5
Guidelines of preparation of project report and its evaluation, methods of clearance from the concern authorities at various labels.

References:
2. Environmental impact assessment by Canter.
4. Dying Wisdom: Rise, Fall, and potential of India’s Traditional rain water harvesting systems by Anil Agarwal & Sunita Narayan, CSE Publication. New Delhi.

EEV-651: Waste Water Engineering Lab

1. Physical analysis of wastewater sample
2. Analysis of samples for DO.
3. Analysis of samples for BOD.
4. To determine the COD.
5. Sampling protocol of wastewater from an Industry.
6. Preservation of wastewater samples for different tests i.e., DO, BOD, Metals etc.
7. To determine the nitrogen contents.

**Reference:**
1. Mathur : Water & waste water testing.

**EEV-652: Environmental Sanitation Lab**

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1. **Study of Storm Water:** Collection & Estimation By Different Formulae
2. **Study on Constructions and Design of Sewers:** Flow in Sewers, Flow in Full & Partially Full Sewers, Types of Sewers, Materials of Sewers, Joints & Sewer Appurtenances
3. **Study on Layout and Constructions of Sewer Lines:** Small Bore Sewer Systems, Planning of Sewerage System. Institutional Wastewater Management.

4. Study of various type of sanitary units
5. Construction and design of septic tank
6. Study of sanitation in rural areas: visit to nearby village
7. Methods of disposal of effluent from residential / commercial buildings.
8. Preparation of drawing of connectivity and net working of sanitary units.

**EEV-031-033: Departmental Elective-III**

**EEV-031-Disaster Management**

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**Unit-I**

**Natural Hazards and Disasters.**

**Unit-II**

**Man induced hazards & Disasters**
Mechanics & forms of Soil Erosion, - Factors & causes of Soil Erosion, Conservation measures of Soil Erosion, Chemical hazards/disasters-- Release of toxic chemicals, nuclear explosion, Sedimentation processes, - Global Sedimentation problems, Regional Sedimentation problems, Sedimentation & Environmental problems, Corrective measures of...
Unit -III
Emerging approaches in Disaster Management- Three Stages:
1. Pre-disaster stage (preparedness) - (a) Preparing hazard zonation maps, predictability/forecasting & warning, b) Preparing disaster preparedness plan, c) Land use zoning, d) Preparedness through (IEC) Information, education & Communication Pre-disaster stage (mitigation) Disaster resistant house construction, Population reduction in vulnerable areas, Awareness
2. Emergency Stage:- a) Rescue training for search & operation at national & regional level, b) Immediate relief, c) Assessment surveys
3. Post Disaster stage-Rehabilitation- a) Political Administrative Aspect, b) Social Aspect, c) Economic Aspect d) Environmental Aspect

Unit-IV:
Natural Disaster Reduction & Management
a) Provision of Immediate relief measures to disaster affected people, b) Prediction of Hazards & Disasters, c) Measures of adjustment to natural hazards


Preparedness :-a) Education on disasters, b) Community involvement, c) The adjustment of Human Population to Natural hazards & disasters, Role of Media, Application of Geographical Information System(GIS) in Disaster risk management

Unit –V
A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India, Ecological planning for sustainability & sustainable development in India-Sustainable rural development:A Remedy to Disasters, -Role of Panchayats in Disaster mitigations, Environmental policies & programmes in India-Institutions & National, Centres for Natural Disaster reduction

References
Savinder Singh, *Environmental Geography, Prayag Pustak Bhawan, 1997*
R.B. Singh (Ed) *Disaster Management*, Rawat Publication, New Delhi, 2000
H.K. Gupta (Ed) *Disaster Management*, Universities Press, India, 2003
R.B. Singh, *Space Technology for Disaster Mitigation in India (INCED)*, University of Tokyo, 1994
R.K. Bhandani: An overview on Natural & Man made Disaster & their Reduction, CSIR, New Delhi
EEV-032- Integrated Impact Assessment

UNIT-I
Introduction & an Overview of IIA
Defining IIA; Sustainable Development challenges and need for IIA, Key Approaches of IIA: Environment, Social Health and Economic, Current Practices, Changing Perspectives & Debate in IIA, Environmental Impacts – examples, need for assessment, difficulties; The EIA Approach – Background, Objectives, Components & Techniques, Impact prediction & analysis, Treatment of Risk and Uncertainty, EIA inputs to the project cycle and development planning, EIA in India – Legislative aspects, Current practices & Constraints, EIA case study

UNIT-II
Biodiversity and Health Impact Assessment Role of BIA in the existing EIA process, Identification, prediction and evaluation of impacts on biodiversity, techniques of biodiversity impact assessment and monitoring, threat reduction methods, Case study, Impact of environment on health, Morbidity Pattern in India, Developing framework for HIA Analysis, Changing concept and approach in Health Impact Assessment, Health Need Assessment, tools and techniques in HIA, HIA Case Study

UNIT-III
Handling Social Issues: the SIA Approach
Overview and scope of Social Impact Assessment (SIA), SIA and community, marginalized/vulnerable groups, indigenous people, resettlement & rehabilitation and development, SIA and Gender Impact Assessment, SIA and NRM, SIA Case Studies

UNIT-IV
Integrated Analysis of Environmental, Social & Health Impacts
Challenges for IIA: Removing inconsistencies and differences between different approaches; other methodological and practical issues, Scope for integrated approach in economic analysis: concept of economic analysis, Cost-Benefit Analysis (CBA), Social CBA, Cost Effectiveness Analysis (CEA), The Analytic Hierarchy Process (AHP) based approach to project appraisal,

UNIT-V
Mapping Tools and Contribution of IIA in Decision makings
Role and relevance of GIS Techniques in IIA, Public Participation in IIA and its relevance to decision-making, Contribution of IIA to decision-making – prospects & constraints; Stakeholder participation in IIA – importance, methodological and practical issues, Emerging Dimensions & Future Directions, Strategic Environmental Assessment (SEA), Technology Assessment, Risk Assessment, IIA Case Studies: Case Study 1, Case Study 2, Case Study 3

References:

**EEV-033-Environmental Risk Assessment**

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**Unit 1**
Environmental Risk, What is an environmental risk, types of environmental risk, the management risk, why do we need environmental risk management. International collaborations in risk management

**Unit 2**
Establishing an overview of the problem
Models, boundaries and contexts, modeling the problem, setting boundaries to the risk system, putting the risk into comparative context.

**Unit 3**
Identifying and estimating risk
Selection of techniques, environmental monitoring and health surveillance, testing and screening, modeling, environmental models, establishing the relationship between the dose and the effect.

**Unit 4**
Risk evaluation and national policies
Policy considerations, legislative considerations, legal considerations, economic considerations.
Managing environmental risks

**Unit 5**
Developing a national risk profile, institutional arrangements, risk management tasks.
Environmental links, socio-economic links, common national problems, emerging needs and suggested actions.

**Reference Books**
1. Environment Risk Assessment (Scope 13-18)-Anne V. Whyte and Ian Burton
2. Environmental Impact Assessment Methodologies, 2nd Ed.
3. Y. Anjaneyulu, Walli Manickam (B S Publications)

**EEV-041-043: Departmental Elective-IV**

**EEV-041- Process Engineering Costing and Plant Design**

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**Unit I**

**Process Development:**

**Plant Design:**
Design basis, Process selection -Selection of equipment, specification and design of equipment’s, material of construction, Plant location, Plant layout and installation, Safety, Start up, Shutdown and Operating guidelines. [8]

**Unit II**

**Cost Engineering**
Time value of money and equivalence, Interest, cost comparisons by present worth, Annual equivalent cost and capitalised cost methods, Uniform gradient and series. Depreciation, Taxes and Insurances
Nature of depreciation, Methods of determining depreciation, depreciation rates in current Indian situation, Types of taxes and insurance’s, Procedure for cost comparison after taxes. [8]

**Unit III**

**Cost Estimation**
Types of cost estimation, capital investment cost, fixed capital cost, working capital cost, start-up costs, process equipment cost estimation, cost index, Equipment costs due to inflation, Battery limit investments, estimation of plant cost, Estimation of total product cost, Manufacturing cost, General expenses.

**Profitability**
Criteria of profitability, Payout period, Return on investment, Present value, Cash flow analysis, Alternative investment analysis, Sensitive analysis in project profitability. [8]

**Unit IV**

**Economic Optimization and Optimum Design**
Nature of optimisation, Uni-variable and multivariable systems, Analytical, graphical and incremental methods of solution, LaGrange multiplier method, Linear programming and dynamic programming establishing optimum conditions, Break even chart for production schedule, Optimum production rates in plant operation, Optimum conditions in batch, cyclic and semicyclic operation, Sensitivity and response analysis. [8]

**Unit V**

**Optimisation of Different Process Equipment**
Viz., transportation systems, heat exchangers, evaporators, mass transfer equipments and reactors. Determination of height and diameter of different process equipments at conditions of optimum cost. Pinch Technology analysis.
Preparation of techno-economic feasibility report.

References

EEV-042-CHEMICAL REACTION ENGINEERING

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Unit I
Rate of reaction, Elementary and non-elementary homogeneous reactions, Molecularity and order of reaction, Thermodynamic formulations of rates, Mechanism of reaction, Temperature dependency from thermodynamics, Arrhenius collision and activated complex theories. [8]

Unit II
Integral and differential methods for analyzing kinetic data, Interpretation of constant volume batch reactor, data for zero, first, second and third order reactions, Half life period, Irreversible reaction in parallel and series, Auto catalytic reaction. [8]

Unit III
Interpretation of variable volume batch reactions data for zero, first and second order reactions, Design equations for batch, plug flow, back mix flow and semi batch reactors for isothermal, adiabatic homogeneous reaction. [8]

Unit IV
Holding time and space-time for flow system, Design of batch, plug flow and mixed flow reactors for first and second order single reactions, Optimum reactor size, Plug flow reactors in series/parallel. Equal and different size of mixed reactors in series and finding the best system for the given conversion, Recycle reactor, Design of reactors for multiple reactions, parallel and series reaction, series-parallel reactions. [8]

Unit V
Temperature and pressure effects for single reaction, Optimal temperature progression for first order reactions. Residence time distribution of fluid in vessels, E, F and C curve, Dispersion models, Tanks in series model [8]

Text Books

Reference Books

EEV-043-HEAT TRANSFER OPERATIONS

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</table>
Unit 1
Introduction to heat transfer and general concepts of heat transfer by conduction, convection and radiation. Conduction: Basic concepts of conduction in solids, liquids and gases, steady state temperature fields and one dimensional conduction without heat generation, e.g., through plane walls, cylindrical and spherical surfaces, composite layers, etc. Insulation materials, critical and optimum insulation thickness. Extended surfaces, fins and their practical applications. Introduction to unsteady state heat transfer.

Unit 2
Convection: Fundamentals of convection, Basic concepts and definitions, natural and forced convection, hydrodynamic and thermal boundary layers, laminar and turbulent heat transfer inside and outside tubes. Dimensional analysis, determination of individual and overall heat transfer coefficients and their temperature dependence, heat transfer in molten metals.

Unit 3
Radiation: Basic laws of heat transfer by radiation, black body and gray body concepts, view factors, Kirchoff’s law, solar radiations, combined heat transfer coefficients by convection and radiation.

Unit 4

Unit 5
Heat Transfer Equipment: Classification, principles and design criteria, types of exchangers, viz., double pipe, shell and tube, plate type, extended surface, Furnaces and their classification and application.

Books Recommended

Reference Books

EEV-701: Environmental System Simulation

<table>
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<tr>
<th>Unit-I</th>
<th>Introduction</th>
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<tr>
<td>introduction</td>
<td>System and System Analysis, Static and Dynamic System, models and modeling, Types of Models, Stochastic and Deterministic Models, Dynamic Simulation Modeling, Necessity of</td>
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</table>
models in management of Environmental System, Steps followed in Modeling, Model Conceptualization, Model Development, Solution Methodologies- Numerical, analytical and Monte Carlo methods of simulation, Computer Coding, Data Acquisition and Processing, Model Calibration, Model Validation and Verification, Sensitivity Analysis.

UNIT-II
Air Pollution Dispersion Modeling
Meteorological factors affecting air quality, Lapse rates, Dry adiabatic, Moist Adiabatic and ambient Lapse rates, Stable, Unstable and Neutral Atmospheric Condition, Maximum Mixing height, Temperature Inversions, Effect of Lapse Rate on Plume behavior- Conning, Looping, Lofting, fanning, fumigation, Point Source Gaussian Plume Model- Effective Stack Height, Pasquil-Gifforth Stability criteria, Horizontal and Vertical Dispersion, Wind Speed Correction, Numerical Examples and Some case studies on Air Pollution Dispersion Modeling.

UNIT-III
Surface Water Quality Modeling
Control mass and volume, Material balance equation, Dissolved Oxygen Depletion, Biochemical Oxygen Demand Measurement, Modeling BOD as a First-order Reaction, Ultimate Biochemical Oxygen Demand, Biological Oxygen Demand: Temperature Dependence, Nitrogenous Oxygen Demand, Theoretical Oxygen Demand, Chemical Oxygen Demand, Dissolved Oxygen Sag Curve, Steps in Developing the DO Sag Curve, Numerical Examples and some case studies on surface water quality modeling.

UNIT-IV
Storm Water Management Models
Component of Urban Drainage System, Elements of EPA Storm water management model, Visual and non visual objects, Computational methods of Runoff, Infiltration, Evapotranspiration and Peak flow component in EPA SWMM, Rainfall-Runoff modeling, Unit hydrograph methods, Hydrologic and Hydraulic routing methods, Typical application of SWMM with examples.

UNIT-V
Application of Operation Research in Environmental Engineering

References:
1. System Simulation By Geoffrey Gordon, Prentice Hall (Higher Education Division, PearsonEducation)
2. Peavy and Rowe: Environmental Engineering: (TMH publications)
5. Introduction to Hydrology by Warren Vissman, Jr and Gary L Lewis (Pearson education)
6. Heera and Gupta: Operation Research
7. Manuals of relevant EPA Models
ECE-702: Water Resources Engineering

Unit-1

Unit-2
Surface Run off: Components and factors affecting run off methods of estimation of run off volume and perk runoff, rating curve, Rainfall – run off relationships.
Sediment transportation: Suspended and bed load and its estimations, Various losses in canal & their preventive measures. Water logging

Unit-3
Irrigation: Developments in India, Necessity & types advantages and disadvantages of irrigation, Function of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, irrigation efficiencies, Principal crops & crops season, crop rotation.

Unit-4
Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects. River Training: Objective & need, Classification of rivers training works, meandering, methods of river training, Bank protection.

Unit-5
Earth Dam: Classification, Causes of failure. Introduction to stability analysis, Gravity Dam: Forces, Methods of analysis, Modes of failure and factor of safety stability analysis. Galleries

References:
1. Irrigation and water resources Engg. By G.L. Asawa New age international publishers.

VII Semester, PRACTICAL/DESIGN/DRAWING

EEV-751: Environmental System Simulation Lab

1. Simple exercise on computer simulation of air pollution.
2. Simple Exercise on Computer Simulation of Surface Water quality.
3. Simple Exercise on Computer Simulation of Soil Water Balance
4. Simple Exercise on application of Storm Water Management Model
5. Exercise on Application of Linear programming in Environmental engineering
6. Exercise on Application of Transportation Problem in Environmental Engineering

Final Year, VIII Semester

EEV051-053: Departmental Elective-V

Paper Name: Sustainable Agriculture, Building and Sanitation

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Unit-1
Meaning and Scope of Sustainable Development Sustainable agriculture, water harvesting and irrigation techniques, water resources management, watershed management, ground water management, rain water harvesting, waste water management – recycle and reuse.

Unit-2
Agro produce processing, organic farming systems – sustainability organic manure, biofertilizer. Post harvest technologies.

Unit-3
Health, Sanitation and community psychology Psychological aspects of community health, family planning, infant mortality rates information on communicable diseases and prevention, drinking water quality parameters, WHO standards, Water contamination, prevention methods of water treatment, sanitation practices for common facilities such as community toilets, sewage system to pit latrines for waterlogged areas.

Unit-4
Building of cost effective and energy efficient houses, materials used in rural housing selection based on local availability, cost, strength and durability, thermal comfort, direction of sunlight, passive solar heating, bonding schemes, site selection based on wind direction and solar rays, ventilation and natural lighting, government policies, habitat management pre-fabrication of building components, new materials, protection against rain.

Unit-5
Water harvesting techniques

4. Rural Water Supply in Developing Countries-IDRC-167e
5. Sanitation in Developing countries—IDRC 168e
Unit– I
Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention, Groundwater Basin Management: Concepts of conjunction use, Case studies.

Unit – II
Ground Water Movement: Permeability, Darcy’s law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

Unit – III

Unit – IV

Unit – V

TEXT BOOKS:
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCES :
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers
EEV-053-Design of Structure

UNIT 1

UNIT 2
Design of one way and two way slabs by limit state method. Serviceability limit states, control of deflection & cracking.

UNIT 3

UNIT 4

UNIT 5

Reference:
1. IS : 456 – 2000
3. Reinforced Concrete design by B.C. Purmia.
5. Reinforced Concrete structures by R. Park & Pandey

EEV061-063: Departmental Elective-VI

EEV-061- Water Power Engineering

UNIT 1
factor, diversity factor, load duration curve, firm power, secondary power, prediction of load
illustative examples.

Unit – 2
Type of Hydro-Power Plants –I Classification of Hydel Plants, run of river plants, general
arrangement of run of river plants, valley dam plants, diversion canal plants, high head
diversion plants storage and pondage illustrative examples.

Type of Hydro Power Plants –II
Basic features historical development, advantages of pumped storage plants, types of pumped
storage plants, relative merits of two unit and three unit arrangement. Three unit arrangement,
reversible pump turbines, problems of operation, topography reservoirs and water conveyance,
power house, efficiency of P-S plants, illustrative example.

Unit – 3
Water Conveyance General. Classification of penstocks, design criteria for penstocks,
economical diameter of penstock, anchor blocks, conduit valves, types of valves, bends and
manifolds, illustrative example, Introduction, water hammer, resonance in penstocks, channel
surges, surge tanks illustrative examples. Intakes, type of intakes, losses of intakes, air
entrainment at intakes, inlet aeration, canals fore bay, tunnels.

Unit - 4
Turbines Introduction, main types of turbines, hydraulic features, turbine size, constructional
features of turbines, layout arrangements, hydraulic of turbines, basic flow equations, draft
tubes, cavitations in turbines, governing of turbines, turbine model testing characteristics of
turbines, illustrative examples.

Unit - 5 Power House Planning
General. (A) surface power stations, power house structure, power house dimensions,
lighting and ventilation, variations in design of power house (B) underground power station,
history, location of U.G power station, Types of U.G power station, advantages of U.G power
house, components of U.G power house, types of layout, limitations of U.G power house
structural design of power house, Tidal phenomenon, tidal power- basis principle, historical
development, location of tidal power plant, difficulties in tidal power generation, components
of tidal power plants, modes of generation, single basin arrangement, double basin system.

Reference Text:
1. Water Power Engineering by M.M. Dandekar and K.N. Sharma, Vani Educational Books
2. Irrigation and water resources Engg. By G.L. Asawa New age international publishers.
3. Irrigation and water power Engineering by B.C. Punamia, Pande B.B. lal (Laxmi Publications Private Limited)

EEV-062- Integrated Watershed Management

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UNIT-I
INTRODUCTION: Concept of watershed development, objectives of watershed development,
need for watershed development in India, Integrated and multidisciplinary approach for
watershed management.,

UNIT-II
WATER HARVESTING: CHARACTERISTICS OF WATERSHED: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds, Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks,

UNIT-III
PRINCIPLES OF EROSION: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation, MEASURES TO CONTROL EROSION: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT-IV
LAND MANAGEMENT: Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

UNIT-V
Planning of watershed management activities, peoples participation, preparation of action plan, administrative requirements.

TEXT BOOKS:

REFERENCE:
1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India

EEV-063- Transport Phenomena

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<td>UNIT 1</td>
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<td>Introduction to transport phenomena, molecular transport mechanisms and general properties, transport with net convective flux, flow turbulence and boundary layer theory.</td>
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UNIT 2
Transport in ducts, heat & mass transfer in duct flow, transport in immersed bodies,

UNIT 3
Unsteady state transport and agitation.

UNIT 4
Estimation of transport coefficient, non-Newtonian fluids, rheological characteristics of materials, agitation of non-Newtonian fluids.

UNIT 5
Heat & mass transfer with chemical reaction inside a porous catalyst.

REFERENCES:
1. R. Byron Bird, Warren E. Steward and Edwin N. Lightfoot, Transport Phenomena by
5. Robert Alber Greenkorn, David P. Kossler, Momentum, Heat and Mass Transfer fundamentals, Marcel Dekker

EEV801: Design of Waste Water System

L T P
3 1 0

Unit – 1  
Concept and Scope of Design of wastewater systems, Basic Design Consideration, Principle of Reactor design and process flow sheets.

Unit -2  

Unit-3  

Unit-4  
Theory and Design of Waste stabilization ponds, aerated lagoons and oxidation ditches, design problems

Unit-5  
Treatment and Disposal of Sludge: Sludge treatment processes, characteristic of sludge, sludge thickening, Sludge conditioning, Sludge dewatering, Aerobic and anaerobic digestion, Final disposal of sludge.

References:
1. Manual on Sewerage and Sewage disposal-CPHEEO, Govt. of India.