DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. FOURTH YEAR

(ENVIRONMENTAL ENGINEERING)

On

Choice Based Credit System

(Effective from session 2019-20)

SEVENTH SEMESTER ENVIRONMENTAL ENGINEERING SESSION 2019-20

S. No.	Subject Code	Subject Name	Department	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1		Open Elective Course-1	Other Deptt.	3---0---0	70	20	10	100	3
2	REV071 REV072 REV073 REV074	**Elective -3** Disaster Management and Mitigation Integrated Impact Assessment Environmental Geotechnology Environmental Planning for Smart Cities	Core Deptt.	3---0---0	70	20	10	100	3
3	REV075 REV076 REV077 REV078	**Elective -4** Process Engineering and Plant Design Chemical Reaction Engineering Heat transfer and operations Transport Phenomenon	Core Deptt.	3---1---0	70	20	10	100	4
4	REV701	Environmental System Modelling	Core Deptt.	3---1---0	70	20	10	100	4
5	REV702	Water Resource Planning and Management	Core Deptt.	3---0---0	70	20	10	100	3
6	REV751	Environmental System Modeling Lab	Core Deptt.	0---0---2	50		50	100	1
7	REV752	Finishing Lab	Core Deptt.	0---0---2	50		50	100	1
8	REV753	Industrial Training	Core Deptt.	0---0---3			100	100	2
9	REV754	Project-1	Core Deptt.	0---0---6			200	200	3
	TOTAL				**450**	**100**		**1000**	**24**

Industrial Training: Industrial Training 1 (completed after IVth sem) & 2 (completed after VIth sem) is to be evaluated in VII semester.

Project-1:-Students will initiate Project work in VII semester as Project -1 and the same will be completed in VIII semester as Project-2.

Evaluation of Project-1 should be based on the progress reported by the student and certified by the supervisor.

EIGHTH SEMESTER **ENVIRONMENTAL ENGINEERING** **SESSION 2019-20**

S No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1		Open Elective Course -2	Other Deptt.	3---0---0	70	20	10	100	3
2		**Elective -5**	Core Deptt.	3---1---0	70	20	10	100	4
	REV081	Construction Technology and Management							
	REV082	Engineering Hydrology and Groundwater Management							
	REV083	Computer Aided Design of Structure							
	REV084	Soil and Water Conservation Engineering							
3		**Elective -6**	Core Deptt.	3---0---0	70	20	10	100	3
	REV085	Water Power Engineering							
	REV086	Integrated Watershed Management							
	REV087	Rural Development & Engineering							
	REV088	Environmental Statistics and Experimental Design							
4	REV851	Seminar	Core Deptt.	0 ---0---3			100	100	2
5	REV852	Project-2	Core Deptt.	0---0---12	350		250	600	12
	TOTAL				**560**	**60**	**380**	**1000**	**24**

REV-071 DISASTER MANAGEMENT AND MITIGATION L T P

3 0 0

Unit-I Concepts of Hazard, Vulnerability, Risks, Natural Disasters (earthquake, Cyclone, Floods, Volcanoes), and Man Made Disaster (Armed conflicts and civil strip, Technological disasters, Human Settlement, Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Risks, Difference between Accidents and Disasters, Simple and Complex Disasters, Refugee problems, Political, Social, Economic impacts of Disasters, Gender and Social issues during disasters.

Unit-II Disaster Risk Reduction Strategies, Disaster Cycle, Phases of Disaster, Preparedness Plans, Action Plans and Procedures, Early warning Systems Models in disaster preparedness, Components of Disaster Relief-(Water, food, sanitation, shelter, Health and Waste Management), Community based DRR, Structural non structural measures in DRR, Factors affecting Vulnerabilities, , Mainstreaming disaster risk reduction in development, Undertaking risk and vulnerability assessments,

Unit-III Policies for Disaster Preparedness Programs, Preparedness Planning, Roles and Responsibilities, Public Awareness and Warnings, Conducting a participatory capacity and vulnerability analysis, , Sustainable Management, Survey of Activities Before Disasters Strike, Survey of Activities During Disasters, DRR Master Planning for the Future, Capacity Building, Sphere Standards. Rehabilitation measures and long term reconstruction. Psychosocial care provision during the different phases of disaster

Unit-IV Introduction to disaster medicine, Various definitions in disaster medicine, Disaster life cycle, Disaster planning, Disaster preparation, Disaster recovery in relation to disaster medical management, Medical surge, Surge capacity, Medical triage, National Assessing the nature of hazardous material - Types of injuries caused, Self protection contaminated area and decontaminated area – Pre hospital medical management of victims – Triaging medical & psychosocial identification of hospitals and other medical facilities to offer efficient disastrous medical service

Unit-V Hazard and Vulnerability Profile India,, Disaster Management Indian scenario, India’s vulnerability profile, Disaster Management Act 2005 and Policy guidelines, National Institute of Disaster Management, , National Disaster Response Force (NDRF)National Disaster Management Authority, States Disaster Management Authority, District Disaster Management Authority Cases Studies : Bhopal Gas Disaster, Gujarat Earth Quake, Orissa Super-cyclone, south India Tsunami, Bihar floods, PlagueSurat

REFERENCES:

1. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012.
2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
3. Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth. Belg;56:395-401
4. Aim and Scope of Disaster Management. Study Guide prepared by Sharman and Hansen. UW-DMC, University of Washington.

REV-072 INTEGRATED IMPACT ASSESSMENT

L T P

3 0 0

Unit-I 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 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, 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

Unit-III 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-IV Contribution of IIA to decision-making–prospects & constraints; Stakeholder participation in IIA–importance, methodological and practical issues, Strategic Environmental Assessment (SEA), Technology Assessment, Risk Assessment.

Unit-V Basic concepts of monitoring and evaluation, guidelines tool for M&E (logic model, monitoring plan, evaluation plan), measures and indicators, evaluation designs and its applications–case study

REFERENCES:

1. Bathwal R.R. (1988) Environmental Impact Assessment, New Age, International Publishers.
2. Canter L.W. (1996) Environmental Impact Assessment, 2ndEdn. New York, McGraw Hill.
3. Dale R. (2004) Evaluating Development Programme and Project, Second Edition, Sage Publication.
4. Lee N. and Kirkpatrick C. (Eds) (2000) Integrated Appraisal and Sustainable Development in a Developing World, Cheltenham, Edward Elgar.
5. Vanclay F. and Bronstein D.A. (1995) Environmental and Social Impact Assessment, Wiley Publishers.

REV-073 ENVIRONMENTAL GEOTECHNOLOGY

L T P

3 0 0

Unit I Introduction, Development of Environmental Geotechnology, Aims,Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems.

Unit II Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil water system, Site Investigation for detection of sub surface contamination

Unit III Load environment factor design criteria, soil structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under water foundation problems.

Unit IV Ash Pond and Mine Tailing Impoundments, Geotechnical re use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action

Unit V Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills

REFERENCES:

1. Fang, H. Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. Designing with geosynthetics

REV-074 ENVIRONMENTAL PLANNING FOR SMART CITIES

L T P

3 0 0

Unit I Concepts of Environmental Planning, History of Environmental Planning, Development of habitat patterns, settlement structure and form in response to environmental challenges. Concepts of Ecology and Ecosystem, Resource analysis for various ecosystems and development imperatives (land, geology, soil, climate, water, vegetation) characteristics, exploitation, causative factors for degradation, analytical techniques.

Unit II Urban Ecosystem. Environmental Zones (Hill, coastal, arid, characteristics, resources, settlements pattern, problems and potentials, regulating mechanisms for development. Environmental Policies and initiatives including policies, strategies, protocols, treaties and agreements

Unit III Environmental Management Resource Management: Including management of land, water bodies and water channels, forests and wildlife, minerals. Management of Urban Areas. Management of sensitive areas – hills, coasts, arid, wetlands etc. (including participatory approaches) Management of Watersheds

Unit IV Smart Cities Innovation economy (Innovation in industries, clusters, districts of a city; Knowledge workforce: Education and employment; Creation of knowledge-intensive companies); Urban Infrastructure (Transport, Energy/ Utilities, protection of the environment and safety); Governance (Administration services to citizens, participatory and direct democracy, services to the citizen, quality of life)

Unit V Planning interventions Inclusive zoning, development and building regulations, Slum Improvement; drafting strategic urban development plans – objectives and key actors; planning framework for actions, process of drafting the plan, key considerations; urban design and decision-making; city transport for all; water supply and sanitation, urban disaster management, management through decentralization

REFERENCES:

1. Randolph, John. Environmental Land Use Planning and Management, 2nd edition. Island Press. Washington, D.C.
2. Shearer, A. W. Examining development-related uncertainties for environmental management: Strategic planning scenarios in Southern California. Landscape and Urban Planning
3. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
4. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development

REV-075 PROCESS ENGINEERING COSTING AND PLANT DESIGN

L T P

3 1 0

Unit-I Introduction: Basic concepts: General design considerations, Process design development, Layout of plant items, Flow sheets and PI diagrams, Economic aspects and Optimum design,

Unit-II Practical considerations in design and engineering ethics, Degrees of freedom analysis in interconnected systems, Network analysis, PERT/CPM, Direct and Indirect costs, Optimum scheduling and crashing of activities.

Unit-III Flow-sheeting: Synthesis of flow sheet: Propositional logic and semantic equations, Deduction theorem, Algorithmic flow sheet generation using P-graph theory, Sequencing of operating units, Feasibility and optimization of flow sheet using various algorithms viz, Solution Structure Generation (SSG), Maximal Structure Generation (MSG), Simplex, Branch-and-bound etc.

Unit-IV Analysis of Cost estimation: Factors affecting Investment and production costs, Estimation of capital investment and total product costs, Interest, Time value of money, Taxes and Fixed charges, Salvage value, Methods of calculating depreciation, Profitability, Alternative investments and replacements.

Unit-V Optimum Design and Design Strategy: Break-even analysis, Optimum production rates in plant operation, Optimum batch cycle time applied to evaporator and filter press, Economic pipe diameter, Optimum insulation thickness, Optimum cooling water flow rate and optimum distillation reflux ratio.

REFERENCES:

1. Peters, M.A. and Timmerhaus, K.D., Plant Design and Economics for Chemical Engineers, McGraw Hill (2003).
2. Anil Kumar, Chemical Process Synthesis and Engineering Design, Tata McGraw Hill (1982).
3. Ulrich, G.D., A Guide to Chemical Engineering Process Design and Economics, John Wiley & Sons (1984).
4. Perry, R.H. and Green, D., Chemical Engineer's Handbook, McGraw-Hill (1997).

REV-076 CHEMICAL REACTION ENGINEERING L T P

3 1 0

Unit I Rate of reaction; Elementary and non-elementary homogenous reactions; Molecularity and order of reaction; Thermodynamic formulations of rates; Mechanism of reaction; Temperature dependency from thermodynamics; Arrhenius collision and activated complex theories.

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.

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 homogenous reaction.

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 & series reaction and series-parallel reactions.

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

REFERENCES:

1. "Heat Transmission", W. H. McAdams, McGraw Hill, 3rd Edition.
2. "Process Heat Transfer", D. Q. Kern, McGraw Hill.
3. “Unit Operations of Chemical Engineering”, McCabe W L, Smith J C, Harriott P, 7th Ed. McGraw Hill, 2005.
4. “Heat Transfer”, J. P. Holman, McGraw Hill, Tenth Edition

REV-077 HEAT TRANSFER AND OPERATION L T P

3 1 0

Unit-I Conduction convection & radiation. General laws of heat transfer. Fourier's law, Thermal Conductivity – its variation with temperature & Pressure and its relationship with electrical conductivity. Heat transfer through composite walls and cylinders. Unsteady state heat transfer through some important shapes. Different types of insulating materials, general properties & application of insulators.

Unit-II Natural convection: Natural convection from vertical plates & horizontal cylinders. Forced convection: In laminar flow - Heat transfer in plate & tubes. In turbulent flow - Empirical equations for individual coefficients: inside tubes, outside tubes, outside bundle of tubes, flow past spheres. Significance of Prandtl No., Nusselt No., Grashof No., Graetz No. & Peclet No. Correction for tube length. Corrections for heating and cooling the fluid. Various analogies between heat & momentum transfer.

Unit-III Radiation: Radiation laws like Stefan Boltzmann's law, Kirchhoff's law, Wien's law, Plank's law etc. Black body, Grey body. Transmissivity, Absorptivity, Reflectivity, Emissivity of black bodies and gray bodies. Application of thermal radiation: Radiation Transfer between surfaces. Radiation through semi transparent materials

Unit-IV Heat transfer with phase change: Boiling of liquids, Pool boiling curve, different types of pool boiling, condensation of vapor, film wise & drop wise condensation, weighted LMTD & Overall Heat transfer Coefficient for desuperheating & sub cooling. Evaporation: Performance of tubular evaporator. Individual & overall Coefficients, Capacity & economy of evaporators. Boiling point elevation, Durhing's rule, Effect of liquid head & friction on pressure drop, Types of evaporators, Multiple effect evaporators. Vapor recompression, Thermal recompression & mechanical recompression.

Unit-V Heat Exchange equipments: Double pipe heat exchangers. Individual and overall heat transfer coefficient, LMTD, Variable overall Heat transfer coefficient, fouling factors, Shell & tube heat exchangers, LMTD correction factors, Extended surface heat exchangers, Fin efficiency and fin effectiveness .

REFERENCES:

1. "Heat Transmission", W. H. McAdams, McGraw Hill, 3rd Edition.
2. "Process Heat Transfer", D. Q. Kern, McGraw Hill.
3. "Unit Operations of Chemical Engineering", McCabe W L, Smith J C, Harriott P, 7th Ed. McGraw Hill, 2005.
4. "Heat Transfer", J. P. Holman, McGraw Hill, Tenth Edition

REV-078 TRANSPORT PHENOMENA L T P

3 1 0

Unit I Importance of transport phenomena; analogous nature of transfer process; basic concepts, conservation laws; continuous concept, field, reference frames, substantial derivative and boundary conditions; methods of analysis; differential, integral and experimental methods.
Phenomenological laws of transport properties, Newtonian and non Newtonian fluids; Theories of transport properties of gases and liquids; effect of pressure and temperature.

Unit II General method of shell balance approach to transfer problems; Choosing the shape of the shell; most common boundary conditions; momentum flux and velocity distribution for flow of Newtonian and non-Newtonian fluids in pipes, for flow of Newtonian fluids in planes, slits and annulus. Heat flux and temperature distribution for heat sources such as electrical, nuclear, viscous and chemical; forced and free convection; mass flux and concentration profile for diffusion in stagnant gas, systems involving reaction and forced convection.

Unit III Conservation laws and equations of change; Development of equations of continuity motion and energy in single multi components systems in rectangular coordinates and the forms in curvilinear coordinates; simplified forms of equations for special cases, solutions of momentum, mass and heat transfer problems discussed under shell balance by applications of equation of change, scale factors; applications in scale-up.

Unit IV Turbulent phenomena; phenomenological relations for transfer fluxes; time smoothed equations of change and their applications for turbulent flow in pipes; boundary layer theory; laminar and turbulent hydrodynamics thermal and concentration boundary layer and their thickness; analysis of flow over flat surface

Unit V Estimation of transport coefficient for non-Newtonian fluids, Rheological models, Rheological characteristics of materials, agitation of non-Newtonian fluids.

REFERENCES:

1. R.B.Bird, W.E.Stewart and E.W.Lighfoot, " Transport Phenomena ", John Wiley, 1978.
2. J.R.Wilty, R.W.Wilson, and C.W.Wicks, " Fundamentals of Momentum Heat and Mass Transfer 2nd Edn., John Wiley, New York, 1973.
3. W.J.Thomson, “Introduction to Transport Phenomena”, Pearson Education Asia, New Delhi, 2001.
4. Suhas V. Patankar, Dudley Brian Spadding, Heat and Mass Transfer in Boundary Layers, Morgan-Grampian.
5. W.M. Kays, M.E. Crawford, Bernhard Weigand, Convective Heat and Mass Transfer, McGraw Hill
6. Asim K. Dutta, Biological and Bio-Environmental Heat and Mass Transfer, Marcel Dekker.
7. Robert Alber Greenkorn, David P. Kossler, Momentum, Heat and Mass Transfer fundamentals, Marcel Dekker

REV-701 Environmental System and Analysis L T P

3 1 0

Unit 1
Introduction: System and system analysis, Static and dynamic system, Models and modeling, Types of models, Stochastic and deterministic models, Dynamic simulation modeling, Necessity of models in management of environmental system, Steps followed in modeling, Model conceptualization, Model development, Solution methodologiesnumerical, analytical and monte carlo methods of simulation, Computer coding, Data acquisition and processing, Model calibration, Model calidation and verification, Sensitivity analysis.

Unit 2
Air pollution dispersion modeling: Meteorological factors affecting air quality, Lapse rate, 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 3
Surface water quality modeling: Control mass and volume, Material balance equation, Dissolved oxygen depletion, Biochemical oxygen demand (BOD) measurement, Modeling BOD as a first-order reaction, Ultimate BOD, BOD: 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 4
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 5
Application of operation research in environmental engineering: Introduction, Linear programming model, Examples of linear programming problems, Developing linear programming models, Graphical solution to LP problems, Simplex method, Simplex tableau for maximization problem, Marginal values of additional resources, Sensitivity analysis, Complications in applying the simplex method, Application in resource allocation and, Water quality and wastewater treatment, Application of transportation problems and dynamic programming in water supply engineering.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TA.

Books 1.
Sivakumar, R. “Introduction to Environmental Science & Engineering’’, Mc-Graw Hill.
2. Gordon, G. “System Simulation”, Prentice Hall.
3. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. “Environmental Engineering”, Tata Mc-Graw Hill.
4. Arya, S.P. “Air Pollution Meteorology and Dispersion”, Oxford University Press.
5. Barrat, R. “Atmospheric Dispersion Modelling”, Earthscan Publications.

6. Warren, V.Jr. and Lewis, G.L. “Introduction to Hydrology”, Pearson education.
7. Gupta, P.K. & Heera, D.S. “Operation Research”, S. Chand.
8. Davis, M. & Masten, S. “Principles of Environmental Engineering and Science’’, McGraw Hill.
9. Rao, M. & Rao, H.V.N. “Air Pollution’’, Mc-Graw Hill.

REV-702 Water Resource Planning and Management L T P

3 0 0

UNIT – I Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves. Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques. Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices.

UNIT – II Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis. Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation. Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.

UNIT – III Sediment Transportation: Suspended and Bed load and its estimation Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.

UNIT – IV Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

UNIT – V Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries.

REFERENCES:

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

6. Water Resources Engg. By Larry W. Mays, John Wiley India
7. Water resources Engg. By Wurbs and James, John wiley India
8. Water Resources Engg. By R. K. Linsley, McGraw Hill
9. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
10. Irrigation Theory and practices by A.M. Michel.
11. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

REV-751 Environmental System and Simulation Lab

L T P
0 0 3

1. Exercise on computer simulation of air pollution.
2. Exercise on computer simulation of surface water quality.
3. Exercise on computer simulation of soil water balance.
4. 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
7. Exercise on application of dynamic programming in environmental engineering.

REV-752 Finishing Lab

L T P
0 0 3

1. Study of the environmental problems in the study area.
2. Sampling work and analysis in the lab.
3. Field study and primary data collection.
4. Secondary data collection from agencies.
5. Statistical analysis of data, model development and estimating pollutant quantities.
6. Designing of system using software/ model/ data.
7. Preparing a map using GIS software and report writing.

REV 081 Construction Technology and Management

L T P

3 1 0

Unit 1

Elements of Management : Project cycle, Organisation, planning, scheduling monitoring updating and management system in construction.

8

Unit -2

Network Techniques : Bar charts, milestone charts, work break down structure and preparation of networks. Application of network Techniques like PERT, GERT, CPM AON and AOA in construction management. Project monitoring, cost planning, resource allocation through network techniques. Line of balance technique.

8

Unit 3

Engineering Economics : Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison present worth method Equivalent annual cost method, discounted cash flow method, analytical criteria for postponing of investment retirement and replacement of asset. Depreciation and break even cost analysis.

8

Unit 4

Contract Management :Legal aspects of contraction, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items, settlements of disputes, arbitration and commissioning of project.

8

Unit 5

Equipment Management : Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipments for earth moving , Hauling Equipments, Hoisting Equipments , Conveying Equipments , Concrete Production Equipments

8

Text Books

1. Construction Planning, Equipment and Methods. : R.L. Peurify. T.M.H., International Book Company.

2. PERT & CPM Principles and Applications L.S. Srinath, E.W.P. Ltd., New Delhi.

3. Network Analysis Techniques S.K. Bhatnagar, Willey Eastern Ltd.

4. Construction Technology by Sarkar , Oxford

5. Construction Project Management by KK Chitkara, Mc Graw Hill Publication.

6. Construction Management and Planning by Sengupta and Guha, Mc Graw Hill

REV 082 ENGINEERING HYDROLOGY AND GROUNDWATER MANAGEMENT

L T P

3 1 0

Unit–1

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.

8

Unit–2

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.

8

Unit-3

Analysis of Pumping Test Data – I: Steady flow groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests, Analysis of Pumping Test Data – II: Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jocob and Chow's simplifications, Leak aquifers.

8

Unit -4

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

8

Unit -5

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies, Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, GhybenHerzberg relation, Shape of interface, control of seawater intrusion.

8

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.

2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

3. Groundwater Hydrology by Bhagu R. Chahar, Mc Graw Hill Publication Ltd.

References :

1. Groundwater by Bawvwr, John Wiley & sons.

2. Groundwater Syatem Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.

3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers

REV 083 Computer Aided Design of Structure

L T P

3 1 0

UNIT – 1 Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 8

UNIT – 2 Principles of software design, concept of modular programming, debugging and testing. 8

UNIT – 3 Computer applications in analysis and design of Civil Engineering systems. 8

UNIT - 4 Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

UNIT – 5 Expert system, their development and applications, Introduction to Neural Networks. 8

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication

2. A.I. and Expert System – Robert L. Lerine & / Lane E. Drang, McGraw Hill

3. “Neural Computing: Waserman, vonnostrand.

4. Auto Cadd 2013 Dummes Bill Fane

5.Cad Frame & Architechture by Pieter Van Der Wolf

REV 084 SOIL AND WATER CONSERVATION ENGINEERING

L T P

3 1 0

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, 8

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. 8

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. 8

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.

8

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. 8

References

1. Alam Singh – Modern Geotechnical Engineering

2. K. R. Arora – Soil Mechanics and foundation Engineering.

3. N. C. Brady – Principles of Soil Sciences

4. B. C. Punmia – Soil Mechanics and Foundation Engineering

REV 085 WATER POWER ENGINEERING

L T P

3 0 0

Unit – 1

Water Power Introduction: Source of Energy, Status of hydro power in the World. Hydro – Power Place of Hydro Power in a Power system, Transmission Voltages and Hydro-power, estimation of water power potential, General load curve, load factor, capacity factor, utilization factor, diversity factor, load duration curve, firm power, secondary power, prediction of load illustrative examples. 8

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. 8

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.

8

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.

8

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.

8

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)

4. Irrigation Water Resources and Water Power Engineering by Dr. P.N. Modi, Standard book House New Delhi.

REV 086 INTEGRATED WATERSHED MANAGEMENT

L T P

3 0 0

Unit-1

INTRODUCTION: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management., 8

Unit-2

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

8

Unit-3

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. 8

Unit-4

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

8

Unit-5

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

8

Text books:

1. Watershed Management by JVS Murthy, - New Age International Publishers.

2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall Publishers.

Reference:

1. Land and Water Management by VVN Murthy, - Kalyani Publications.

2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India

REV 087 Rural Development Engineering

(L-T-P 3-0-0)

UNIT- I Rural Development Planning and Concept of Appropriate Technology: Scope; development plans; various approaches to rural development planning; concept of appropriate technology. Rural development programme/ projects.

[8]

UNIT- II Rural Housing: Low cost construction materials for housing; Architectural considerations for individual and group housing; Composite material - ferro-cement & fly ash, autoclaved calcium silicate bricks and soil-stabilized un-burnt brick; Plinth protection of mud walls; design consideration and construction of: non-erodable mud plaster, Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry; rat-trap bond for walls; Panels for roof, ferro-cement flooring / roofing units, Earthquake resistant measures for low cost houses.

[8]

UNIT- III Water Supply and Rural Sanitation: Sources of water. BIS & WHO water standards. Quality, Storage and distribution for rural water supply works; basic design principles of treatment-low cost water treatment technologies; conservation of water; rainwater harvesting; drainage in rural areas, low cost waste disposal systems; septic tank ; Biogas technology; low cost community & individual Garbage disposal systems, Ferro-cement water storage tanks.

[8]

UNIT- IV Low Cost Roads and Transport: Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases, Bituminous Construction, Surface Treatments for roads in rural areas. Soil Stabilization, Lime, Lime Flyash and Cement Treated Course. Crusher-run-Macadam. Use of local materials. Flexible Pavement: Design factors, Basic Principles, Guidelines for Surfacing for Rural Road.

[8]

UNIT- V Low Cost Irrigation: Consideration of low cost irrigation techniques , drip & sprinkler irrigation systems. Watershed and catchments area development - problems and features of watershed management, watershed structures

[8]

Reference Books:

1. A.G.Madhov Rao, D.S.Ramachandra Murthy, Appropriate Technologies for low cost Housing Oxfordand IBH Publishing Co. Pvt .Ltd.
2. CBRI, Roorkee, Advances in Building Mat erials and Construction.
3. C. Satyanarayana Murthy, Design of Minor Irrigation and Canal Structures. Wiley Eastern Ltd.,

4. Document on Rural Road Development in India Volume1& 2; Central Road Research Institute, New
Delhi.
5. Water supply and sanitary engineering by Rangwala, .Charotar publication
6. Rural Infrastructure by P.Nair, SBS Publication
7. Rural Infrastructure by Samalia Bihari Verma, Gyaneshwar Prasad & Sahib Kumari Singh, Sarup & Sons.
8. Rural Development by Katar Singh, SAGE Publication
9. Information and Communication Technology for Agriculture and rural development by R. Saravanan, New India Publishing agency

REV 088 Environmental Statistics and Experimental Design

(L-T-P 3-0-0)

Unit-I

Stochastic Processes in the Environment: Probability concepts; Conditional probability and Baye s theorem. 8

Unit-II

Environmental Data Analysis: Descriptive statistics; Averaging times; Sample size determination; Sampling frequency and duration;

8

Unit-III

Measurement uncertainty; Accuracy and precision; Sample and dynamic blanks; Error propagation; Linear least-squares regression

8

Unit-IV

Trend analysis; Non-parametric statistics. Experiment Design and Hypothesis : Testing : Factorial design of experiments; Confidence intervals; Equality of means;

8

Unit-V

Ttest; Analysis of variance (ANOVA); F-test; Significance of factor effects and their interactions

8