18WRM-11 OPTIMIZATION TECHNIQUES IN WATER RESOURCES ENGINEERING

Sub Code	: 18WRM 11	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module: 1

Introduction: Development of optimization techniques, nature and characteristics of operation research, methodology of optimisation, applications of optimisation techniques, classification of operation research model, uses and limitation of optimisation techniques.

Linear programming I: Mathematical model of LPP, canonical and standard form of Problem, LPP formulations, graphical solutions of LPP.

Linear programming II: Simplex method, Simplex algorithm, method of penalty and two phase method.

Module: 2

Linear programming III: Concept of duality, formulation of dual linear problems, primal – dual relationship, duality theorem, shadow prices in linear programming, dual simplex method, advantages of duality, revised simplex method.

Module: 3

Transportation problem: Transportation problem, mathematical formulation of problem, steps in transportation method, methods for finding initial basic feasible solution, degeneracy in transportation problem.

Module: 4

Assignment problems: mathematical formulation, assignment algorithm methods for solving assignment problems.

Integer Programming: Nature of the problem, graphical method Gomory's all integer cutting plane method, mixed integer programming problem.

Module: 5

Goal Programming: Application and solution of the problem.

Dynamic Programming: Dynamic programming, characteristics of DP problems, D.P. algorithm, Bellman's optimality principle, recursive relations, backward & forward recursions, solutions to various problems, dimensionality in D.P.

REFERENCES:-

1. H.A. Taha: “Operations Research” Macmilan publishing Co.
2. S.D. Sharma: “Operations Research” KedaranathRamnath& Co. Meerut.
3. S.Ravidran,D.T.Phillips& J.J Solberg “Operation Research”.
4. KantiSwarup, P.K. Gupta &Manmohan “Operations Research” Sultan chand& sons.

18WRM-12 ENGINEERING HYDROLOGY

Sub Code	: 18WRM 12	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module: 1

Introduction: Concept of hydrology-applications related to water resources development-global water resources balance-Annual water resources balance of India-triple cell air circulation, the hydrologic cycle-components of hydrologic cycle (Hartan’s).

Module: 2

Precipitation:- Introduction ,forms and types of Precipitation measurement of Precipitation Mean aerial depth of Precipitation, competition of missing data, double moss analysis, computation of rainfall data Network density, DAD curves.

Evaporation and Infiltration:- Evaporation Processes, Measurement And Estimation of Evaporation, Infiltration indices, measurement factor affecting infiltration

Module: 3

Runoff:-The runoff process-gemorphological factors-hydrograph analysis-unit and synthetic unit hydrographs-s-curve hydrograph stream gauging objectives, techniques-computation of reservoir capacity.

Hydrology of floods: Nature and causes of floods –Methods of production of flood flows-flood discharge formula and envelope curves design flood-flood frequency analysis-probability table-normal lognormal, grumble log Pearson type-III distributions.

Module: 4

Flood routing hydrologic method of routing-reservoir and channel routing-routing through junctions.

Flood control: Method-flood control dams detention basins and levees-diversion channels – flood channel improvement schemes.

Module: 5

Urban Hydrology: Urban Hydrological cycle, types of urban runoff, impact of urbanization. Runoff computation methods-rational formula,Rationalmethod, Chicago method drainage systems- pipes, openchannels, retention and detention reservoirs, storm –sewer design-groundwater in urban areas. Quality of urban runoff and ground water.

Droughts: classification and impacts, types of drought: drought indices and assessment of drought.

REFERENCE:-

1. Linsley, Kohler and paulhus, hydrology for engineers.
2. Varshney, engineering hydrology.
3. Linsley: Franzini, elements of hydraulic engineering.
4. Chow, V.T.Hand book of applied hydrology.
5. H.M.Raghunath, Hydrology.
6. Drought R.Nagrajan capital publishing company new delhi

18WRM-13 WATER RESOURCES SYSTEM ANALYSIS

Sub Code	: 18WRM 13	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module: 1

System Approach: Definition of system and classification, Water resources systems and their importance, steps in systems design. System relationship. Economic and social development, Value system.

Module: 2

Objective of Water Resources Development: Efficiency objectives. Economic growth, Income redistribution. Net benefit and optimal conditions.

Module:3

Engineering Economics: Equivalence of kind and time, Cost and benefits of projects. Planning horizon. Cash flow diagrams. Discount factors, discounting techniques. Present worth of costs and benefits. Nature of supply and demand. Price Elasticity. Indifference curves. Production function. Optimal path of expansion. Market allocation under pure completion. Discount rate and its effect on project evaluation. Welfare economics and multi objective optimization of an objective function. Constraints, Langrangean Multiplier technique and Trade off.

Module: 4

Techniques of Project Evaluation: Benefits from water resources. Primary, secondary tangible and intangible benefits. Examples Irrigation, Power production, Flood control and investigation. Depreciation and accounting methods, Benefits cost analysis. Internal rate of return. Effect of risk benefits and uncertainty in benefits.

Module: 5

Mathematical Optimization of System: Formulation of an optimization problem. Objective function. Constraints. Classification of problems. Linear programming problems and its solutions of simplex method. Dual linear programming problems and its use. Dynamic programming problem formulation. Solution of simple problem. Use of digital computers sensitivity analysis for solution of problems and package computer programs.

REFERENCES:-

1. Economics of Water Resources Planning- James and Lee
2. Design of Water Resources Systems- A.Mass
3. Water Resources Development- E.Kuiper
4. Water Resources System Engineering-W.A.Hall and Dracup.A
5. Optimization Theory and Applications-S.S.Rao
6. Water Resources System Palnning and Analysis-D.P.Louks, Stedinger and Haith Current Literatures and Publications

18WRM-14 REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM

Sub Code	: 18WRM 14	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module: 1

Principles of Remote Sensing: Introduction to remote sensing, Remote sensing system, Electromagnetic spectrum, Black body Atmospheric windows, Spectral characteristics of earth's surface, Range of sensing system.

Module: 2

Platforms, Sensors and Data Products: Ground aircraft, space aircraft platforms- photographic sensors, scanners, radiometers, Radar and Mission planning. Data types and format, Scale and Legend

Photogrammetry: Photogrammetry basics – applications, applications of aerial photo interpretation to Water Resource Engineering.

Module: 3

Data Interpretation and Analysis: Introduction, SOI Topomaps, satellite data – multispectral, multitemporal, multisensoral, multistage concepts. Types of interpretation, photo interpretation techniques for aerial photo and satellite imagery, Interpretation elements, restoration/ enhancement procedures, pattern ,recognisation concepts, classification algorithms, Post processing procedures, etc.

Module: 4

Geographic Information System: Introduction, history if GIS, comparisons with CAD, Necessity of GIS, components of GIS, GIS Architecture-data input, data manipulation, data output, Operation-processes and capabilities, different types of GIS, GIS data-spatial and non spatial, data models with advantages and disadvantages

Module: 5.

Global Positioning System: Introduction, system overview, working principles, GPS surveying methods, survey planning and observations, GPS data processing and applications of GPS.

REFERENCES:-

1. Thomas.M.Lillisand and R.W. Kiefer. “Remote sensing and Image Interpretation” John Wiley and Sons, New York.
2. Sabins, and Floyd, F.J.R. “Remote sensing Principles and Interpretation”, W.H.Freeman, San Francisco.
3. Philip H.Swain and Shirley M.Davis. “Remote Sensing: The Quantitative Approach”, McGraw Hill Publication.
4. Johnson R.Jensen. “Introductory Digital Image Processing” Prentice Hall, New Jersy.
5. Burrough,PA “Principles of Geographic Information system for Land Resources Assessment. Clarendon Press, Oxford.
6. SatheeshGopi “Global Positioning System. Tata McGraw Hill Publishing Company, New Delhi.
7. Current Literatures and Publications

18WRM-15 ADVANCED FLUID MECHANICS

Sub Code	: 18WRM15X	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 52	Exam Marks	:	60

Module: 1

Introduction: Fluid properties, concepts of fluids motion, types of flow continuity equation energy equation and momentum equation.

Potential flow theories: Ideal and real fluids, Stream function and velocity potential function. Flow nets, standard patterns of flow, source, sink, uniform flow, vortex, doublet, Rankin's body, lift and drag.

Module: 2

Real flow: Navier-stokes equation, application to simple problems having closed form solutions, parallel flow, poiseuille's equation. Viscous shear stress & dissipation of energy.

Module: 3

Basic concepts of free surface flow: flow regimes, velocity & pressure distribution, energy principle &its applications, specific energy, critical flow computations, momentum equation & its applications, specific force diagram, velocity equation, uniform flow computation.

Module:4

Steady gradually varied flow: dynamic equation, characteristics of flow profiles & method of computation.

Module:5

Steady rapidly flow: Hydraulic jump- types, characteristics of jump, length of jump, surface profile & location of jump.
Design of stable channels: Regime & attractive force methods.

REFERENCES:-

1. Valentine, H.R"Applied Hydrodynamics", International Text-Butterworth.
2. Rouse, H."Advanced Fluid Mechanics", John Willey & sons, N York.
3. White, F.M "Viscous Fluid Flow", McGraw hill pub. Co., N York.
4. Chow, V.T., "open Channel Hydraulics", McGraw hill pub. Co., N York.
5. French ,R.H,"open Channel Hydraulics", McGraw hill pub. Co., N York.
6. Subramanya K "Flow in open channels", Tata McGraw hill pub

18WRM-16 Advanced Water Resources Engg.-Laboratory-I

Laboratory

I-Semester M-Tech courses

1. Analysis of Precipitation data.
2. Determination of yield from a catchment – A case study.
3. Derivation of UH hydrograph from single and multi storm events.
4. Estimation of probable maximum flood – A case study.
5. Estimation of design flood.
6. Regional flood frequency analysis – AS case study.
7. Hydrologic flood routing method applied to Indian rivers.
8. Derivation of synthetic UH – A case study.
9. Hydrometric data analysis.
10. Hydraulic routing methods – case studies (method of characteristics)
11. Computation of back water and draw down curves.

Note: each student should carry out at least two analysis

18WRM-21PROJECT PLANNING EVALUUATION & RESOURCE ENGINEERRING

Sub Code	: 18WRM21	IA Marks	:	400
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1

Introduction: Water Resource Projects- Over all planning- Water resources planning – water resource of India – development policy – and programs and planning approach – Data requirement- string and rational method.

Module:2

Project planning: Bar chart method, critical path method, PERT method, Float time. Compression and decompression of network scheduling. Resource leveling. Operating cost and fixed costs. Optimum costs. Objective and policies. Project control – Human aspects of project management.

Module:3

Inventories: Management and operating cost of stores, Economic levels of ordering stocks. Machinery requirements for concrete dams, earth dams, etc. estimation of costs and benefits from machinery. Irrigation projects, power projects and multipurpose projects – Lift irrigation projects.

Module:4

Spatial Planning and Regional analysis: Introduction, problems, potentials, trends, physical characteristics, basic and non basic concepts, analysis of spatial linkages. Social aspects of economic development.

Module:5

International Project Planning and Management: Introduction, institutes of technical, financial and scientific cooperation.

REFERENCES:-

1. Design of water resource systems- Mass et al.
2. Water resources systems planning – M.C Chaturvedi and Peter Rogards.
3. Benefit cost analysis for water resource system planning- Charles W. Howe.
4. Construction planning and Management- P.S Gahlot, B.M. Ahir
5. Irrigation commission reports 1972 Ministry of Irrigation and Power- Volume I,II,&III.
6. Water resource of India and their utilization in agriculture – Dhakshina Murthy et al.
7. Current literatures and Publications.

18WRM-22GROUND WATER DEVELOPMENT& MANAGEMENT

Sub Code	: 18WRM 22	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1

Fundamental concepts:- Aquifers Trans- aquifer in consolidate and unconsolidated formations-hydro geologic regions (areas of ground water potential in India-vertical distribution of soil water below the ground-porosity, yield, specific retention, storage coefficient Darcy's law and its validity-ground water flow contours and their applications.

Module:2

Exploration for ground water- surface and subsurface methods.

Well hydraulics:- Transmissibility, diffusivity and unconfined aquifers-Leaky aquifers-non-equilibrium equation-pumping tests-methods of estimating aquifer parameters well loss.

Module:3

Well systems: Multiple well systems-interference geohydrologic boundaries: Method of images-cavity well-partially penetrating we large diameter wells. CooperPapadopoulos method.

Design and construction of wells-percussion and rotary drilling method-well screens development and completion of wells-main tens of wells selection of pump sets.

Module:4

Ground water control: - Level fluctuations and seasonal variation-computation of safe yield of a basin-artificial recharge and salt water intrusion in coastal aquifers.

Module:5

Ground water Management problems-Management practices mathematical and R.C. Network modeling of ground water problems.

REFERENCE:-

1. Walton W.C.-Ground water resources. Evaluation.
2. Johnson E.E.-Ground water 3. Todd D.K. Ground water hydrology.
3. Sharma H.D. and Chaula A.S-Manual on ground water and tube wells.
4. Parveenkumar-Ground water and well Drilling Davis and D waist hydrology. 7. H.M. Raghunath –Groundwater.

18WRM-23 APPLIED IRRIGATION &MANAGEMENT

Sub Code	: 18WRM 23	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1

General: Irrigation Development in India: Historical review modern trances-inter disciplinary approach.

Module:2

Elements of soil Agronomy: Physical properties of soils soil profile –soil aeration –Indian Agricultural soil, Classification based on irritability-soil moisture, capillary and non-capillary pores-soil moisture relations-soil moisture measurement.

Module:3

Soil and Land Management in Agricultural: Soil Management in relation to water use-soil horizons, classification and surveys-land capability farm development: size of farm unit, land development in relation to solid characteristics and irrigation practices-conservation village-land shopping and grading-equipment.

Module:4

Crop requirements and irrigation scheduling : Major Indian crops times of sowing and harvesting –critical periods of growth moisture stress, nutritional disorders-rooting depths-consumptive use of crop blanney-criddle, Thornthwait penman, Christiansen methods-crop selection crop water requirements, duty period depth and frequency of application protective irrigation –irrigation schedules in relation to crop requirements and maximum water-use efficiency scope of computerization-cropping patterns-soil water, fertilizer and plant interactions.

Module:5

Water conveyance and application lined and unlined channels-seepage losses-water control and diversion structure structures in field channels and drain: their design and location- underground

pipe system application methods: border, check, basin, furrow and sprinkler irrigation, sub irrigation and drip irrigation –relative merits.

Drainage: Glances of water logging-design of surface and subsurface drains-saline and alkaline lands reclamatation and management of Sal affected lands.

REFERENCE:-

1. Michael, A.M. Irrigation.
2. Kramer, P.J. Soil and plant water relations.
3. Luthin, J. N. Drainage Engineering.
4. FAO UNESCO (1973) Irrigation Drainage and Salinity.
5. Taylor and Ashcroft, physical Fdaphology.
6. Greager, Justin and Hinds, Engineering for dams, Voles-I,II,III
7. Elevatorski, E.A. Hydraulic Energy Dissipaters.
8. Varshney, Theory and Design of Irrigation works.
9. Golze, Hand book of dam engineering.
10. Bharat Singh and Sharma, Earth and Rock fill dams.
11. Thomas, H.H., Engineering of large dams.

18WRM241 HYDRAULIC STRUCTURES

Sub Code	: 18WRM 24	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1

General: Classification of dams-selection of type-types and method of investigation for dam sites-foundation treatment River diversion during construction.

Module:2

Gravity Dams: Design criteria-low and high dams-forces method of zoning-non-overflow section, stability analysis, gravity analysis and elements of trial load twist analysis overflow section: methods of evolving ogee profile-credit details for different-discharge characteristics.

Module:3

Arch Dams: Classification-cylinder theory: constant radius, Constar angle and variable radius dams-elements trial load analysis foundation deformations-temperature effects.

Buttress Dams: Types-relative merits choice of buttress spacing principle of design of corbels.

Module:4

Earth Dams: Types and general principles of design-causes failure analysis of seepage through earth dams-stability analysis-design of filters, cut-offs, upstream and downstream protection works-construction methods.

Module:5

Miscellaneous Items: Spillway crest gates-types of spillways-energy dissipation devices-galleries and other opening in dams-construction of mass concrete dams and temperature control-instrumentation for observing the structural behaviour of dams.

REFERENCE:-

1. Greager, Justin and Hinds, Engineering for dams, Voles-I,II,III
2. Elevatorski, E.A. Hydraulic Energy Dissipaters.
3. Varshney, Theory and Design of Irrigation works.
4. Golze, Hand book of dam engineering.
5. Bharat Singh and Sharma, Earth and Rock fill dams.
6. Thomas, H.H., Engineering of large dams.

18WRM 242 FLOW MEASUREMENTS

Sub Code	: 18WRM **252**	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1 & 2

Demand and necessity of flow measurements-principles and method of measurements of hydro mechanical quantities such as time, angle, linear quantities, surface volume, pressure, velocity intensity of flow total flow and devices.

Module: 3, 4 & 5

Measurement of quantities in free surface flow, theory of weirs, modern techniques of measuring river flows using ultrasonic flow meters, electromagnetic flow meter, traces techniques, salt velocity and salt dilution method,(optical anemometer for volumetric flow river gauging –conventional methods-Electro acoustic methods of sounding in rivers-measurement of sediment concentration sediment samples Irrigation flow structures for distribution of flow such as Parshal flume, venture meter-large scale flow measurement-ground-water flow-Isotope methods-unsteady flow measurements-waves and surges. Precipitation measurements using radar

18WRM-243 RIVER HYDRAULICS AND SEDIMENT TRNSPORT

Sub Code	: 18WRM15X	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1

Alluvial streams and their hydraulic geometry: Introduction, geomorphic cycles, stages of streams, nature of bed materials, different reaches of river and their characteristics, hydraulic of water flow, flow characteristics of meandering rivers, basic causes of scouring, silting and meandering.

Module:2

River Training works: Hydrological studies- Engineering principles, objectives and methods of river training, flood control, bank protection, prevention of hill slips, sediment control, navigation, protection of hydraulic structures.

Module:3

Sediment Transport: Scope and importance of subject, sediment properties-the initiation of sediment movement-Modes of sediment motions-suspended load: Distribution, effect on the velocity profile-Bed load: Sediment movement along bed, bed load formulae, bed forms, effect of bed forms on flow resistance and rating curves-sediment samplers, determination of total sediment load of natural- Reservoir sedimentation.

Module:4

Sediment properties- Threshold of particle transport critical velocity and critical Shear stress concepts sediment movement in water Bed-forms-Channroaghness and resistance to flow. Sediment load-Different models-Bed load formula of du boys, Shields, Meyer-peter Einstein bed load function-Yalins formula pintails' Stochasion approach suspended load-Diffusion theory Total Sediment load by Kalinake,

Module:5

Design of stable channel -Design of stable channel tract-force method of stable channel design. Erosion, deposition, Sucre local scours problems principles of transport of solids in pipe principles of movement of sediment by waves, tides and current.

REFERENCES:-

1. Mechanics of Sediment Transportation and Alluvial Stream Problems. Garde and Rangaraj.
2. Open channel Flow – K Subramanya
3. Hydraulics of Sediment Transport – Graf
4. Irrigation Engineering – Mujumdar
5. USRB Manual on River Training Works
6. Current literatures and Publications
7. CBIP Manual on River Behavior, control and Training.

18WRM251 COASTAL ENGINEERING

Sub Code	: 18WRM253	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1& 2

Introduction –Small amplitude and finite amplitude wave theories way kinematics, pressure and energy group velocity –wave deformations- Refraction, diffraction, sealing, reflection and breaking, tide and costal water level fluctuations .

Module:3

Basin oscillations-steam surge calculator wind wave generation significant wave theory-wave forecasting –wave statistics.

Module: 4

Wave Structure interaction –piles, pipelines, cables sea-walls breakwater and caissons-Floating Structures.

Module: 5

Coastal processes-Equilibrium beach-literal dried on shore offshore transport. Diffusion in costal water.

18WRM-252 URBAN WATER RESOURCES MANAGEMENT

Sub Code: 18wrm254	IaMarks : 40
Hrs/Week: 04	Exam Hours : 03
Total Hrs : 52	Exam Marks : 60

Module:1

URBAN HYDROLOGIC CYCLE

Water in the urban eco-system-Urban Water Resources – Major problems – Urban hydrological cycle- Storm water management objectives and limitations – Strom water policies- Feasibility consideration.

Module:2

URBAN WATER RESOURCES MANAGEMENT MODELS

Types of models- Physically based-conceptual or unit hydrograph based-Urban surface runoff models- Management models for flow rate and volume control rate – Quality models.

Module:3

URBAN STORM WATER MANAGEMENT

Storm water management Practices (Structural and Non-Structural Management measures)- Detention and retention concepts – Modelling concept – Types of storage – Magnitude of

storage-Hydraulic analysis and design guidelines – Flow and storage capacity of urban components-Temple tanks.

Module:4

MASTER PLANS

Planning and organizational aspects- inter dependency of planning and implementation of goals and measures- socio – economics financial aspects – potential costs and benefit measures – measures of urban drainage and flood control benefits – effective urban water user organizations.

Module: 5

OPERATION AND MAINTENANCE

General approaches to operation maintenance- complexity of operations and need for diagnostic analysis – operation and maintenance in urban water system- maintenance management system – inventories and conditions assessment – social awareness and involvement.

REFERENCES:

1. GEIGER W.F ,Marsalek .F., and ZUIDENA , F.C (Ed) , manual on drainage in urbanized areas – vol.1 and vol.II , UNESCO 1987.
2. Hengeveled, H and C.DeVoch .t (Ed)., Role of water in urban Ecology 1982.
3. Martin, P.Wanalista and yousef, -A.Yousef, Storm water management John Wiley and sons,1993.
4. Neil S. Grigg., Urban water Infrastructure planning, Management and Operations, John Wiley and Sons,1986.
5. Overtens D. E and meadows M E Strom water modeling, Academic Press, new York,1976

18WRM-253 ENVIRONMENTAL IMPACT ASSESSMENT AND DISASTER MANAGEMENT

Sub Code	: 18WRM152	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1

Environmental Impact Assessment: Definition, basic concept and principles of EIA. Regulatory framework in India. Environmental inventory, base line studies, over view of EIA studies.

Module:2

Assessment and Methodologies: Physical, biological assessment. Socio economic and cultural environmental assessment. EIA methodologies – Adhoc, matrix, checklist approaches. Economic evaluation of impacts- cot benefits of EIA. Public participation in environmental decision making. Procedures for reviewing EIA analysis and statement. Decision methods for evaluation of alternatives.

Module:3

Environmental Assessment: Introduction, process, Basic steps involved, Description of environmental setting – Base line data collection, possible impacts due to water resources projects. Impact perdition and assessment – methods of impact assessment, Matrix and checklist method, Selection of proposed action. Preparation of environmental impact statement

Module:4

Disaster Mitigation and Management: Introduction, types, models of disaster management, Decision making, tools and techniques, primary and secondary data. Land suitability, Earthquake Hazards, Flood assessment, Drought assessment and remedies,

Module:5

Environmental impact Assessment, Fire hazards and management, Traffic management, Socio economic studies, Inter department cooperation. Regional and Global Disaster Mitigation measurements

Case Studies: Disaster Assessment, Mitigation and management

REFERENCES:-

1. Thomas M. Lillisand and R.W. Keifer, Remote Sensing and Image Interpretation, John Wiley, 1987
2. Sabins and Floyd, F.J.R Remote Sensing principles and Interpretation, W.H. Freeman, Sanfrancisco, 1978
3. C. Elachi Introduction to physics and Techniques of Remote Sensing, Wiley New York, 1978
4. Jenson J R Introductory Digital Processing: A Remote Sensing Perspective, Prentice Hall,Engelwodd, Cliffs, NJ. 1986
5. P A Burrough and R A McDonned Principles of Geographical Information System. Oxford Systems, Oxford University Press, 1998
6. Current Literatures and Publications.

18WRM26-Advanced Water Resources Engineering-Laboratory II

II-Semester M. Tech courses

(At least two experiments should be carried using computer based models)

1. Parameter estimation through regression
2. Design and analysis of hydraulic structures
3. Digital simulation of regional aquifers
4. Estimation of crop water requirements
5. Design and operation of reservoir
6. Irrigation scheduling
7. Diagnostic analysis of irrigation systems
8. Stream flow analysis and simulation
9. Determination of design flood
    a) Total response models
    b) Unit hydrograph models
    c) Synthetic unit hydrograph model.

18WRM-31 INTEGRATED WATERSHED MANAGEMENT

Sub Code	: 18WRM 31	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module: 1

Introduction: Definition & importance, delineation of watershed, watershed characteristics, causes consequences of watershed deterioration, objectives, principle of watershed operations & management, different approaches in watershed management, watershed management plan- identification of problems, objectives & priorities. Steps in developing watershed. Issued in watershed management- Land degradation. Socio economic survey- collection of data, analysis of problems, watershed maps.

Module: 2

Map preparation: Introduction, different approaches, thematic maps- base map, drainage, land use/land cover, hydro geomorphology, soil, slope, lineament etc. Map updation, change detection & analysis.

Drainage analysis: Definition, drainage pattern- different types, Horton's &Strahler's Method of stream ordering. Analysis – linear aspects, relief aspects and the influences.

Module: 3

Runoff and Soil loss estimation: Introduction, necessity, runoff- different methods, factors affecting runoff, SCS curve number, Soil loss- introduction, importance, types of erosion, resources mapping, urbanisation effect on hydrological cycle. Runoff estimation, soil loss estimation (USLE), erosion control measures and land reclamation. Management control, sediment control & flood control.

Module: 4

Water conservation and harvesting: Introduction, conservation, methods for crop land, treatment for catchments, small storage structures, design data. Small earthen dams- planning, construction sequence, computation of storage capacity, small weirs, drought from pond, nala

bonding. Ground water recharge- ground water recharge, extraction, water harvesting methods and techniques.

Module: 5

Water resources management for sustainability: principles, integrated urban water management, water law surface and ground water management aspects, sustainable water supply methodologies for arid and semi-arid regions, life cycle assessment (LCA)

REFERENCES

a. Tideman, EM "watershed management"- guidelines for Indian conditions, omega pub. New Delhi.
b. Thomas M Lillisand& RW kiefer. "remote sensing & interpretation ", WH Freeman, San Francisco
c. Water resources engineering by larry W Mays wileystydents edition

18WRM-321 PROJECT MANAGEMENT

Sub Code	: 18WRM322	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module: 1

Introduction: Project, project management, different phases of project management, project life cycle, importance of project management, various projects, ideas of project planning, scheduling, monitoring and control.

Techniques of project management: Bar chart, milestone chart, control diary chart PERT/CPM networks event, activity, work breakdown structure, preparation of network, earliest and latest timings, critical path, project duration, squared networking system.

Module: 2

Floats: Total, free, independent and interference, importance of floats in planning and monitoring of various projects. PERT Statistics: probability of completion of a project in a given time.

Module: 3

Time – Cost Trade off: Normal time, normal cost, direct cost and indirect cost, crash time and crash cost, why shorting project duration, project time – cost relationship cost slope.

Resource allocation and scheduling techniques: Resource and their conflicts, resource levelling, resource allocation, single project single resource, single project multi resources, multi project resource allocation.

Module: 4

Project monitoring and control: Project monitoring techniques – progress measurement techniques, performance monitoring techniques, updating – review and reporting techniques - frequency of updating and method of updating.

Module: 5

Use of corrective actions of management information system: M.I.s. and its use in project management, project monitoring and control cell, progress reports – cost based and hand based, project status report, liasoning and co-ordination with all departments within the organization, helping in decision making.

Making scheduling and monitoring effective: checklist for ascertaining effectiveness, organizing for scheduling and monitoring, obtaining commitments to schedules, use of computer, realistic scheduling, and making everyday behaviour scheduled based.

Orientation programmes for effective scheduling and monitoring various forms and need for orientation, program design, influencing every day behaviour through project management.

REFERENCES:-

1. B.M.Naik “Project Management” – vikas Pub. House Delhi.
2. Sadahanchaudhry“ Project scheduling and monitoring in practices” South Asian pub. Delhi.
3. J.J. Modir, C.R.Philips and E.w.Davis“ Project Management with CPM, PERT and precedence Diagramming” C.B.S. Pub. Delhi.
4. H.N.Ahuja“ Project Management – techniques in planning and controlling construction project” John Wily and Son’s Inc.
5. F.L.Harrison “Advanced Projects Management” Gower Pub.co.ltd.

18WRM322 ENVIRONMENTAL HYDRAULICS

SUB CODE: 18WRM322	IA MARKS : 40
HRS/WEEK : 04	EXAM HOURS : 03
TOTAL HRS : 50	EXAM MARKS : 60

Module: 1

Modelling – Introduction, applications in environmental management.

Module: 2

Physical phenomena- advection diffusion, dispersion, Ficks law of diffusion and convective-diffusion equations for turbulent & shear flow regimes.

Steady- state water quality modeling – models for conservative and non- conservative substances.

Module: 3

Data collection and analysis – specialized water quality surveys, estimation of decay and reareation rates.

Module: 4

Mixing zones in rivers - types of outfalls and mixing regimes. Steady –state 2-D analysis. Field study methodology. Parameter estimation – lateral mixing co-efficient – critical point method – simple numerical problems.

Module: 5

Eutrophication models – simplified nutrient loading models for rivers and lakes.

Ocean disposal of water – siting and design of outfalls.

Text books:

1. “hydrodynamics and transport for water quality modeling”- James L. Martin, Steven C McCutcheon, Lewis publishers.
2. “environmental modeling – fate and transport of of pollutants in water , air and soil “ – schnoor J.L, John Wiley and sons.

REFERENCES:

1. Environmental system engineering” Rich L.G., McGraw Hill.
2. “principles of water quality management and control” – Thormann R.V., and Mueller J.A., (1987), Harper & Row publications.
3. “system approach to water quality management”- Thormann R.V.,(1980) , McGraw Hill.
4. “handbook of Environmental calculations” Lee C.C., and Lin S.D., (1999) , McGraw Hill, New York.

Surface water quality modeling”- Steven C Chapra, McGraw Hill international editions

18WRM-331 RIVER MECHANICS

Sub Code	: 18WRM331	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module: 1

Introduction, Historical development of understanding of river mechanics, properties of river flow analysis, and predication fluvial geomorphology, channel adjustment and river metamorphosis, aggradations and degradation.

Module: 2

Flow in alluvial sand channel, properties of sediment, analysis of bed form bed load suspended load wash load, concept of graded river bed and bank erosion process, fall velocity bed forms and flow resistance sediment transport incipient motion stability analysis alluvial channel,

Module: 3

Regime concept of sediment transporting canals and rivers. Reservoir sedimentation

Module: 4

Secondary currents and its effect on suspended load Erosion and deposition of cohesive material Salinity intrusion in Estuaries River

Module: 5

River Training and control.

18WRM332HYDRAULIC MODELLING

(04hours/week)

Sub Code	: 18WRM**251**	IA Marks	:	40
Hrs / Week	: 04	Exam Hours	:	03
Total Hrs	: 50	Exam Marks	:	60

Module:1

Types of models-physical analogy and mathematical (analytical and numerical) scale model laws, principles of similarity, concurrent Satisfaction of criteria,

Module:2

Construction operation and interpretation of models.

Module:3

Fixed- bed and mobile bed model prototype, conform role of Instrumentation and data processing.

Module:4

Analytical models, viscous flow, electrical analogy, mechanical analogs and other miscellaneous anal ogs scaling laws.

Module:5

Analytical models: recapitulation of models.

PROJECT& INTERNSHIP

Note:
1. Project Phase-1: Students in consultation with the guide/co-guide if any, shall pursue literature survey and complete the preliminary requirements of selected Project work. Each student shall prepare relevant introductory project document, and present a seminar.

CIE marks shall be awarded by a committee comprising of HOD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The IA marks awarded for project work phase-1, shall be based on the evaluation of Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25.

SEE (University examination) shall be as per the University norms.
2. Internship: Those, who have not pursued /completed the internship, shall be declared as failed and have to complete during subsequent University examinations after satisfying the internship requirements.

Project Phase-2:

IA marks shall be awarded by a committee comprising of HOD as Chairman, Guide/co-guide, if any, and a Senior faculty of the department. The CIE marks awarded for project work phase -2, shall be based on the evaluation of Project Report subjected to plagiarism check, Project Presentation skill and Question and Answer session in the ratio 50:25:25.

Semester End Exam (SEE) shall be at the end of IV semester. Project work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms.

DESIGN OF PROJECT WORK

One of the following projects shall be taken for the design. Visit to such projects/departments and collection of data is necessary for design of project work.

PROJECTS:

I. Irrigation projects
II. Water resources engineering projects
III. Remote sensing applications to water resources engineering
IV. GIS application to Water resources engineering
V. Statistical Analysis of Hydrological data
VI. Ground water engineering projects
VII. Water resources system Analysis & Design project

VIII. Watershed development studies
IX. Rainwater harvesting project
X. Computer Applications(Any one)

a. Reservoir studies
b. Canal drainage system
c. Cross drainage network
d. River morphology studies
e. Water balance studies
f. Rainfall run-off modelling
g. Infiltration studies
h. Rain gauge/Meteorological station network design
i. Environmental Impact studies of projects

The design project shall include: data collection & detailed design of any part of the project as authorised by the concerned guide/s.