FACULTY OF ENGINEERING AND TECHNOLOGY
Proposed Revised Structure of M.E. (W.R.E.)

SEMESTER - I		CONTACT HRS.PER /WEEK				EXAMINATION SCHEME						
SUB Code.	SUBJECT	TH	Tu	P	TOTAL	TH.	CT	TW.	P	TOTAL	Th. Exam (HRS)	CREDITS
MWR601	Computational and Statistical Methods	3	1	-	4	80	20	-	-	100	3	4
MWR602	Engineering Hydrology & Hydrologic Systems	3	1	-	4	80	20	-	-	100	3	4
MWR603	Ground Water Engineering	3	1	-	4	80	20	-	-	100	3	4
MWR604	Advanced Fluid Mechanics	3	1	-	4	80	20	-	-	100	3	4
MWR641	Elective – I	3	1	-	4	80	20	-	-	100	3	4
MWR621	Labrotary-1	-		2	2	-	-	-	50	50	-	1
MWR622	Software lab -1	-		4	4	-	-	50		50	-	2
MWR623	Seminar -1	-		2	2	-	-	-	50	50	-	1
	Total	**15**	**5**	**8**	**28**	**400**	**100**	**50**	**100**	**650**	**-**	**24**

SEMESTER - II		CONTACT HRS.PER /WEEK				EXAMINATION SCHEME						
SUB Code.	SUBJECT	TH	Tu	P	TOTAL	TH.	CT	TW.	P	TOTAL	Th. Exam (HRS)	CREDITS
MWR651	Hydraulic Structures	3	1	-	4	80	20	-	-	100	3	4
MWR652	Water Resources Systems Planning & Management	3	1	-	4	80	20	-	-	100	3	4
MWR653	Land & Water Management	3	1	-	4	80	20	-	-	100	3	4
MWR654	Channel & River Hydraulics	3	1	-	4	80	20	-	-	100	3	4
MWR691	Elective – II	3	1	-	4	80	20	-	-	100	3	4
MWR671	Labrotary-II	-	-	2	2	-	-	-	50	50	-	1
MWR672	Software lab - II	-	-	4	4	-	-	50		50	-	2
MWR673	Seminar -II	-	-	2	2	-	-	-	50	50	-	1
	Total	**15**	**5**	**8**	**28**	**400**	**100**	**50**	**100**	**650**	**-**	**24**

Th. = Theory, Tu = Tutorial, P = Practical, CT = Class Test, TW = Term Work

SEMESTER - III		CONTACT HRS.PER /WEEK				EXAMINATION SCHEME						
SUB Code.	SUBJECT	L	T	P	TOTAL	TH.	CT	TW.	P	TOTAL	Th. Exam (HRS)	CREDITS
MWR721	Dissertation– I	-	-	12	12	-	-	50	-	-	-	12
	Total	**0**	**0**	**12**	**12**	**0**	**0**	**50**	**0**	**50**	**-**	**12**

SEMESTER - IV		CONTACT HRS.PER /WEEK				EXAMINATION SCHEME						
SUB Code.	SUBJECT	L	T	P	TOTAL	TH.	CT	TW.	P	TOTAL	Th. Exam (HRS)	CREDITS
MWR771	Dissertation– II	-	-	20	20	-	-	50	200	-	-	20
	Total	**0**	**0**	**20**	**20**	**0**	**0**	**50**	**200**	**250**		**20**

MWR601 : COMPUTATIONAL AND STATISTICAL METHODS

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test: 20
Credit: 4

UNIT I

Numerical Solution of Ordinary Differential Equations : Solution by Taylor's Series, Euler's Method, Runge Kutta Methods, Solution of Algebraic and Transcendental equations, Newton Rapson, Bisection method.

UNIT II

Finite Elements method : Basic Concepts, Solution of Discrete Problems, Steady State and Time Dependent Continuous Problems, Application of Finite method through illustrative examples.

UNIT III

Classification and Presentation of data, Basic Concepts of Probability, Probability Axioms, Analysis and Treatment of Data, Population and Samples, Measures of Central Tendency Measures of Dispersions, Measures of Symmetry.

UNIT IV

Probability Distributions : Discrete and Continuous Probability Distribution Functions – Binomial, Poisson, Normal, Lognormal, Transformations to Normal Distributions, Extreme Value Distributions, Parameter Estimation – Methods of Moments, Method of Maximum Likelihood, Probability Weighted Moments and Least Square Methods.

UNIT V

Regression Analysis : Simple Linear Regression, Evaluation of Regression – Confidence Intervals and Tests of Hypothesis – Multiple linear Regression – Correlation and Regression Analysis.

UNIT VI

Fuzzy logic, Neural Networks and Genetic Algorithms : Introduction, Concepts, Basic Fuzzy Mathematical Operations, Mathematical Model of Neuron, Learning Algorithms, Architecture, Introduction to genetic algorithm, Operators, Applications.

Recommended Books

1. Gupta S.P. (1999) "Statistical Methods " , S. Chand & Sons
2. Hann C.T., (1995), "Statistical Methods in Hydrology", East West Press, New Delhi.
3. Sastry, S.S. (1995), "Introductory Methods of Numerical Analysis ", Prentice Hall of India (P) Ltd., New Delhi.
4. Rao V & H. Rao, (1995), "C++, Neural Networks and Fuzzy Logic, BPB Publications, New Delhi.
5. Goldberg, D.E. (200), "Genetic Algorithms in Search, Optimization & Machine Learning", Addison Wesley Longman (Singapore) Pte. Ltd., Indian Branch, Delhi.

MWR602:ENGINEERING HYDROLOGY AND HYDROLOGIC SYSTEMS

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I

Introduction : Hydrologic cycle, Physical and systems Approach, Systems concept, Linear and non linear systems, Lumped and Distributed Systems, Deterministic and Stochastic Systems, Time Invariant Systems, Nature of Problems in Engineering Hydrology.

UNIT II

Hydrograph Analysis : Infiltration, Effective Rainfall, Runoff, Runoff components, direct Runoff Hydrograph.

Unit Hydrograph Theory : Linear Time Invariant System, Response Functions of Linear Systems, Derivation of Non Parametric Unit Hydrograph from Single Storm and Multi Storm Events, S-Curve Hydrograph, Instantaneous Unit Hydrograph.

UNIT III

Rain fall: Run off Analysis: Review of rational Methods, Conceptual Model, Clark and nash Models Derivation of Unit Hydrograph for ungauged catchments ,Synthetic unit Hydrograph.

UNIT IV

Hydrologic Statistic: Probabilistic Treatment of Hydrologic Data, Frequency and Probability Functions, Statistical parameters, Frequency analysis, annual maximum and partial duration series models, Regional frequency analysis, Design flood.

UNIT V

Hydrologic Flood Routing: Reservoir routing, channel routing, estimation of flood routing models, flood forecasting, analog models, real time flood forecasting.

UNIT VI

Applications of remote sensing and GIS in hydrology: Geomorphologic hydrological Land use and soil mapping using remote sensing, Evaluation of water resources potential using remote sensed data, Areal Assesment of floods Inundated Areas, Soil moisture areas and pollution of River Waters, Watershed Management Using Remote Sensing Techniques, Concepts of Geographical information Systems (GIS) and its Application in Hydrologic Studies.

Recommended Books

1. Chow, V.T. Maidment, D.R. and Mays, L.W. (1988), "Applied Hydrology". McGraw Hill Inc. N. York.
2. Singh, V.P. (1985), "Hydrologic Systems", Prentice Hall, N. York
3. Singh, V.P. (1992), "Elementary Hydrology", Prentice Hall of India, N Delhi.
4. Haan C.T. (1995), "Statistical Methods in Hydrology", East West Press, New Delhi.
5. Viessman, W, Lewis, G.L. and Knapp, J.W. (1989), "Introduction to Hydrology", Harper and Row Publications Inc. Singapore.
6. Ponce, W.F. (1987), "Engineering Hydrology, "Remote Sensing and Image Interpretation", John Wiley & Sons.
7. Lillesand, T.M. and Kiefer, R.H. (1993) "Remote sensing and Image Interpretation", John Wiley & Sons.

MWR603 : GROUND WATER ENGINEERING

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test: 20
Credit: - 4

UNIT I: Hydrogeology

Porosity and permeability of Rocks, Groundwater in Igneous, Metamorphic Sedimentary rocks and non industrated sediments, hydro geological regions of India, surface and subsurface geophysical methods for groundwater explorations.

UNIT II : Well Hydraulics

Aquifers and aquifer parameters, Darcy's law, hydraulic conductivity and its characteristics, Dupuit's equation, groundwater flow direction, steady groundwater flow, groundwater flow equation, estimation of aquifer parameters from pumping test data, graphical techniques and their limitations, groundwater well losses, interference among wells, potential flow, image well theory and its applications in groundwater flow.

UNIT III

Water well design and well drilling: Well screen, development and completion of wells, rotary drilling and rotary percussion drilling, maintenance of wells.

UNIT IV

Groundwater management: Conjunctive use, alternative basin yields, artificial recharge of groundwater, groundwater quality, case study.

UNIT V

Groundwater modeling: Groundwater flow, mathematical analog and digital modeling case studies, regional groundwater modeling.

Recommended Books

1. Todd, D.K. (1995), "Groundwater Hydrology", John Wiley & Sons, Singapore.
2. Raghunath, H.M. (1992) "Groundwater" Wiley Eastern Ltd., N. Delhi.
3. Garg, S.P. (1993) "Groundwater and Tube Wells", Oxford and IBH Publishing Co. N. Delhi.
4. Domenico (1972), "Concepts and Models in Groundwater Hydrology", McGraw Hill Inc., New York.

MWR604 : ADVANCED FLUID MECHANICS

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I: Introduction
Survey of Fluid Mechanics, Structure of Fluid mechanics based on Rheological, Dilational, Temporal Variation, Fluid Type, Motion Characteristics and spital Dimensionality Considerations, Approaches in Solving Fluid Flow Problems, Fundamental Idealizations and Descriptions of Fluid motion, Quantitative definition of Fluid and flow, Reynolds Transport Theorem, Mass Momentum and energy conservation Principles for Fluid Flow.

UNIT II: Potential Flow
Frictionless Irrotational Motions, 2-dimensional Stream Function and Velocity Potential Function in Cartesian and Cylindrical Polar Coordinate Systems, Standard patterns of Flow, Sources, Sink, Method of images in Solving Groundwater Flow problems, methods of Conformal Transformations.

UNIT III: Differential analysis of fluid flow
Study of Local Behavior, Differential Approaches in Analysis Viscous Flows, Equation of Motion of Viscous flow, Navier – Stokes Equations, Exact and approximate solution of N-S equations, Hele – Shaw Flow, Creeping Flow past a sphere, Boundary layer concepts, Prandtl's Boundary Layer Equations, Laminar Boundary Layer Along a Flat Plate, Integral Momentum Equation, Blassius Solution.

UNIT IV: Turbulence in Fluid Flow
Origin of Turbulence, Statistical analysis of turbulence, Reynolds equations for turbulence, Theories of Turbulent shear Stresses, Velocity distribution in smooth and rough pipes, Resistance coefficients for pipes, Turbulent boundary layer and boundary layer separation.

UNIT V: Design of Testing of Models
Design of an experiment, Dimensional Analysis, Complete set of Dimensional Analysis, Practical Significance of Key Modeling Parameters, Design of Model and model tests.

UNIT VI: Computational Fluid dynamics
Introduction and fundamentals, equation of motions, solution procedure, grid generation, and boundary conditions, laminar, turbulent and open channel flow, CFD calculations.

Recommended Books

1) Valentine, H.R. (1970), "Applied Hydrodynamics", International Text Butterworth.
2) White, F.M. (1980), "Viscous Fluid Flow", McGraw Hill Pub. Co. N. York
3) Yalin, M.S. (1971) "Theory of Hydraulic Models", McMillian Co.
4) Mohanthy A.K. (1993) Fluid Mechanics", Prentice Hall of India, New Delhi.

MWR641: Elective –I (WATER SUPPLY SYSTEMS)

Teaching Scheme:
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I: Introduction
Water Requirements , Sources of water, water Supply , water Supply Considerations ,Water Quality , Drinking Water Standards, Secondary Standards – Toxics, Water Pollutants, Quality Criteria for surface Water ,purpose of Water Treatment –Selection of Water processes.

UNIT II: Conventional Treatment processes
sedimentation , type of sedimentation , Zone Setting ,Filtration ,Gravity Granular ,- Media Filtration ,Head Losses , Back Washing and Media Filtration , Head Losses, Back Washing and Media Fluidization,- Pressure Filters –slow sand Filters, Coagulation and flocculation Coagulants, Coagulant aids, Rapid Mixing Devices, Disinfection Methods ,Fluoridation, De fluoridation

UNIT III: Water Softening
Lime Soda Process ,Variations-Ion Exchange Softening and Nitrate Removal

UNIT IV: Iron and Manganese Removal
Iron Corrosion, Water Stabilization –Cathodic Protection.

UNIT V: Test and Odour
Method of control, Aeration, Adsorption and Control of Algae Growth.

UNIT VI: Reduction of Dissolved Salt
Distillation, Reverse Osmosis, Electrolysis
Transportation and Distribution of Water: Aqueducts, Hydraulic Consideration, Design of Transportation System, Distribution Reservoirs and Service Storage.

Recommended Books

1.ViessmanJr.,mark J Hsmmer (1990) Water Supply and Pollution Control. McGraw International Edition
2. Peavy ,H.S.Row ,D.R.and Techbanaglous, G(1995) Environmental Engineering McGraw International Edition

3. Fair , Geyer , okun (1990) Water Supply Engineering John Wiley

3. Turbuit T H Y (1998) “Principles of Water Quality Control”, Pergamon Press.

MWR642 : Elective – I (TECHNIQUES OF WATER APPLICATION)

Teaching Scheme :
Theory:3 hrs/ week
Tutorial: 1hrs/ week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

Water Conveyance Techniques :

UNIT I
Conveyance through Open channel, Lined and unlined channels, types of linings and economics of lined channels.

UNIT II
Cross-drainage works and regulating structures. Types of C.D. works such as aqueducts, super-passage, canal siphons and culverts. There layout and hydraulic design concept.

UNIT III
Main head regulators, cross regulators and distributory head regulators. Their layouts and hydraulic design considerations.
Conveyance through closed conduit system, elements, controlling devices, general concepts of hydraulic design.

Water Application Techniques:

UNIT IV
Lift irrigation- General concepts, elements of lift irrigation schemes. Design consideration involved in intake well, jackwell, rising main and distribution system. Concept of cost economics.

UNIT V
Drip Irrigation: General concept, advantages and disadvantages. Components of system types of sprinklers, design concepts.

UNIT VI
Sprinkler irrigation : General concept, advantages and disadvantages. Components of the system types of sprinklers, design concepts.

Recommended Books

1 Israelsen Henson- "Irrigation Principles and Practices", John Wiley.
2 Finkel, H.J-"Hand Book of irrigation Technology" CRC Press Inc., Florida
3 Cuenca, R. H.- "Irrigation system design" Prentice Hall.
4 Khushani-" Irrigation system design-Voi. III Oxford and IBH.

MWR643: Elective- I (GIS APPLICATIONS IN WATER RESOURCES ENGINEERING)

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I
Introduction Scope of Remote Sensing and GIS in Water Resource and Environmental Systems – Geomorphological, Hydrological and Land use Mapping.

Evaluation of Water Resources Potential Rainfall Runoff modeling using remote sensing inputs.

UNIT II
Flood and Draught Studies, Flood plane zoning – inundated areas – evaluation models – Draught assignment and monitoring.

UNIT III
Command Area Studies – Cropping patterns, conditions of crops, irrigation system performance – crop yield estimation.

UNIT IV
GIS, Hydrology and Resources Management – Watershed development, measurement options, inventory.

Remote Sensing in Show Cover Studies – Snowmelt Runoff.

UNIT V
Reservoir Sedimentation, Erosion and Deposition – Catchment Area Treatment – Estimation of Sediment Load – Use of models.

UNIT VI
Environmental Applications – Urban Storm water Studies – Soil waste management – wetlands nonpoint sources pollution.

Recommended Books

1. Lillesand T.M. and Kiefer R.W., (1993), Remote Sensing and Image Interpretation" John Wiley and Sons, N York
2. Swain P.H., and S.M. Davis, (1987), "Remote Sensing – The Quantitative Approach", McGraw Hill Publishing Company, N. York.'
3. Lyon, J.G. and McLarthy, J., (1995), "Wetland and Environmental Application of GIS", Lewis Publisher, Washington.

MWR621 : Laboratory – I

Teaching Scheme:
Practical : 02 Hours / Week

Exam Scheme:
Practical Exam : 50 Marks
Credit: 1

Performance of experiments based on studies is expected by the candidates during Lab-I work. Any five following experiments are required to perform in the laboratory.

1. Flow around immersed lamina using Hele shaw model.
2. Study on electric analogy apparatus.
3. Verification of Bernoulli's equation.
4. Study of Hydraulic Jump.
5. Determination of discharge coefficient of standing wave flume.
6. Verification of Stroke's law.
7. Study of water hammer phenomenon.
8. Water quality Analysis for various parameters.

MWR622 : Software Laboratory – I

Teaching Scheme:
Practical: 02 Hours / Week

Exam Scheme:
Term work: 50 marks
Credit: 2

Performance of experiments based on studies is expected by the candidates during Lab-I work. Any three of following software are required to performed in the laboratory on open source / licensed computer software.

1. GIS tool in watershed development.
2. HEC-HSM software
3. Water CAD Software.
4. Surface water modeling system.
5. Ground water modeling system.
6. Computational Fluid Dynamics using open source toolkit software open foam or any other equivalent software.
7. Study of any one simulation software for conducting practical's.

MWR623: SEMINAR – I

Teaching Scheme:
Practical: 02 Hours / Week

Exam Scheme:
Practical Exam: 50 marks
Credit : 1

Seminar shall be a term work submitted in the form of technical report of research, analysis and design on any current topic in the concerned or allied field. It is expected that the students should refer the journals, and proceedings of National and International seminar / conference. Student should follow standard practice of seminar report writing (International journals). The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner appointed by the Principal of the Institution. Seminar topics from text and reference books will not be accepted.

MWR651: HYDRAULIC STRUCTURES

Teaching Scheme:
Theory: 3 hrs/ week
Tutorial: 1hrs/ week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I

Masonry and concrete dams: Evaluation of theory of design, Earth quake forces on dam and water mass, up-lift force. Strengthening and raising of dams, High dams.

Arch dams – Development of arch dams, equations of cylindrical shells, general concepts about trial load method and elastic shell method.

UNIT II

Counter fort and hollow dams: Genesis of the style, pros and cons. General stability of the dam.

Rock fills dams: General Design principles, methods of constructions and compaction.

UNIT III

Instrumentation in dams.

UNIT IV

Earth dams: calculation and control of seepage through dam and foundation. Drainage of earth dams, design of filters, design of earth dams.

UNIT V

Spillways: Determination of capacity, Types, ogee, side channel, chute, shaft, siphon, etc. general layout and elements, Basic Principles of hydraulic design. Energy dissipation arrangements.

Spillway Gates – Types such as Tainter, drum, vertical lift, automatic gates. General discussion about layout, elements and basic principles of design.

UNIT VI

Outlets through dams – Pressure and non-pressure outlets, types, layouts, general arrangement and components, nature of flow in outlets, head losses, hydraulic considerations involved in the design of high head outlets.

Recommended Books

1. Creager, Justin, Hinds – "Engineering for dams Vol. I, II, III.
2. Sharma, H.D. "Concrete Dams"
3. Garg, S.K. (1988) "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, Delhi.

MWR652: WATER RESOURCES SYSTEMS PLANNING & MANAGEMENT

Teaching Scheme :
Theory: 3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test: 20Marks
Credit: - 4

UNIT I

Introduction: General Principles of Systems Analysis to Problems in Water Resources Engineering, Objectives of water resources systems Socio – Economic Characteristics.

UNIT II

Economic Analysis of Water Resources Systems : Principles of Engineering Economy, Capital, Interest and Interest rate, Time Value of Money, Depreciation, Benefit Cost Evaluation, Discounting Techniques, Socio – Economic Analysis.

UNIT III

Methods of Systems Analysis: Linear Programming Models, Simplex Method, Sensitivity Analysis, Dual Programming, Dynamic Programming Models, classical optimization techniques, Non-Linear Programming, Gradient Techniques., Genetic algorithm, Stochastic Programming, Simulation, Search techniques, Multi objective optimization.

UNIT IV

Water Quantity Management: Surface water storage requirements, storage capacity and yield, reservoir design, water allocations for water supply, irrigation, hydropower and flood control reservoir operations, planning of an Irrigation system, irrigation scheduling, groundwater management, conjunctive use of surface and subsurface water resources, Design of water conveyance and distribution systems.

UNIT V

Water Quality Management : Water Quality Objectives and Standards, Water Quality Control Models, Flow Augmentation, Wastewater Transport Systems, River Water Quality Models.

UNIT VI

Legal Aspects of water & Environment Systems: Principles of Law Applied to Water Rights and water allocation, water laws. Environmental protection law. Environmental constraints on Water Resources Development.

Recommended Books

1. Loucks, D.P., Stedinger, J.R. and Haith, D.A. (1982) "Water Resources Systems Planning and Analysis", Prentice Hall Inc. N. York
2. Chaturvedi, M.C. (1987), "Water Resources Systems Planning and Management", Tata McGraw Hill Pub. Co., N. Delhi.
3. Hall W.A. and Dracup, J.A. (1975), "Economics of Water Resources Planning ", McGraw Hill publication N Delhi.
4. James, L.D. and Lee (1975) "Economics of water resources planning", McGraw Hill Inc. N York.
5. Kuiper, E. (1973) "Water Resources Development, Planning, Engineering and economics", Buttersworth, London.
6. Biswas A.K. (1975) "Systems Approach to water management" McGraw Hill Inc, N York.
7. Taha, H.A. (1995), "Operation research", Prentice Hall of India, N. Delhi.

MWR653: LAND AND WATER MANAGEMENT

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test :20 Marks
Credit: - 4

UNIT I
Irrigation Development in India, Planning of Irrigation projects, command area development programme,

UNIT II
Physical and chemical properties of soil, soil profile, soil aeration, classification of Irrigable Soils, Soil survey, soil management.

UNIT III
Soil-Plant-Water relationships, Capillary and non capillary pores, water relation of soils, infiltration, Hydraulic conductivity, water movement through soils, Soil water potential, soil moisture constants, plant water relations, rooting characteristics,

UNIT IV
Watershed management: Objectives, water conservation and harvesting, soil erosion-principles and causes, estimation of soil loss, universal soil loss equation-control and conservation, Land capability classification.

UNIT V
Watershed development ridge to valley concept, water harvesting technique for life saving irrigations, land treatment, drainage line treatment, role of geology, design of structure, estimation of water harvested, impact on environment, hydrology of micro watershed, case study.

UNIT VI
Irrigation Management : Land Grading and Field Layout, Cropping patterns, Fertilizers, On-farm developments, Diagnostic analysis of irrigation system, water application methods, Rotational water distribution, Micro Irrigation, Water Logging and Salt Problems, Reclamation and Management of Salt affected Soils, Drainage, Participatory Irrigation Management.

Recommended Books

1. Murthy, V.V.N. (1999) "Land and Water Management Engineering", Kalyani Publishers, Ludhiana.
2. Scwabe G.O., Fagmeir, D.D. and Eliot W.J. (1995) "Soil and Water Management Systems", Jhn Wiley and Sons, N York.
3. Michael, B.A.M. (1990) "Irrigation", Vikas Publishing House Pvt. Ltd. N Delhi
4. Asawa, G.L. (1995) "Irrigation Engineering", New Age International Pub. Co. N Delhi.
5. Suresh, R.L. (1999) "Soil and water conservation engineering", standard publishing Co. Delhi.
6. Watershed hydrology by V.S.R. Murthy

MWR654: CHANNEL AND RIVER HYDRAULICS

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20Marks
Credit: - 4

UNIT I

Basic concepts of free surface flows: flow regimes, velocity and pressure distribution, kinetic energy and momentum principles, engery-depth relationships, specific energy, critical depth, computation of the critical depth, section factors, hydraulic exponents, specific force diagram.

UNIT II

Flow resistance: the resistance equation, uniform and non uniform flow computation and application, longitudinal profiles.

UNIT III

Steady gradually varied flow: dynamic equation, characteristics of flow profiles, and methods of computation, practical problems, gradually varied flow analysis and computation.

UNIT IV

Steady Rapidly varied flow: Hydraulic jump analysis and location, jump in sloping channels and oblique jump.

UNIT V

Unsteady rapidly varied flow: Monoclinal Rising wave, Dam Break Problem, Moving hudraulic jump, positive and negative surges, Hydraulic Flood Routing.

UNIT VI

Fluvial hydraulics: Basic characteristics of river beds and sediments, initiation of motion, Regimes of flow, Resistance to flow in alluvial streams, Theories of Bed load, suspended load and total load.Design of stable channels: Regime and Tractive force methods.

Recommended Books

1. Subramanya K. (1998) "Flow in Open Channels", Tata McGraw Hill Publishing Co.
2. Henderson. (1955) "Open channel flow", McMillan Pub. London.
3. Chow V.T. (1979) "Open Channel Hydraulics", McGraw Hill Inc. New York.
4. Garde R, J. and RangaRaju K.G. (1980) "Mechanics of Sediment Transportation and Alluvial Stream Problems" Wiley Eastern Limited, New Age International Limited, New Delhi, Pune.
5. French R.H. (1995) "Open Channel Hydraulics," McGraw Hill Publishing Co. New York.

MWR691: Elective – II (NEURO FUZZY APPLICATIONS)

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I

Introduction: Basic concepts of Neural Networks and Fuzzy logic, differences between conventional computing and Neuro-Fuzzy computing, characteristics of Neuro-Fuzzy computing.

UNIT II

Fuzzy Set Theory : Basic definations and terminology and membership functions – formulation and parameters, basic operations of fuzzy sets – complement, intersection, vision, t – norm and T – conorm

UNIT III

Fuzzy Reasoning and Fuzzy Interference : Fuzzy rules, Fuzzy resoning, Fuzzy Inference systems, Fuzzy modeling, Applications of Fuzzy reasoning and modeling in Civil Engineering problems.

UNIT IV

Fundamental concepts of Artificial Neural Networks : Model of a neuron, activation functions, neural processing, Network architectures, learning methods.

UNIT V

Neural Network Models : Feed forward Neural Network, Back propagation algorithm, Applications of Feed forward networks, Recurrent networks, Hopfield networks, Habbian learning, self-organizing networks, unsupervised learning, competitive learning.

UNIT VI

Neuro-Fuzzy Modeling :Neuro-Fuzzy computing, Hydrologic modeling Time series Analysis and Modeling, Water Management.

Recommended Books

1. Jang, JSR, C.T. Sun and E. Mizutan (1997), " Neuro-Fuzzy and Soft Computing", Prentice Hall, N.J.
2. Simon Haykin, (1993), "Neural Networks, A Comprehensive Foundation", McMillan College Publishing Company.
3. Kosko, B. (1997), "Neural Networks and Fuzzy Systems", Prentice Hall of India Pvt. Ltd., New Delhi.
4. Klir, George J., T.A. Forger, (1995), "Fuzzy Sets, Uncertainty and Information", Prentice Hall of India, Pvt. Ltd., New Delhi.
5. Rao V. and H. Rao, (1995), "C++ Neural Networks and Fuzzy Logic, BPB Publications, New Delhi.

MWR692: Elective – II (ENVIRONMENTAL EVALUATION OF WATER RESOURCESDEVELOPMENT)

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I

Introduction : Environment and its interaction with human activities, Environmental imbalances Attributes, Impacts, Indicators and Measurements, Concepts of Environmental Impact Assessment (EIA), Environmental Impact Statement, Objectives of EIA, Advantages and Limitations of EIA.

UNIT II

Principles of Environmental engineering, Ecological diversity, its importance and conservation, Ecosystem evaluation, landscape-main ecological elements, Diversity, matrices, patches, corridors, Interrelations of ecological elements in a cultural landscape, Reclamation and environmental engineering, water resources and ecology, saving endangered species, International and regional convention on environmental protection.

UNIT III

Environmental issues in water resource development – Land Use – Soil erosion and their sort and long term effect – Eco system studies – Flora –Fauna –Aquatic and terrestrial ecosystem balance – Disturbance and long term impacts – changes in quantity and quality of flow – sedimentation – Environmental impact assessment of water resources development structures – Case Studies.

UNIT IV

Water Quality Impact Assessment: Attributes to be Considered, Water Quality Impact Assessment of Water Resources Projects, Data Requirement of water quality impact Assessment for Dams, Impacts of Dams on Environment, Case Studies.

UNIT V

Methodologies for Carrying Environmental Impact Assessment: Overview of Methodologies Adhoc, Checklist, Matrix, Network, Overlays, Benefit Cost Analysis, Choosing a Methodology, Review Criteria.

UNIT VI

Guidelines and legal aspects for environmental protection, role of Ministry of environment and forests, Role of pollution control board, Environmental protection acts, measures of effectiveness of pollution control activity.

Recommended Books

1. Jain, R.K., Urban, L.V., Stracy, G.S., (1991), "Environmental Impact Analysis", Van Nostrand Reinhold Co., New York.
2. Rau, J.G. and Wooten, D.C. (1995), "Environmental Impact Assessment " ,MacGraw Hill Publication Co., New York.
3. Canter, L.W., (1997), "Environmental Impact Assessment", McGraw Hill Pub. Co., New York.
4. Environmental impact of water Resource Projects by S.A. Abbasi , Discovery publishing house, New Delhi.

MWR693: Elective – II (WATER POWER ENGINEERING)

Teaching Scheme :
Theory:3 hrs / week
Tutorial: 1hrs / week

Exam Scheme:
Theory: 80 Marks, Class Test 20
Credit: - 4

UNIT I

Introduction: Sources of energy, types of power, choice of type of generation. Components of a waterpower project, types of hydro power schemes and their general layouts. Concept of power transmission.

Estimation of Hydropower available – Basic water power equation, estimation of discharge and hear available. Preliminary choice of the type of system.

UNIT II

Nature of demand : Load curves, load duration curves, load factor, plant capacity factor, plant use factor, firm and secondary power.

UNIT III

Intakes : Types, elements of an intake, hydraulic design of various elements.

Conveyance System : Power channel, pressure conduits, tunnels. General concepts of design and the economics. Tail Race : Functions, types (Channel and tunnel). Draft tubes, function and principle types.

UNIT IV

Surge tank : Function, location, types such as simple, restricted orifice, differential, air cushion chamber type. Basic design criteria. Fore bay.

UNIT V

Power station : Types, elements of a power station. General criterion for the design of main dimensional of the powerhouse. Economic comparison of underground power stations with the surface power stations.

Turbines : Classification, characteristics of different types, choice of type. Turbine setting and cavitations. Tidal power stations : Concepts general layout, classification, types.

UNIT VI

Pumped storage plants : Concepts, general layout, types and economics.

Other types of power plant :a) Depression power plant. (b) Micro Power Station – Need for the development and the problems faced.

Recommended Books

1. Mosonyi, E. – "Water Power Development" Vol. I & II
2. Brown,G. Etal – "Hydro –electric engineering practice" Vol. I, II and III
3. Dandekar M.M. – "Water Power Engineering Vikas Pub. House Pvt. Ltd :

MWR671: Laboratory – II

Teaching Scheme :
Practical : 02 Hours / Week

Exam Scheme :
Practical Exam : 50 Marks
Credit :- 1

Performance of experiments based on studies is expected by the candidates during Lab-I work. Any five following experiments are required to perform in the laboratory.

1. Determination of ϕ index by double ring type infiltrometer.
2. Rainfall data collection by natural siphon recording type rain gauge and determination of mass curve and hyetograph from obtained data.
3. Measurement of permeability.
4. Determination of rate of evaporation.
5. Design of rainwater harvesting system.
6. Study of resistivity meter.
7. Study of vortex flow.
8. Study of water budgeting & water audit.

MWR672: Software Laboratory – II

Teaching Scheme :
Practical : 02 Hours / Week

Exam Scheme :
Term work : 50 marks
Credit :- 2

Performance of experiments based on studies is expected by the candidates during Lab-I work. Any three following experiments are required to perform in the laboratory on open source / licensed computer software.

1. Study on Environmental Impact Assessment Software tool.
2. Study on river CAD model.
3. Study on Fluid flow model.
4. Application of MATLAB and its tool boxes.
5. Study on SPSS Software tool.
6. Study on Aquachem Software.

MWR673: SEMINAR – II

Teaching Scheme :
Practical : 02 Hours / Week

Exam Scheme :
Practical Exam: 50 marks
Credit :- 1

Topic of the seminar II shall be decided in such a way that it will enhance the knowledge of the student in a particular topic which is not covered in the syllabus. It is expected that the students should refer the journals, and proceedings of National and International seminar / conferences. Student should follow International Practice of seminar report writing (International Journals). The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner appointed by the Principal of the Institution. Seminar topics from text and reference books will not be accepted.

SEMISTER - III

MWR721: Dissertation– I

Teaching Scheme:
Practical: 12 Hours / Week

Exam Scheme :
Term work : 100marks
Credit :- 12

DISSERTATION

The dissertation shall consist of a report on any research work done by the candidate or a comprehensive and critical review of any recent development in the subject or detailed report of the project work consisting of experimentation / numerical work, design and or development work that the candidate has executed.

- In part I dissertation it is expected that the student should decide a topic of dissertation which is useful in field or practical life. It is expected that the students should refer the journals, and proceedings of National and International seminar / conferences. Emphasis should be given to the introduction of topic, literature review, objective of the study along with some preliminary work / experimentation carried out on dissertation topic.

- Student should submit part I dissertation report (soft bound) in three copies covering the content discussed above and highlighting the features of the works to be carried out part II of the dissertation. Student should follow standard practice of dissertation writing.

- The candidate will deliver a talk on the topic and the assessment will be made on the basis of term work and the talk thereon by internal examiner appointed by the Principal of the Institution.

SEMISTER - IV

MWR771: Dissertation Part – II

Teaching Scheme:
Contact Hours: 20 Hours / Week

Exam Scheme:
Term work: 100 Marks
Practical: 200 Marks
Credit: 20

The part II of dissertation will be in continuation of part I after completion of work satisfactorily the examinee shall submit the dissertation in soft bound two copies to the head of department. The examinee shall present the pre synopsis of the dissertation work before two internal examiners out of which one will be guide. The suggestion given by these two examiners should be incorporated before submitting the final four copies of the head of the institution. The term work marks should be submitted to the university by the internal guide, examinee should take into account the opinion of other two examiners who were present at time of pre synopsis.

Viva-voce examination shall consist of defense presented by the examinee on his/her work in the presence of other teachers and students and two examiners appointed by the university , one of whom will be the guide and second will be external examiner.