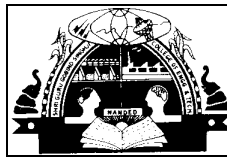


COURSES OF STUDY

M. Tech. Civil Engineering (Water Management)

(2010 Entry students)



**Department of Civil and Water Management Engineering
SHRI GURU GOBIND SINGHJI INSTITUTE OF ENGINEERING &
TECHNOLOGY, VISHNUPURI, NANDED – 431 606 (M.S.)**

M. Tech. Civil Engineering (Water Management)
Courses of Study

SEMESTER-I		SEMESTER-II	
MCW501	Numerical Methods (L-T-P) (3-1-0) Credits 4	MCW512	Water Resources Economics Planning and Management (L-T-P) (3-1-0) Credits 4
MCW502	Surface Water Hydrology (L-T-P) (3-1-0) Credits 4	MCW513	Systems Engineering & its Applications (L-T-P) (3-1-0) Credits 4
MCW503	Ground Water Engineering (L-T-P) (3-1-0) Credits 4	MCW514	Watershed Management (L-T-P) (3-1-0) Credits 4
<i>Elective-I</i>	(L-T-P) (3-1-0) Credits 4	MCW515	Hydraulic Structures (L-T-P) (3-1-0) Credits 4
MCW504 MCW505 MCW506	Soil Science & Agro-technology Hydraulic Engineering Participatory Irrigation Management	<i>Elective-III</i>	(L-T-P) (3-1-0) Credits 4
<i>Elective-II</i>	(L-T-P) (3-1-0) Credits 4	MCW516 MCW517 MCW518	River Basin Organization Irrigation Engineering Soft Computing Techniques
MCW507 MCW508 MCW509	Environmental Impact Assessment Water Works Engineering Remote Sensing and GIS	MCW519	Computation in Water Management (L-T-P) (0-0-2) Credits 1
MCW510	Water Management Laboratory (L-T-P) (0-0-2) Credits 1	MCW520	Seminar-II (L-T-P) (0-0-2) Credit 1
MCW511	Seminar-I (L-T-P) (0-0-2) Credit 1		

Part-III & Part IV

SUBJECT	TEACHING CREDITS				
	L	T	P	Credits	
PART-III					
MCW521	Dissertation-I	--	--	24	24
	Sub Total	--	--	24	24
PART-IV					
MCW522	Dissertation-II	--	--	24	24
	Sub Total	--	--	24	24

L-Lecture, T-Tutorial/Seminar/Project, P-Practical.

M. Tech Civil Engineering (Water Management)
Programme Structure

Credits	Semester I	Semester II	Semester III	Semester IV	Total
Course Work					
Core Courses	12	16	-	-	28
Electives	08	04	-	-	12
Lab. Courses	01	01	-	-	02
Seminar	01	01	-	-	02
Projects	-	-	24	24	48
Total	22	22	24	24	92

Examination

There would be one midterm examination during the semester of 30 marks (90 minutes duration) at the end of 8th week. At the end of the semester there would be a major examination of 70 marks (3 hours duration).

The distribution of weightage for each component shall be decided and announced by the course coordinator at the beginning of the course, subject to such stipulations as or given in the scheme of teaching and examination for a given programme with prior approval of DPGPC.

Those courses which have practical component (Term work / Sessional) or which are completely practical (Term work / Sessional) in nature will be evaluated regularly during the regular schedule (50%). It also has end term evaluation (50%). The practical grades shall appear separately on the grade card.

SEMESTER - I

MCW 501 NUMERICAL METHODS (3-1-0) Credits 4

Curve fitting, System of linear and nonlinear algebraic equation. Ordinary and partial differential equations, different schemes, implicit and explicit schemes accuracy convergence and stability, method of characteristics, Introduction to computational fluid dynamics and its applications, Grids and their classification, Convection and diffusion equation, Navier-Stokes equation, Finite difference method: solution to steady and unsteady flows Ground water flow problems, pollutant dispersion, flood wave propagation, Tidal Model

Text and Reference Books:

1. Numerical Methods for Engineers by Chapra S.C and Canale R.P., McGraw Hill Publications.
2. Numerical methods in Engineering practice by Amir Wadi Al- Khafaji, J.R. Tooley, H.R.W. Publication.
3. Numerical Methods for Scientific and Computations by M.K. Jain et al, Wiley Eastern Engineering Publication.
4. Introduction to Methods of Numerical Analysis by S.S. Sastry, Prentice Hall, New Delhi..
5. Computational Fluid Flow and Heat Transfer by Murlidhar K and Sundararajan T, Narosa Publishing House.

MCW 502 SURFACE WATER HYDROLOGY (3-1-0) Credits 4

Hydrologic processes, Modeling of Hydrological Processes, Analysis of Hydrologic data. Rainfall DAD Analysis, Intensity Duration frequency analysis, PMF, Evaporation and evapotranspiration: empirical relations, Penman equation, Infiltration indices, Infiltration models, Stream flow: Rainfall-Runoff models, dependability, Hydrologic statistics, Floods Synthetic UH, Instantaneous UH Dimensionless UH. Flood frequency studies, design flood, Flood routing, Droughts: Hydrology of droughts. River hydrology, Stochastic Hydrology, Introduction, time series, smoothening of data, stochastic modeling, types of stochastic models.

Text and Reference Books:

1. Handbook of Applied Hydrology by V.T. Chow, McGraw Hill Publication, New York.
2. Engineering Hydrology by K. Subramanya, Tata McGraw Hill, New Delhi.
3. Hydrology for Engineers by Linsley, Kohler and Paullahus, McGraw Hill Pub, NY.
4. Engineering Hydrology by CSP Ojha, Berndtsson and P. Bhunya Oxford University Press, 2008

MCW 503 GROUNDWATER ENGINEERING (3-1-0) Credits 4

Hydrodynamics, continuity equation, equations of motion, Boundary conditions. Dupuit's approximations. Mapping techniques for confined and unconfined aquifers, Pumping test, interpretation and use of data. Unsaturated flow, Hydraulics of open wells, single & multiple well system, well losses, consideration of non isotropic, non homogeneous medium, Hydrodynamic dispersion, ground water pollution. Conjunctive use system, Future projections, Mathematical modeling. Numerical methods applicable to groundwater systems, analog models, simulation models for problem solving in ground water flow. Ground water availability and flow in hard rock areas.

Text and Reference Books:

- | | |
|---|--|
| 1. Groundwater | by Raghunath, Wiley Eastern publication. |
| 2. Dynamics of Fluids in Porous Media | by Bear J., (1972), Elsevier Publications Co. NY |
| 3. Numerical Methods in Groundwater Hydrology | by A.K. Rastogi, |
| 4. Groundwater Hydrology | by D.K. Todd, (1980), John Wiley & Sons, NY |

ELECTIVE I: Candidate can opt for any one of the following three courses i.e. (MCW504 or MCW505 or MCW506)

MCW 504 SOIL SCIENCE AND AGROTECHNOLOGY (3-1-0) Credits 4

Classification of soils, characteristics of Indian soils; physical, chemical, Biological, properties of soils and their roles in crop production; Reactions of fertilizers; preparation of soil maps; crop production potential. Principles of crop production, inputs to crop productions; weeds and methods of weed control; soil fertilizer doses; principles of crop physiology; dry land farming; Agro climatology of crop planning, water requirement of crops.

Text and Reference Books:

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|----------------------------------|----|--|
| 1. Fundamentals of soil science | by | Foth, Wiley publication. |
| 2. Soils | by | Donahue, Miller Shicklune, |
| 3. Introduction to agronomy | by | Vaidya, Sahastrabudhe |
| 4. Manual on Irrigation Agronomy | by | R.D. Misra, M. Ahmed Oxford & IBH Pub. |

MCW505 HYDRAULIC ENGINEERING (3-1-0) Credits 4

Basic concepts: Energy and momentum equation and their application. Critical flow, channel controls, and transitions. Uniform flow and flow resistance, sheet flow; concepts of Boundary layer, surface roughness, theoretical uniform flow equations; Instability of Uniform flow; Gradually varied flow, flow profile classification and computation methods; Flow profiles in Natural channels. Spatially varied flow. Hydraulic Jump. Unsteady flow: continuity equation, dynamic equation, wave propagation, Method of characteristics; Rapidly varied Unsteady flow, Surges, Dam-break problems. Dispersion in open channels. Properties of sediment, sediment movement, tractive force, Bed load theory, suspended load theory. Estimation of transported sediment.

Text and Reference Books:

1. Open Channel Hydraulics by V.T. Chow. McGraw Hill Publication.
2. Mechanics of Sediment Transportation and Alluvial Stream Problems by Garde, Ranga Raju; Wiley Eastern Publication.
3. Flow through Open Channel by K.S. Ranga Raju. TMH Ltd. New Delhi.
- 4 Engineering Hydraulics by Hunter Rouse
- 5 Hand Book of Applied Hydraulics by Calvin Victor Davis and Kenneth E Sorensen

MCW506 PARTICIPATORY IRRIGATION MANAGEMENT (3-1-0) Credits 4

Principles of management and its functions, management by objectives, Water laws, common property resources, ground water legislation, MWRRA 2005, Irrigation act and CADA act in various states of India. Irrigation system model, irrigation system as socio technical enterprise. Organizational and institutional bottlenecks, information and communication system. Beneficiary's participation, canal committees, water use cooperative society and it's functions. Incentives for WUA, Status of PIM in India, Equity and social justice in water management. Dynamics of social change due to irrigation, farmers organization. Technology transfer methods. Communication, adoption & diffusion, reacting to people and motivation.

Text and Reference Books:

1. PIM- Paradigm for 21st century Volume I and II by L. K. Joshi and Rakesh Hooja, IndiaNPIM New Delhi
2. Farmer's managed irrigation system by R. K. Patil and S. N. Lele, SOPECOM Pune
3. Hand book on PIM compiled by David Groenfeldt, IndiaNPIM , New Delhi
4. WALMI publication on PIM

ELECTIVE II: Candidate can opt for any one of the following three courses i.e. (MCW507 or MCW508 or MCW509)

MCW 507 ENVIRONMENTAL IMPACT ASSESSMENT (3-1-0) Credits 4

Technical and procedural aspects of environmental impact analysis (EIA), environmental impact statement, various methods of EIA, general procedure for characterizing environmental pollution, relative merits and demerits of EIA methods. Socioeconomic impacts, resettlement and rehabilitation of project affected people, world bank policy. Guidelines and legal aspects for environmental protection, role of Ministry of Environment and Forest, role of pollution control board, environmental protection acts, measures of effectiveness of pollution control activities. Total impact assessment, post project audit, inter sector pollutant transfer. EIA case studies of i) Irrigation projects; ii) Pollution of water bodies due to industries; iii) Ground water exploitation.

Text and Reference Books:

1. Environmental Impact of Water Resource Projects by S.A. Abbasi, Discovery Publishing House, New Delhi.
2. Environmental Impact Assessment – Scope 5 Edited by Munn Wiley Publication.
3. Environmental Impact of Water Resources Development by R.S. Goel., (1993), Tata McGraw Hill Publishing Co. New Delhi.

4 Environmental Impact Assessment	by Dee, Duke, Baker, Whitman, Fahringer. McGraw Hill book co., New York
5 Environmental Impact Assessment (2005)	by David Lawrence, John Wiley & sons Inc.

MCW 508 WATER WORKS ENGINEERING (3-1-0) Credits 4

Integrated approach to water supply and sanitation, Million Development goals, Estimation of demand, Demand side management, Sources of water for increasing population, Economics of water supply and pricing of water, procedure of fixing water charges.

Basic design considerations, Pre design report.

Design of water treatment plant based on raw water quality parameters. High service pumps and distribution system. Design of distribution system.

Residual processing, recovery of chemicals. Filter backwash, Ultimate disposal, Operation maintenance and troubleshooting.

Water audit, procedure, lessons drawn to improve w/s. Losses and leakages, Reasons, Detection, Measurement and measures to control. Management, legal and institutional aspects.

Rain water harvesting system design, decentralized system, small isolated systems for apartments and industries

Text and Reference Books:

1 Water treatment plant design	by ASCE and AWWA
2 Water treatment principle and design	by J. M. Montgomery
3 IWWA data book	
4 Water works engineering	by Qasim, Motley and Zhu. Prantice Hall of India Pvt. Ltd. Publication, 2004

MCW 509 REMOTE SENSING AND GIS (3-1-0) Credits 4

Photogrammetry and photo interpretation, Remote Sensing and data analysis: Fundamentals of ideal remote sensing systems. Law governing electromagnetic radiation, spectral signatures. Sensors, platforms and their characteristics, Fundamentals of processing and analysis of remotely sensed data by Analog, Digital and hybrid systems and the equipments required. Digital analysis of CCTS. Supervised and unsupervised classification techniques.

Application to agriculture and Irrigation: Basic interaction and mechanism of soil, vegetation and water. Land survey, geomorphology, drainage characteristics, erosion hazard, vegetative cover, cropping, water quality and irrigation intensity, Estimation of surface and ground water irrigation potential. Disease detection. Agricultural management and planning. Predicting crop yield through arial photographs and other remotely sensed data, delineation of surface water bodies.

Text and Reference Books:

1. Remote Sensing Methods and Application	by R. Michael Horti, Wiley Interscience Publications.
2. Introduction to Environmental Remote Sensing	by Baret. E.C. and Curtis L.F., Chapman and Hall, London.
3. Remote sensing and Image Interpretation	by Lillesand T.M. and Kiefer R.W., Wiley, New York

MCW 510 WATER MANAGEMENT LABORATORY (1Credit)

Following experiments shall be performed in various laboratories of the department

1. Rainfall data collection by natural siphon recording type rain gauge and determination of mass curve & hyetograph from obtained data
2. Determination of ϕ index by double ring type infiltrometer
3. Measurement of permeability
4. Determination of rate of evaporation
5. Measurement of Water quality parameters
6. Pumping test on well
7. Design of rain water harvesting system
8. Study of resistivity meter
9. Calculation of crop water requirement

Term Work: The term work shall be based on the report of minimum 6 experiments performed by the candidate.

Practical Examination: It shall be an oral based on the above mentioned term work.

MCW511 SEMINAR I (1 Credit)

The seminar should be done on any topic with focus on Water Resource Management to be decided by students and the teachers concerned. Seminar work shall be in the form of report to be submitted by the student at the end of the semester. The candidate will make a presentation before departmental students and faculty on the topic and the assessment will be made by two internal examiners appointed by the DPGPC, one of them will be the supervisor.

SEMESTER - II

**MCW 512 WATER RESOURCES ECONOMICS, PLANNING AND MANAGEMENT
(3-1-0) Credits 4**

Planning and decision making process, Systems approach to water resource planning. Water as economic commodity, Principles of economics, discounting techniques, Price theory, Resource allocation, project optimality conditions. Cost benefits studies, Role of benefit cost parameters in project selection. Economic feasibility tests. Decision making under uncertainty and risk. Cost benefit studies of single & multipurpose projects. Economic planning, capacity expansion. Multiobjective planning, Methods of analysis. Stakeholders' participation, Preparation of feasibility report, interstate water disputes, international development on water transfer. Concept of IWRM.

Text and Reference Books:

1. Water Resources Project Economics by Kuiper , (1971), Butterworth, London.
2. Water Resources System Planning and Management by M.C. Chaturvedi, (1987), Tata McGraw Hill Co. New Delhi.
3. Water Resources Planning and Management by O.J. Helweg., (1985), John Wiley and Sons Inc., USA

MCW 513 SYSTEMS ENGINEERING AND ITS APPLICATION (3-1-0) Credits 4

System concepts, Open and closed systems, system modeling, concavity and convexity of space, systems formulation, dual simplex, primal dual simplex, modified simplex procedures, sensitivity and parametric analysis, Nonlinear programming, quadratic programming, optimization methods and method of calculus, Dynamic programming. Systems applications in water Resources Engineering.

Text and Reference Books:

1. Water Resource, Distribution, Use and Management by Mather J.R. John – Wiley and Sons publication.
2. A systems approach to Civil Engineering Planning and Design by Jewell Thomas K., Harper and Row Publication.
3. Water Resources Systems Engineering by Hall and Dracup, Tata McGraw Hill publication.
4. Systems Approach to Water Management by A.K. Biswas.

MCW 514 WATERSHED MANAGEMENT (3-1-0) Credits 4

Watershed types, Rainfall-Runoff relationship, Necessity of soil and water conservation, Soil-Water-Plant relationship, Land use capability classification, soil erosion definition, processes and forms, factors influencing soil erosion, Erosion hazard assessment, effects on water yield, soil and water conservation practices in catchments. Soil and water conservation practice in commands, Agro-forestry, Soil conservation on private land, Watershed development: ridge-to-valley concept, Water harvesting techniques for life saving irrigations, Land Treatment, Drainage line treatment, Role of geology, Design of structures, Estimation of water harvested, impact on environment, Hydrology of micro- watershed, Case studies

Text and Reference Books:

1. Soil and Water Conservation Engineering by Glen O. Schawb et al Wiley Publication.
2. Soil and Water Conservation by F.R.Troeh et al Prantice Hall Inc Publication.
3. Soil Conservation by N. Hudson, Batsford Academic Publication.
4. Soil Erosion and Conservation by Morgan, R.P.C. Longman scientific Publication.
5. Watershed Hydrology by V.S.R. Murthy,
6. ICRISAT Manual on Watershed

MCW 515 HYDRAULIC STRUCTURES (3-1-0) Credits 4

Spillways: Types, general layout elements & basic principles of Hydraulic design. Spillway gates: types such as tainter, drum, vertical left, automatic. General layout, basic principles of design. Determination of Spillway capacity: rating curves, spillway design, flood hydrographs, routing of floods, flood forecasting. Energy dissipaters: types, general layout, basic concept of hydraulic design outlet through dams: types, layout, general arrangements & components, Transitions: Transitions in open channels and closed conduits, design considerations. Design of large dams, Arch and Buttres dam, Reservoir and its planning.

Text and Reference Books:

1. Open Channel Hydraulics by Chow V.T.
2. Design of Small Dams – USBR Oxford IBH Publishing Company Bombay.
3. Irrigation & Hydraulic Design Vol . I, II, & III by Leliavisky S
4. Hydraulic Structures by Grishing, Mir Publishers, Moscow (USSR)

ELECTIVE III: Candidate can opt for any one of the following three courses i.e. (MCW516 or MCW517 or MCW518)

MCW 516 RIVER BASIN ORGANIZATION (3-1-0) Credits 4

River basin as unit of planning, Water availability studies and demand assessment at basin level, IWRM approach.
Basic functions for water resources management, Water management objectives, Institutional arrangement for performing the functions, Basic indicators at basin level to measure progress and performance, Criteria for developing indicators, Stakeholder participation, Water allocation, Water resources systems analysis, Pollution management at basin level, Planning for pollution control, Monitoring of water resources systems: Pollution, quality and use.
Economic and financial instruments for RBO, Basin planning process. Implementation of basin plan.

Text and Reference Books:

1. IWRM for RBO UNDP manual
2. Integrated River Basin management through decentralization by Kemper, Karin, Springer publication

MCW 517 IRRIGATION ENGINEERING (3-1-0) Credits 4

Irrigation Techniques: Gravity Irrigation, Subsurface Irrigation, Tube well Irrigation, Lift Irrigation, Sprinkler Irrigation and Drip Irrigation. Hydraulic design of Gravity, Subsurface, Tube well, Lift, Sprinkler & Drip Irrigation.
Assessment of irrigation water, Audit of irrigation water.
Preparation of irrigation schedules based on crop water requirement. Different types of irrigation water distribution.
Water logging : causes, surface and subsurface drainage design .
Canals: Design, linings and regulation works, operation and maintenance of canal system, canal automation.
River training, diversion and protection works. Reservoir operations.

Text and Reference Books:

1. Irrigation by Zimmerman , Wiely – Toppan publication.
2. Principles and practice of Irrigation Engineering by S.K. Sharma, S. Chand and Company Ltd. New Delhi.
3. Irrigation Theory and practice by A.M. Michael., Vikas publishing house.
4. Canal Automation CBIP Publication No. 238, New Delhi

MCW 518 SOFT COMPUTING TECHNIQUES

(3-1-0) Credits 4

1. Artificial Neural Networks

Development of ANN, Types of ANN structure, Properties of Neural Network, Components of Neural Network, Neurons, Layers, Input and output weights, Threshold, Types of transfer functions, Learning with neural network, Types of learning, Stability and convergence, Fundamentals of Error backpropagation learning, Generalized delta rule, EBP algorithm, Data normalization, Selection of learning rate and momentum factor; Application of ANN in hydrology and water management problem

2. Fuzzy Logic

Introduction, fuzzy system, classical set and fuzzy sets, operation and properties of classical and fuzzy set. Classical relation and fuzzy relations, crisp relations, operations on fuzzy relations, various types of binary fuzzy relations, fuzzy relations equations, The extension principle and its applications, tolerance and equivalent relation, value assignment, application of fuzzy logic for various problems encountered in hydrology and water resources management.

3. Genetic Algorithm

Introduction to fundamentals of techniques and applications of genetic algorithms.

Text and Reference Books:

1. Neural Networks, Fuzzy Logic, and Genetic Algorithms by S. Rajasekaran and G.A. Vijayalakshmi Pai, PHI publications.
2. Neural Networks: A Comprehensive foundation by S. Haykin, McMillan Publications, 1994.
3. Understanding neural networks and fuzzy logic basic concepts and applications by Kartalopoulos S.T., Prentice Hall (2000).

MCW 519 COMPUTATIONS IN WATER MANAGEMENT

(1 Credit)

Application of Software Laboratory

1. GIS Tool in Watershed Development
2. HEC-HMS Software
3. WaterCAD Software
4. Artificial Neural Network Problem
5. Surface Water Modeling System
6. Groundwater Modeling System

Hydraulics Laboratory

1. Field Measurement of Velocity by Current Meter
2. Velocity Measurement by Pitot Tube
3. Velocity & Discharge Measurement
4. Depth Measurement by Echo Sounder
5. Sieve Analysis

Field Survey by Electronic Total Station

Term Work: The term work shall be based on the report of minimum 6 experiments performed by the candidate.

Practical Examination: It shall be an oral based on the above mentioned term work.

MCW 520 SEMINAR II*(1 Credit)***Preamble:**

- i) Gain ability to prepare independently a sound research proposal
- ii) Gain capability to carry out review of literature in proposed area of dissertation
- iii) Acquire skills of technical report writing and presentation

Methodology:

- a) Faculty of the department and invited experts shall deliver few lectures on various research areas demonstrating research methodology and report writing.
- b) Students shall carry out review of literature of atleast 5 international journal papers.
- c) Students shall prepare a report on review of literature and problem statement of his/her proposed area of dissertation.
- d) Students shall demonstrate the acquired skills through power point presentation.
- e) Seminar guide shall supervise the process.

SEMESTER – III and IV**DISSERTATION - I and II***(24 Credits per Semester)*

Candidates will have to undertake research work independently on a topic related to water management and submit a detailed report of the same. He/She will have to defend the work carried out at the Institute practical Examination. He/She will have to submit monthly progress report of the work to the department, till the completion of the project work.