FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF

CIVIL ENGINEERING

Marwadi University Marwadi Chandarana Group NAAC A+

Computational Methods in Water Resources Engineering

01CI0718

Objective of the Course:

- To provide an overview of computation techniques in water resources engineering.
- To develop a model of surface & subsurface water resources system.
- To introduce modern computational methods in water resources engineering.
- To make aware with different software used in modeling of WRS.

Credit Earned: 03

Prerequisite: Basics of Water Resources Engineering, Advanced Engineering Mathematics

Student's learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Discover various computation methods in water resources engineering.
2. Rate modeling concepts in various water resources systems.
3. Develop a model for surface water resources system and Irrigation engineering.
4. Analyze the water distribution system using suitable software.
5. Appraise artificial intelligence in the water resources system.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	00	00	03	50	30	20	25	25	150

Detailed Syllabus

Sr. No	Topic name	Hours
1	**Introduction**	**04**
	1.1 Introduction and definition of numerical methods	02
	1.2 Solution techniques	02
2	**Modeling the Water Resources System**	**12**
	2.1 Concepts of modeling	02
	2.2 Overview of computer model: Surface hydrology	02
	2.3 Subsurface hydrology modeling	02
	2.4 Cropping Patterns Modeling	02
	2.5 Multipurpose water release modeling	02
	2.6 Hydropower modeling	02
3	**Computing Techniques**	**12**
	3.1 Numerical methods	02
	3.2 Finite difference and finite element method	02
	3.3 Application in Surface Water Modeling	02
	3.4 Application in Subsurface Water Modeling	02
	3.5 Solute transport problems	02
	3.6 Pipe network analysis	02
4	**Software Learning**	**10**
	4.1 Introduction of HEC-RAS and Application	02
	4.2 Introduction of SWAT and Application	02
	4.3 Introduction of LOOP and Application	02
	4.4 Introduction of MADFLOW	04
5	**Modern Computation Method**	**04**
	5.1 AI in Irrigation Engineering	02
	5.2 AI in water resources management	02
	TOTAL	**42**

List of Assignments/Tutorials

Sr. No	Topic name
1	Introduction of Numerical Methods
2	Computation methods in water resources engineering
3	Modeling for Hydrology and Water Resources Management
4	Modeling of WR system using Software.
5	AI emerging in Water Resources Management.

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	20%	45%	10%	10%	10%

Instructional Method and Pedagogy:

1 Prerequisites of the course and its pattern shall be discussed at the commencement of the course.
2 Lectures shall be conducted in the classroom using various teaching aids.
3 Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.
4 A minimum of two internal exams will be conducted and an average of two will be considered as a part of a 15% overall evaluation.
5 At the end of each unit/topic, an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.
6 The assignments/tutorials/technical visits are planned in such a way that they cover the practical aspects of the course contents.

Recommended Study Material

1. Chow, V.T., Maidment, D.R., Mays. L.W., "*Applied Hydrology",* McGraw Hill.
2. Reddy, J. N., "*An Introduction to Finite Element Method",* Tata McGraw-Hill.
3. Niyogi, P., Chakrabarty, S. K., Laha, M. K., "*Introduction to Computational Fluid Dynamics",* Pearson Education.
4. Vedula S. and Majumdar P.P. "Water Resources Systems: Modelling Techniques and Analysis", Tata MCgraw Hill Publishing Company ltd, New Delhi
5. Chapra, steven C. Canale, Raymond P. "Numerical Methods for Engineer", Tata MCgraw Hill Publishing Company Ltd, New Delhi.
6. Jain, M. K.; Iyernger, S.R. & Jain R. K. "Numerical Methods for scientific and Engineering Computational, 6th ed. New International (P) ltd.