HWRM-405 RESERVOIR DESIGN AND OPERATION (THEORY) (02 credit hours)

PRE-REQUISITE: HWRM-204 Surface Water Hydrology

LEARNING OUTCOMES

Following are the learning outcomes of the course:

- Student will learn about Reservoir Classification and Capacity
- Student will learn about Reservoir Simulation
- Student will learn about Flood Routing
- Student will learn about Computer Application to Reservoir Operation
- Student will learn about Reservoir Economics and optimization

CONTENTS

Introduction to the principles and practices of reservoir operation and design

THEORY

Unit-1 Reservoir Classification and Capacity

1.1. Classification of reservoirs
1.2. Methods to determine water availability for reservoir design
1.3. Methods to determine capacity of reservoir
1.4. Ripple mass curve analysis
1.5. Sequent peak analysis

Unit-II Reservoir Simulation

2.1. Simulation, optimization method to determine reservoir capacity
2.2. Stochastic methods in determination of reservoir capacity.
2.3. Concept of probability of failure in reservoir operation.
2.4. Reservoir operation studies using simulation
2.5. system analysis techniques for reservoir operation
2.6. Conjunctive use of reservoirs.

Unit-III: Flood Routing

3.1. Flood control procedure by reservoir operations.
3.2. Flood routing through a reservoir
3.3. Level pool method
3.4. Muskingum method
3.5. Muskingum-Cung method
3.6. Runk-Kutta Methods

Unit-IV: Computer Application to Reservoir Operation

4.1. Application of computer methods for reservoir operation and design.
4.2. Review of widely used computer model for reservoir design and operation
4.3. Application of R language for reservoir operation and design

Unit-V: Reservoir Economics and optimization

5.1. Basic concept economics
5.2. Cost benefits ratios analysis for reservoir operation
5.3. Optimization of reservoir demand and supply
5.4. Linear programming for reservoir operation
5.5. Dynamic programming for reservoir operation

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

ASSIGNMENTS – TYPE AND NUMBER WITH CALENDAR

It is continuous assessment. The weightage of Assignments will be 25% before and after midterm assessment. It includes:

- classroom participation,
- attendance, assignments and presentation,
- homework
- attitude and behavior,
- hands-on-activities,
- short tests, quizzes etc.

ASSESSMENT AND EXAMINATIONS:

Sr. No.	Elements	Weightage	Details
1.	Mid Term Assessment	35%	It takes place at the mid-point of the semester
2.	Formative Assessment	25%	It is continuous assessment. It includes: classroom participation, attendance, assignments and presentation, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

RECOMMENDED TEXT BOOKS / SUGGESTED READINGS

1. Viessman, Jr., W., Lewis, G.L. and Knapp, J.W. (1989) *Introduction to Hydrology*, Harper and Row, New York
2. Singh, V. P. (2017) *Handbook of Applied Hydrology, Second Edition*, McGraw-Hill Education
3. Eagleson, P.S. (1970) *Dynamic Hydrology*, McGraw-Hill, Inc., New York.

4. Kumar, D. (2011) *Watershed Modeling and Management*: A Concise Approach VDM Verlag Dr. Müller ISBN-13: 978-3639371482
5. Westervelt, J. (2001) Simulation Modeling for Watershed Management 2001st Edition Springer ISBN-13: 978-0387988931
6. Eslamian, S. (2014) *Handbook of Engineering Hydrology*: Modeling, Climate Change, and Variability (Volume 1) 1st Edition CRC Press ISBN-13: 978-1466552463
7. Subramanya, K.G. (2008) *Engineering Hydrology* 3rd Edition, McGraw-Hill, Inc.

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PRE-REQUISITE: HWRM-204 Surface Water Hydrology

LEARNING OUTCOMES

Following are the learning outcomes of the course:

- Student will learn about Practical Reservoir Capacity
- Student will learn about Computer Application

CONTENTS

PRACTICAL

Unit-1 Practical Reservoir Capacity

1.1. Practical aspects regarding capacity of reservoir
1.2. Ripple mass curve analysis
1.3. Sequent peak analysis
1.4. Simulation, optimization methods

Unit-II Computer Application

2.1. application of computer methods and models for reservoir operation and design
2.2. Linear Programming
2.3. Dynamic Programming

TEACHING – LEARNING STRATEGIES

- Lecture based examination
- Presentation/seminars
- Class discussion
- Quizzes

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