

HWRM-402: WATERSHED MODELING (THEORY)

(02 Credit hours)

PRE-REQUISITE: HWRM-204

LEARNING OUTCOMES

Following are the learning outcomes of the course:

- Student will learn about Introduction to Catchment Modeling
- Student will learn about Catchment Characteristics
- Student will learn about Types of Models
- Student will learn about Applications of Different Models to Execute Catchment Modeling

CONTENTS

Introduction to the principles and practices of catchment modeling, watershed analysis and rainfall runoff modeling.

THEORY

Unit-I: Introduction to Catchment Modeling

- 1.1. Introduction to catchment modeling.
- 1.2. Catchment processes and hydrologic losses
- 1.3. Evaporation
- 1.4. Interception
- 1.5. Infiltration
- 1.6. Water storage

Unit-II Catchment Characteristics

- 2.1. Catchment characteristic and morphology
- 2.2. Runoff generation
- 2.3. Types of runoff, factors effecting runoff
- 2.4. Theories of runoff generation

Unit-III: Types of Models

- 3.1. Conceptual watershed modeling
- 3.2. Computer simulation approaches in catchment hydrology,
- 3.3. Types of catchment models,
- 3.4. Black box models
- 3.5. Conceptual models
- 3.6. Semi-distributed models
- 3.7. Distributed models

Unit-IV Applications of Different Models to Execute Catchment Modeling

- 4.1. Model calibration and validation and prediction
- 4.2. Study of Stanford watershed model
- 4.3. SWMM model
- 4.4. HEC 1 model
- 4.5. HEC- HMS model
- 4.6. SARR model
- 4.7. HBV model

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. [Dixon, B. and Uddameri, V.](#) (2016) *GIS and Geocomputation for Water Resource Science and Engineering* 1st Edition American Geophysical Union ISBN-13: 978-1118354131
2. Maidment, D, R. and Morehouse, S. (2002) *Arc Hydro: GIS for Water Resources* 3rd Edition Esri Press ISBN-13: 978-1589480346
3. Armstrong, L. (2011) *Hydraulic Modeling and GIS* Esri Press ISBN-13: 978-1589483019
4. Vieux, B, E. (2016) *Distributed Hydrologic Modeling Using GIS* 3rd edition Springer ISBN-13: 978-9402409284
5. [Maity, R.](#) (2018) *Statistical Methods in Hydrology and Hydro climatology* (Springer Transactions in Civil and Environmental Engineering) 1st ed Springer ISBN-13: 978-9811087783
6. [Kumar, D.](#) (2011) *Watershed Modeling and Management: A Concise Approach* VDM Verlag Dr. Müller ISBN-13: 978-3639371482

7. [Westervelt, J.](#) (2001) *Simulation Modeling for Watershed Management* 2001st Edition Springer ISBN-13: 978-0387988931
8. Eslamian, S. (2014) *Handbook of Engineering Hydrology: Modeling, Climate Change, and Variability* (Volume 1) 1st Edition CRC Press ISBN-13: 978-1466552463

HWRM-402 WATERSHED MODELING (LAB)

(01 Credit hrs)

PRE-REQUISITE: HWRM-204

LEARNING OUTCOMES

Following are the learning outcomes of the course:

- Student will learn about Practical Performance of Spatial Models
- Student will learn about Practical Performance of Hydrological Models

CONTENTS

Introduction to the principles and practices of catchment modeling techniques with practical skills through the use of computer

PRACTICAL

Unit-1 Practical Performance of Spatial Models

- 1.1. Practical aspects regarding Rainfall-Runoff Modeling,
- 1.2. Practical performance of ARC SWAT Model
- 1.3. Practical performance of SARR Model
- 1.4. Practical performance of ARC-HYDRO Tools

Unit-II Practical Performance of Hydrological Models

- 2.1. SWMM model
- 2.2. HEC 1 model
- 2.3. HEC- HMS model
- 2.4. SARR model
- 2.5. HBV model

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:

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

ASSESSMENT AND EXAMINATIONS:

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