## HWRM-206 URBAN HYDROLOGY (THEORY) (02 Credit Hrs)

**PRE-REQUISITE:** HWRM-101 Introduction to Hydrology

### LEARNING OUTCOMES

Following are the learning outcomes of the course:

- Student will learn about Concepts of Urban Hydrology
- Student will learn about Urban Drainage
- Student will learn about Urban Runoff
- Student will learn about Urban Flooding and Storm Water Management

### CONTENTS

### THEORY

#### Unit-1 Concepts of Urban Hydrology

1.1. Introduction Urbanization and
1.2. Urban water demands
1.3. Review of hydrological process
1.4. Storm water runoff generation

#### Unit-II Urban Drainage

2.1. The main design criteria used in drainage systems:
2.2. Type of sections design
2.3. The Concept of maximum and minimum velocities in urban drains
2.4. Return period
2.5. Hydrologic risk
2.6. Flood Frequency analysis
2.7. IDF relationships
2.8. Design events

#### Unit-III: Urban Runoff

3.1. Open channel flow in urban watersheds
3.2. Estimation of runoff rates from urban watersheds
3.3. Flow routing
3.4. Storm water drainage structures
3.5. storm water detention

#### Unit-IV: Urban Flooding and Storm Water Management

4.1. Urban flooding
4.2. Structural and non-structural control of urban flood
4.3. Measures of urban flooding
4.4. Introduction to urban groundwater systems
4.5. Storm water quality, pollutants
4.6. Urban storm water models
4.7. Urban water distribution networks

**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. Butler, D. & Davies, J.W. (2004) *Urban Drainage*, Spon Press, 2nd Edn., 2004.
2. Akan A.O and Hioughtalen R.J. (1984) *Urban Hydrology, Hydraulics and Stormwater Quality Engineering, Applications and Computer Modeling*, John Wiley & Sons 2003
3. Hall, M.J. (1984) *Urban Hydrology*. Elsevier, 1984.
4. Shaw, E.M. (1994) *Hydrology in Practice*. 3rd Edn., Chapman & Hall, 1994.
5. Ladson, T. (2005) *Hydrology* - An Australian Introduction. Oxford University Press, South Melbourne

## HWRM-206 URBAN HYDROLOGY (LAB) (01 Credit Hrs)

**PRE-REQUISITE:** HWRM-101 Introduction to Hydrology

### LEARNING OUTCOMES

Following are the learning outcomes of the course:

- Student will learn about Concepts of Urban Hydrology
- Student will learn about Urban Drainage
- Student will learn about Urban Runoff
- Student will learn about Urban Flooding and Storm Water Management

### CONTENTS

### THEORY

**Unit-1 Land Use classification analysis**

1.1. Introduction Urbanization
1.2. Land use classification

**Unit-II Urban Drainage Analysis**

2.1. Return period
2.2. Hydrologic risk
2.3. Flood Frequency analysis
2.4. IDF relationships
2.5. Design events

**Unit-III: Urban Flooding and Storm Water Management**

3.1. Measures of urban flooding
3.2. Storm water quality, pollutants estimation
3.3. Urban storm water models

### 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. Butler, D. & Davies, J.W. (2004) *Urban Drainage*, Spon Press, 2nd Edn., 2004.
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