

## **HWRM-406 SUSTAINABLE WATER RESOURCES DEVELOPMENT (03 Credit hrs)**

**PRE-REQUISITE:** HWRM-205

### **LEARNING OUTCOMES**

Following are the learning outcomes of the course:

- demonstrate critical thinking about sustainable water systems.
- engage with major policy issues and concepts including water regulation, governance, and the water-energy-food nexus.
- discuss theoretical and substantive areas of water management for different human and natural uses.
- articulate methods used in evaluating sustainable water systems such as modeling, demand and supply management and water accounting.
- employ tools to evaluate real world case studies.

### **CONTENTS**

#### **Unit-1 Human and Water**

- 1.1. concepts of sustainable water resources development
- 1.2. what we are doing today
- 1.3. future water resources availability
- 1.4. ethical water utilization
- 1.5. overexploitation of water resources

#### **Unit-II Sustainable development and water**

- 2.1. Indigenous perspectives on water
- 2.2. Balancing diverse needs for water
- 2.3. Environment
- 2.4. ecosystem services,
- 2.5. the human right to water

#### **Unit-III: Water Foot Prints**

- 3.1. Water Foot-Print and Accounting
- 3.2. Integrated Water Resources Management
- 3.3. Agricultural water use

#### **Unit-IV: Management of Water Resources**

- 4.1. Water use
- 4.2. Water reuses
- 4.3. stewardship within the industrial sector
- 4.4. efficient water resources design
- 4.5. why, what and how to manage water resources
- 4.6. concept of environmental water management
- 4.7. water allocation and water scheduling problems

#### **Unit-V: Water Governance**

- 5.1. Water governance,
- 5.2. legislation and law

- 5.3. Water pricing and privatization
- 5.4. understanding trade-offs

#### **Unit-VI: Global Efforts**

- 6.1. Think Globally: Act Locally on water resources
- 6.2. Manware on water resource management
- 6.3. Local water organizations; WAPDA, IRRIGATION WASA etc
- 6.4. World water organizations; UN, GWP, WWC, etc.

#### **Unit-VII: Hydro-politics**

- 7.1. International water disputes
- 7.2. Local water disputes
- 7.3. Water sharing among provinces pros and cons
- 7.4. Indus Water treaty
- 7.5. Selected Case studies

#### **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 mid term assessment. It includes:

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

#### **ASSESSMENT AND EXAMINATIONS:**

<b>Sr. No.</b>	<b>Elements</b>	<b>Weightage</b>	<b>Details</b>
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. Hoekstra, A. Y. (2000). *Appreciation of water: four perspectives*. *Water Policy* 1(6): 605-622.
2. UN Water (2013). *UN-Water Analytical Brief Water Security and the Global Water Agenda – 4-page Summary for Decision Makers*.
3. **Kubota, N.K. Setiawan, J. Indra, B.** (2016) “*Sustainable Water Management New Perspectives, Design, and Practices*” Springer ISBN 978-981-10-1204-4
4. Rong, S. **and** Li, F. (2019) *Sustainable Development of Water and Environment Proceedings of the ICSDWE* Springer ISBN 978-3-030-16729-5
5. Ghosh, M. K. and Roy (2011) *Sustainable Development Environment, Energy and Water Resources* CRC Press ISBN 9781439888254
6. Farolfi, S. Perret, S. Hassan, R. (2013) *Water Governance for Sustainable Development Approaches and Lessons from Developing and Transitional Countries* Routledg, ISBN 9780415852029