Course title: Geoinformatics for Water resources

Course code: NRG 183	**No. of credits:** 3	**L-T-P:** 30-00-30	**Learning hours:** 45

Pre-requisite course code and title (if any):

Department: Department of Natural and Applied Sciences

Course coordinator(s): Dr. Ayushi Vijhani	**Course instructor(s):** Dr. Ayushi Vijhani

Contact details: ayushi.vijhani@terisas.ac.in

Course type: Elective	**Course offered in:** Semester 3

Course description

Course start with basis overview of Remote Sensing and GIS application in Water Resources followed by basic concept of hydrological process and estimation of hydrological parameters. Geospatial technique to evaluate and management of watershed. Further soil, snow, glacier study link with water resources and enhanced the capability to estimate water budget of the watershed. A detail description on ground water with basic knowledge to evaluating the hydrogeomorphology and quality aspects of water. Finally, the water resources link with climate change and hydrological disaster

Course objectives: Enhance the capability and advanced knowledge of Geoinformatics tools and technique to understand, monitor, mapping and management of Water Resources in various aspects.

Course content

Module	Topic	L	T	P
1.	Overview of RS & GIS Application in Water Resources Management; Hydrological Modelling with Geospatial Inputs	2		
2.	Hydrological cycle, Estimation of precipitation, Hydrological Parameter Estimation using RS & GIS; Digital Elevation Model (DEM) hydro-processing,	2		
3.	Drainage network and drainage pattern, watershed definition and scope, morphometric parameter	2		
4.	Watershed Characterization; Watershed Prioritization and Conservation Planning	2		
5.	Aquatic System; Classification of Wetland and Wetland mapping using Remote Sensing	2		
6.	Water balance studies- interception, soil moisture, evaporation, run off and discharge	2		
7.	Snow/Glacier Mapping, Monitoring and Snow Melt Runoff Model;	2		
8.	Soil erosion and Sediment modelling, Reservoir Sedimentation Assessment using Remote Sensing	2		
9.	Darcy's Law, porosity, permeability, Transmissibility, specific yield, specific capacity, field capacity and depression storage; role of remote sensing in evaluation hydrological investigations	4		
10.	Type of aquifer, aquiclude, aquitard, aquifuge, ground water regimes, application of remote sensing for the hydro geomorphological interpretation and Ground Water Prospects Zonation	2		
11.	Source of Water Pollution, Water quality parameters, Water Quality modelling: Surface and Ground Water quality mapping and modelling	2		
12.	Application of remote sensing in Oceanography: Sea Surface Temperature, Chlorophy-ll, Total Suspended Solids, Fishing potential and Coastal wetland.	4		
13.	Monitoring of Hydro-meteorological Disasters and Damage Assessment; Flood Modelling and Early Warning Systems,	2		

Labs:				
1	Geospatial model for Water Resources			3
2	Exercise on Surface Water modelling (one case study)			6
3	Exercise on Ground Water modelling (one case study)			6
14.	**Group project** The objective of this module is to give hands on experience on tools and techniques learnt throughout the course. Group project (Students will undertake a group project on relevant topics [module 3 to 13]. This module will consist of requisite data download, data processing, analysis and final presentation on any thematic areas [module 3 to 13] at the end of the semester)			15
15.	**Total**	**30**	**0**	**30**

Evaluation criteria:

- Minor test 1 : 10% [Syllabus—module no.s 1, to 4] (Learning outcome 1)
- Minor test 2 : 10% [Syllabus—module no.s 5 to 8] (Learning outcome 2)
- Major test : 40% [End of the module no.s 1 to 13] (All learning outcomes)
- Presentation : 40% [Group project module no.s 3 to 13] - Synopsis 10%; Presentation 20%; Report 10% (All learning outcomes)

(Students will developed a project on application based on from module no.s 3 to 13

Learning outcomes

- Develop appropriate methods for studying and/or solving the problems related to hydrological cycle, estimation of hydrological parameter and water budget with the help of RS&GIS
- Able to provide geo-information science and earth observation technology to watershed management and prioritization
- Hands on training on geoinformatics tools and technique in the application of water resources

Pedagogical approach

Lectures, Lab exercises, Tutorials

Course Reading Materials (* = compulsory readings)

Jensen J. R, Remote Sensing of the Environment: An Earth Resource Perspective, Pearsons, 2009.

Lillesand T, Kiefer RW and Chipman J, Remote Sensing and Image Interpretation, Wiley &Sons. 2009.

Chang K., Introduction to Geographic Information Systems, McGraw-Hill, New York, 2006.

Lo, C.P. and Yeung, A.K.W., Concepts and Techniques of Geographic Information Systems, PHI Leaning Private Limited 2011.

JVS Murty, 2004, "Watershed management" New Age International Pvt Ltd, New Delhi

Ebgman, E.T., and R.J. Gurney. (1991) Remote sensing in hydrology. London, Chapman and Hall

Shamsi UM, GIS Applications for Water, Wastewater, and Stormwater Systems, Taylor and Francis, 2005

Lyon JG GIS for Water Resources and Watershed Management Chen Y, GIS and Remote Sensing in Hydrology, Water Resources and Environment, 2004

Bedient B. Philip and Huber C. Wayne (2002). Hydrlogy and floodplain analysis, Prentice Hall, Upper saddle river, New Jersey. USA. Bastiaanssen,

W.G.M. 1998. Remote sensing in water resources management: the state of the art. Colombo, Sri Lanka: IWMI

Karanth, K.A, 2008, Ground water assessment Development and management. Tata McGraw Hill

Recommended journals for reference

Journal of the American Water Resources Association

Climate change Australian Journal of Water Resources International Journal of Ecology and Environmental Sciences International Journal of Disaster Risk Science Aquatic Procedia Hydrological Sciences journal Journal of Hydrology Geoscience Frontiers Global Environmental Change Modeling Earth Systems and Environment Agricultural Water Management International Journal of Water Resources and Environmental Engineering
Additional information
Student responsibilities

Course reviewers:

Dr M P Punia, Sr. Scientific Officer, Department of Remote Sensing, BIT (Mesra), Jaipur

Prof R B Singh, Department of Geography, Delhi University