Course title: Advanced geo-informatics for water resources

Course code: WSW 175	**No. of credits:** 3	**L-T-P distribution:** 28-6-8	**Learning hours:** 42

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

Department: Department of Regional Water Studies

Course coordinator(s): Dr Neeti | **Course instructor(s):** Dr Neeti

Contact details:

Course type: Compulsory Core | **Course offered in:** Semester 2

Course description:

This course introduces the participants to the fundamentals of advanced geospatial technology (Remote sensing, GIS). It prepares the candidate for the geospatial modelling and analysis for water resources.

Course objectives:

The course provides skills in use of geospatial techniques and related technologies required for solving real-world problems in context of water resources management. This course provides an overview of cutting edge remote sensing and GIS (Geographical Information Systems) techniques that is by and large being used by water professionals. The students will be equipped with unique knowledge and skills necessary sustainable management of water resources. This course will be offered to students of M.Tech. (Water Science and Governance) and pre-Ph.D. Students from other programs willing to pursue doctoral studies in water resources. The students are suggested to read different books, magazines and peer reviewed journals.

Course contents

Module	**Topic**	**L**	**T**	**P**
1	Advance Remote Sensing: introduction to thermal, hyper spectral and microwave remote sensing. Advance Geographical information system: spatial analysis, geospatial modeling.	10	2	4
2	Application of Remote Sensing and GIS in water resource engineering, Watershed hydrology, Factors influencing watershed hydrology, physical processes in watershed and basic concepts of hydrological modelling, DEM application in Water Resources (ArcHydro tools)	8	2	6
3	Terrain indices for Water Resources Application: DEM derivatives; slope, aspect, flow direction, flow accumulation, drainage network extraction, Watershed delineation using DEM, Spatial modelling using RS/GIS in hydrology**:** snow melts runoff modelling, rainfall run-off modelling, and groundwater modelling.	10	2	6
	Total	28	6	16

Evaluation criteria

2 minor tests:	10% each
Practical:	30%
Tutorial:	10%
End-term exam:	40%

Learning outcomes :

1. The student will get equipped to analyse geo-information problems encountered in professional practice and develop appropriate methods for studying and/or solving the problems, develop and design appropriate methods for geospatial framework data collection and processing.
2. The student would be able to provide geo-information science and earth observation technology to generate, integrate, analyse and visualize spatial data.
3. The student would be able to formulate and carry out independent research in the general field of Geo-informatics, possibly as part of a multi-disciplinary research and development project

Pedagogical approach

Predominantly based on classroom teaching and outdoor activities for data collection.

Materials

Suggested 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.

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

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
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

Journals

Water resources Management, International Journal of Applied Earth Observation, Hydrological Processes, Remote Sensing of the Environment

Additional information (if any)

Student responsibilities

Classes will be interactive. Students are expected to be regular in attendance, participation, and submission of assignments. They must come prepared with readings when required.

Course reviewers:

1. Dr. S.P. Aggarwal, FIE, Scientist/Engineer "SG" & Head, Water Resources Department, Indian Institute of Remote Sensing, ISRO| Dept. of Space| Govt. of India, 4, Kalidas Road, Dehradun, Uttarakhand - 248 001 | India
2. Dr. Vaibhav Garg, Scientist/Engineer 'SD' Water Resources Department, Earth Resources & System Studies Group, Indian Institute of Remote Sensing-Dehradun, Indian Space Research Organization, 4, Kalidas Road | Dehradun | Uttarakhand - 248 001 | India