

Course title: Introduction to geoinformatics				
Course code: WSW 169		No. of credits: 4	L-T-P: 37-10-24	Learning hours: 71
Pre-requisite course code and title (if any): None				
Department: Regional Water Studies				
Course coordinator(s): Sherly M A			Course instructor(s): Sherly M A	
Contact details: sherly.ma@terisas.ac.in				
Course type: Compulsory Core			Course offered in: Semester 1	
Course description This course introduces the participants to the fundamentals of geospatial technology (Surveying, Remote Sensing, GIS and GPS). This course is intended to introduce the applications of Remote Sensing & GIS techniques in water resources management.				
Course objectives 1. To provide a strong fundamental understanding of the GIS and remote sensing technologies. 2. To understand the basic principle underlying the GIS/model-based management of water resources and environment.				
Course content				
Module	Topic	L	T	P
1	Introduction to Surveying and Remote Sensing <ul style="list-style-type: none"> • Elements of Surveying: Basic principle of surveying, Types of surveying, Levelling, Minor instruments of surveying • Introduction to Photogrammetry • Introduction to Remote Sensing: Electromagnetic Radiation (EMR), EMR spectrum and its properties, EMR wavelength regions and their applications • Atmospheric windows, Interaction of EMR with atmosphere and the surface; Sensors and Satellite Resolutions: Spectral, Spatial, Temporal and Radiometric • Digital image: Optical Sensor, Panchromatic & Multispectral Image and its properties, Spectral signatures, Vegetation and Bare soil 	10	2	8
2	Introduction to GIS and GPS <ul style="list-style-type: none"> • Introduction to Geographical information system, concept of spatial and non-spatial data • GIS data model: Raster and Vector • Map: Scale, Projection and Datum, Map design, Rectification and Georeferencing • Introduction to GPS: Single point positioning and Differential positioning • Spatial data: Entry, topology and editing 	14	4	14
3	GIS and Remote Sensing methods relevant to water resources <ul style="list-style-type: none"> • Map algebra: Local, Neighbourhood, Zonal operations • Extraction of water info from topographical maps; Extraction of water Indices using band combination • Digital Image Classification & Land use / land cover mapping 	13	4	2

4	<p>PRACTICALS</p> <ol style="list-style-type: none"> 1. Familiarisation with relevant surveying instruments 2. Introduction to ERDAS IMAGINE 2011; File formats. Import / Export of files using ERDAS IMAGINE 3. Study of the Spectral Signature of water and other relevant features 4. Display, analysis and interpretation of black & white images, grey image, pseudo image and FCC 5. Introduction to GIS and GPS software tools 6. Map rectification- Define projection and Reprojection 7. Digital database creation -Point features, Line features, Polygon features 8. Data editing-Removal of errors -Overshoot & Undershoot, Snapping, Topology Creation 9. Feature base: Dissolving, Merging; Layer base: Clipping, Intersection and Union 10. Spatial and Attribute query and Analysis; Map algebra / Math in Raster 			
	Total	37	10	24
<p>Evaluation criteria:</p> <ul style="list-style-type: none"> • Minor 1: 10% [module no. 1] [5-6 week] • Minor 2: 10% [module no. 2] [10-12 week] • Practical: 30% [Regular practical exercises-10%, viva-voce-5%, Exam-15%] [End of Semester] • Tutorial: 10% [Assignments] [End of Semester] • End-term exam: 40% [modules 1-3] [End of Semester] 				
<p>Learning outcomes</p> <ul style="list-style-type: none"> • Learning of the basics of surveying, remote sensing, GIS and GPS • Experience with software relevant to remote sensing, GIS and GPS • Introduction to selective methods in GIS and remote sensing relevant to water resources management 				
<p>Pedagogical approach The course will be delivered through class lectures, lab exercises and tutorials.</p>				
<p>Course Reading Materials</p> <ul style="list-style-type: none"> • Punmia, B.C., Jain, A. K. and Jain, A. K. (2016), Surveying Vol. I, 17th edition, Laxmi Publications (P) Ltd., New Delhi, India. • Jensen J. R. (2009), Remote Sensing of the Environment: An Earth Resource Perspective, 2nd edition, Pearsons, New Delhi • Lillesand T. M., Kiefer, R.W. and Chipman, J. W. (2008), Remote Sensing and Image Interpretation, 6th edition, John Wiley & Sons, New Jersey, USA. • Chang K.-T. (2006), Introduction to Geographic Information Systems, 1st edition, McGraw-Hill, New York, 2006. • Burrough, P. A., McDonnell, R. A. and Lloyd, C. D. (2015). Principles of Geographical Information Systems, 3rd edition, Oxford University Press, Oxford, UK. 				
<p>Advanced Reading Material</p> <ul style="list-style-type: none"> • Shamsi, U. M. (2005), GIS Applications for Water, Wastewater, and Stormwater Systems, Taylor and Francis, London. • Lyon, J. G. (2002), GIS for water resources and watershed management. Lyon JG (ed), 1st edition, Taylor & Francis, London. • Chen, Y. (2004), GIS and Remote Sensing in Hydrology, Water Resources and Environment, IAHS Press, Centre for Ecology and Hydrology, Wallingford, UK. • Engman, E. T. and Gurney, R. J. (1991), Remote sensing in hydrology, 1st edition, Chapman and Hall, London. 				
<p>Recommended journals for reference</p> <ul style="list-style-type: none"> • Advances in Water Resources • Asian Journal of Geoinformatics 				

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| <ul style="list-style-type: none">• Journal of Water Resources Planning and Management• International Journal of Geoinformatics• International Journal of Remote Sensing |
| Additional information |
| 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:

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2. Prof. R. D. Garg, Professor, Department of Civil Engineering, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand - 247667, India.