

Unit 1: Geographic analysis and modelling

Exploration, query, vector spatial analysis & geoprocessing – extraction, proximity, overlay

Network analysis – route, trace, closest facility, allocation

Raster based spatial modelling and analysis – density, distance, map algebra – arithmetic & weighted overlay: multi-criteria decision making

Surface modelling and analysis: DEM creation – input sources, interpolation; slope, aspect, volume, profile, hill shade, view shed, visibility, contouring

Unit 2: Advanced Remote Sensing techniques and their applications

Active remote sensing techniques: a) LIDAR – terrestrial, airborne: available datasets and software packages b) Microwave RS: SAR principles, processing techniques, interferometric DEM – eg: SRTM, available datasets and software packages and special applications

Basics & Applications of hyper-spectral RS: principles, processing methods, use of hyper spectral indices

Thermal RS: principles and processing techniques, available datasets and applications

Photogrammetry – stereoscopy, 3D measurements and stereo DEM – eg. Carto DEM, Aster DEM; Introduction to various image processing and photogrammetric software packages.

Unit 3: Applications in Ecology & Environment Management - Advanced

Landscape level biodiversity characterization, disturbance analysis including forest fire vulnerability analysis and conservation planning

Applications in EIA and Cost-Benefit Analysis: quantifying impacts and use in the preparation of EMP

Applications in hydrological modelling and analysis: ground water prospecting, watershed characterisation and conservation treatment planning

Applications in community health (epidemiologic) assessment and management;

Urban Ecology: heat island mapping & monitoring, sprawl assessment and monitoring;

Land use / land cover dynamics – monitoring, cause-consequence analysis & modelling

Pollution dispersion modelling: water, air & soil – various quality indices

Soil erosion estimation, zonation and modelling

Environmental suitability analysis – Eco sensitive area zonation – multiple criteria decision making

Preparation of land use / activity regulatory zoning using geospatial tools

Unit 4: Participatory/crowd sourced mapping and information sharing

Web/Internet and mobile Geoservices: crowd sourced mapping, data collection and information sharing. Case studies – MANU, Bhuvan Panchayat

Unit 5: Introduction to Web and Cloud GIS- Web GIS, Advantages, Web Map Service (WMS), Web Feature Service (WFS), Map Server, Geo server, Cloud based GIS, 3D Modelling, and Mobile GIS

TEXT BOOKS/ REFERENCES:

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2. Jensen J. R. 2000. Remote Sensing of the Environment - An Earth Resources Perspective, Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi
3. Jensen J. R. 1996. Introductory Digital Image Processing. Prentice Hall Series
4. John Wainwright and Mark Mulligan (Eds). 2004. Environmental modeling - finding simplicity in complexity. John Wiley & Sons Ltd.
5. Jorgensen S. E., Chon T. S. and Recknagel F. A., 2009. Handbook of Ecological Modeling and Informatics. WIT Press, 448 pages, ISBN-13: 978-1845642075
6. Kang-tsung Chung. 2002. Introduction to Geographical Information System. McGraw Hill Companies, International edition.
7. Lillesand T. M., Kiefer R. W. and Chipman J. W. 2008. Remote Sensing and Image Interpretation (Sixth Edition). John Wiley & Sons, USA
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9. Peng Z. P. and Tsou M.H. 2003. Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks. Wiley, Hoboken, NJ.
10. Rafael C. Gonzalez and Richard E. Woods. 2004. Digital Image Processing (2nd). Pearson education.
11. Sabins Floyd F. 1987. Remote Sensing principles and interpretation (3rd). W. H. Freeman and Company, New York.
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14. Steven E. Franklin. 2001. Remote Sensing for Sustainable forest management. Lewis publishers.
15. Wise S. 2002. GIS Basics. Taylor Publications.
16. Zeleny M. 1982. Multiple Criteria Decision Making, Mc-Graw Hill