

**SYLLABU FOR PH.D COURSE WORK
IN REMOTE SENSING AND GIS
(Examination to be held in 2025, 2026 & 2027)**

Course No.1

Title of the Course: Research Methodology

Credits: 4

Time Allowed: 3 hours

Contact hours: 45

Maximum Marks: 100

Unit-I

- 1.1 Information technology infrastructure hardware, software and data, systems and application software, enterprise software
- 1.2 Telecommunication systems, wired and wireless communication, networking, major types of networks-LAN, WAN, MAN etc., distributed mobile and wireless applications.
- 1.3 Introduction to cartography, nature and scope of cartography, digital cartography-elements of digital cartography relation between digital cartography, RS&GIS.
- 1.4 Cartographic transformations and reasons for transforming cartographic data, map projection-concept and classification.

Unit-II

- 2.1 Aerial Photography- basic information and specifications of aerial photographs, types of aerial photographs.
- 2.2 Planning and execution of photographic flights, relief displacement of vertical features and its determination.
- 2.3 Satellites and their characteristics-geo-stationary and sun-synchronous, platforms-types and their characteristics.
- 2.4 Elements of image interpretation, techniques of visual interpretation and interpretation keys.

Unit-III

- 3.1 Basic concept and principles of thermal microwave and hyperspectral sensing
- 3.2 Sensors-types and their characteristics, across track (whiskbroom) and along track (pushbroom) scanning.
- 3.3 Thermal radiation principles, thermal process and properties, characteristics of thermal IR images and factors affecting thermal images.
- 3.4 Introduction to microwave remote sensing-concept and principle, backscattering, cross section wavelength, incidence angle, aspect angle, aircraft radar system.

Unit-IV

- 4.1 Introduction to digital image processing- concept of digital image, steps in DIP.
- 4.2 Fundamental of image recertification, interpolation, intensity interpolation.
- 4.3 Radiometric & geometric correction of remotely sensed data

- 4.4 Pattern recognition and image classification, unsupervised classification- advantage, disadvantage and limitations, supervised classification-training site selection classifiers used in supervised.

Unit-V

- 5.1 Introduction to GIS - definition, concept and history of developments in the field of information systems
- 5.2 Spatial data models - raster and vector, data inputting & GIS, Spatial data quality and Uncertainty.
- 5.3 Spatial data analysis - significance and type, attribute query, spatial query, Vector based spatial data analysis- topological analysis, Raster based spatial data analysis- local, neighborhood, regional and global.
- 5.4 Introduction to Global Positioning Systems (GPS)-fundamentals concepts, GPS system elements and signals, classification of GPS receivers.

Note: The paper shall contain ten questions of descriptive nature, selecting two questions from each unit. The candidate shall attempt five questions selecting one question from each unit . All questions carry equal marks

Suggested Text Books and References

- Introduction to Information Technology by EFRAIM TURBAN, R. KELLY RAINER and RICHARD E. POTTER Published by John Wiley & Sons.
- Robinson A., Morrison, J.L., Muehrcke P.C., Guptil S.C. 2002: Elements of Cartography. John Wiley
- Mishra R.P and Ramesh A. 1989: Fundamentals of Cartography. Concept Publishing Company
- Rampal K.K. 1999: Hand book of Aerial Photography and Interpretation. Concept Publication
- Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern
- Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley
- Sabbins, F.F., 1985: Remote Sensing Principles and interpretation. W.H. Freeman and company
- Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press
- Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
- Gibson, P.J. 2000: Digital Image Processing. Routledge Publication
- Chang.T.K. 2002: Geographic Information Systems. Tata McGrawHill
- Heywood.I, Cornelius S, CrverSteve. 2003: An Introduction to Geographical Information Systems. Pearson Education
- Ram Mohan Rao. 2002: Geographical Information Systems. Rawat Publication

**SYLLABU FOR PH.D COURSE WORK
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Course No. II

Title of the Course: Remote Sensing and GIS applications

Credits: 6

Time Allowed: 3 hours

Contact hours: 60

Maximum Marks: 150

Unit-I

- 1.1 Remote Sensing in Geology and discuss the basic concept of geomorphology, earth surface process and resultant landforms
- 1.2 Interpretation of drainage pattern and its significance in geologic interpretation.
- 1.3 Interpretation of landforms related to igneous, sedimentary and metamorphic rocks and describe the Geomorphological mapping and for terrain evaluation.
- 1.4 Remote Sensing in mineral exploration- an overview and application of remote sensing in mineral exploration- Indian examples

Unit-II

- 2.1 Basic concepts of water resources-Hydrological cycle, Darcy's law, porosity, permeability, transmissibility, specific yield, specific retention and hydraulic conductivity
- 2.2 Remote Sensing in groundwater exploration and factor affecting ground water occurrence.
- 2.3 Water harvesting structures and discuss the optimum site selection criteria for rain water harvesting
- 2.4 Water quality monitoring and hydrological modeling using RS and GIS

Unit-III

- 3.1 Role of Remote Sensing in agriculture and describe the spectral characteristics of different crops.
- 3.2 Agro-meteorology-its importance and application of RS in agro-meteorology
- 3.3 Salt affected soil and mapping of salt affected soil using Remote Sensing
- 3.4 Wasteland their mapping and management using Remote Sensing

Unit-IV

- 4.1 Remote Sensing Application in forest cover change detection and its mapping of stressed vegetation.
- 4.2 Forest types and forest density mapping, biomass and growing stock estimation using RS and GIS techniques.
- 4.3 Bio diversity studies using RS and GIS, biological invasion and monitoring of invasive species through RS and GIS

- 4.4 Environmental management plan (EMP), its importance and role of GIS in preparation of EMP

Unit-V

- 5.1 Role of Remote Sensing in human settlement and urban planning and principles of urban area development planning
- 5.2 Interpretation of urban and rural settlements and their delineation and analysis through remote sensing and GIS techniques.
- 5.3 Urban land use classification, mapping and conservation using remote sensing.
- 5.4 Identification of urban sprawl and change detection studies through RS & GIS.

Note: The paper shall contain ten questions of descriptive nature, selecting two questions from each unit. The candidate shall attempt five questions selecting one question from each unit . All questions carry equal marks

Suggested Text Books and References

- Skidmore A.2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis
- Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
- Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
- Anji Reddy, M. 2004: Geoinformatics for Environmental Management. B.S. Publications
- Chow, V.T., 1988: Advances in Hydro Science McGraw Hill
- Franklin S.E. 2001. Remote Sensing for Sustainable Forest Management. Lewis Publication
- Rajoura.R.2003; Integrated Watershed Management, Rawat Publication

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Course No. III

Title of the Course: Research and Publications Ethics (RPE)

Credits: 2

Time Allowed: 2 ½ hours

Contact hours: 30

Maximum Marks: 50

Unit-I

- 1.1 Introduction to philosophy : definition, nature and scope, concept, branches
- 1.2 Ethics : definition, moral philosophy, nature of moral judgements and reactions; Ethics with respect to science and research.
- 1.3 Intellectual honesty and research integrity, Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP).
- 1.4 Redundant publications, duplicate and overlapping publications, salami slicing: Selective reporting and misrepresentation of data.

Unit-II

- 2.1 Publication ethics: definition, introduction and importance
- 2.2 Best Practices/Standards setting initiatives and guidelines: COPE, WAME etc.
- 2.3 Conflicts of interest; Publication misconduct: definition concept, problems that lead to unethical behavior and vice versa types.
- 2.4 Violation of publication ethics, authorship and contributor ship; identification of publication misconduct, complaints and appeals.

Unit-III

- 3.1 Predatory publishers and journals.
- 3.2 Open access publications and initiatives; SHERPA, ROMLO online resource to check publisher copyright & self-archiving policies
- 3.3 Software tool to identify predatory publications developed by SPPU
- 3.4 Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal suggested, etc.

Unit-IV

- 4.1 Subject specific ethical issues, FFP, authorship; Conflicts of interest: Complaints and appeals: examples and fraud from India and abroad.
- 4.2 Use of plagiarism software like Turnitin, Urkund and other open source software tools.
- 4.3 Indexing database; Citation databases: Web of Science, Scopus tetc.
- 4.4 Impact Factor of journal as per journal citation Report, SNIP, SIR, IPP, Cite Score; Metrics: h-index, g-index, i10 index, altmetrics.

Suggested Readings

- K. Muralidhar, A Ghosh and A.K. Singhvi (Eds), 2019, Ethics in Science Education, Research and Governance. Indian National Science Academy, New Delhi, India
- Santosh Kumar Yadav, Research and Publication Ethics Springer International Publishing
- Sudhir Gupta and Sushil Kamboj 2020, Research and Publication Ethics, Alexis Press LLC.
- Yatendra Kumar Singh and Bipin Dubey, 2021. Introduction of Research Methods and Publication Ethics. Friends Publications, India.

Note: The paper shall contain ten questions of descriptive nature,. The candidate shall attempt any five questions. All questions carry equal marks.