ORDINANCES & SYLLABUS

FOR

ONE YEAR

POST GRADUATE DIPLOMA IN REMOTESENSING

&

GEOGRAPHIC INFORMATION SYSTEM

DEPARTMENT OF GEOGRAPHY

NATIONAL POST GRADUATE COLLEGE

AN AUTONOMUS COLLEGE OF UNIVERSITY OF LUCKNOW

2 RANA PRATAP MARG,

LUCKNOW – 226001

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ORDINANCES, REGULATIONS, SCHEME OF EXAMINATION AND SYLLABUS RELATING TO THE ONE YEAR IN *POST GRADUATE DIPLOMA IN REMOTESENSING & GEOGRAPHIC INFORMATION SYSTEM*

TITLE

This diploma course is one year advanced diploma. The title of the course shall be **"POST GRADUATE DIPLOMA IN REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM"**

OBJECTIVE

The aim of this course is to impart knowledge of techniques and methods of Remote Sensing & GIS. Identify areas in various disciplines with respect to educational, national and global priorities and to promote the students to develop brilliant ideas for promoting scientific and technological applications for the benefit of society

DURATION

The One Year Post Graduate Diploma Course will be a FULL TIME Course and shall be conducted for 24 weeks each in Two Semesters of One academic year.

SEATS

The total number of the student to be admitted to the course shall be 40

ELIGIBILITY

The eligibility conditions for admission to this course is that the student should pursue Geography in Graduation or Post Graduate with minimum 45% marks.

Other stream students are also eligible for the admission with minimum 55% marks in graduate& post graduate.

Students should have a working knowledge of computers, Disk Operating System (DOS), Windows operating system, and Microsoft-Office suite.

ADMISSION POLICY

Admission will be made on the basis of College Rules. Reservation Policy of the Lucknow University will be followed.

ATTENDANCE

Seventy five Percent attendance shall be compulsory as it is a full time diploma course.

FEES

Each student shall pay Rs.20, 000.00 per year as fees for the one year post graduate Diploma course. It will be revised from time to time by College.

COURSE CONTENT

The curriculum of the course shall be divided into Two Semesters. Three theory papers and 1 practical in Semester I. Similarly two theory papers and one practical and one project in Semester II.

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Semester I

PAPER I	**PRINCIPLES OF REMOTE SENSING**	**100 MARKS**	**4 CREDITS**
PAPER II	**FUNDAMENTALS OF GEOGRAPHICAL INFORMATION SYSTEM**	**100 MARKS**	**4 CREDITS**
PAPER III	**CARTOGRAPHY, GPS, & PHOTOGRAMMETRY**	**100 MARKS**	**4 CREDITS**
PAPER IV	**PRACTICAL (A)**	**100 MARKS**	**4 CREDITS**
TOTAL		**400 MARKS**	**16 CREDITS**

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Semester II

PAPER I	**PRINCIPLES OF VISUAL & DIGITAL IMAGE PROCESSING**	**100 MARKS**	**4 CREDITS**
PAPER II	**APPLICATION OF REMOTE SENSING IN GIS**	**100 MARKS**	**4 CREDITS**
PAPER III	**PRACTICAL (B)**	**100 MARKS**	**4 CREDITS**
PAPER IV	**PROJECT**	**100 MARKS**	**4 CREDITS**
TOTAL		**400 MARKS**	**16 CREDITS**

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SEMESTER-I

(Total Marks: 100)

PAPER I-PRINCIPLES OF REMOTE SENSING

Unit: I

Principles of Remote Sensing: Definition, types and scope, development and applications of Remote Sensing; Stages in remote sensing data acquisition, EMR & EMR interaction with atmosphere and Earth surface.

Unit: II

Platforms, Sensors and Data Products: Remote sensing Sensors: Passive and Active; Platforms: airborne and space borne; Remote sensing data products; Thermal & Microwave Remote Sensing

Unit: III

Satellite & Indian Space programmes**:** Satellite & types, Overview of imageries from various satellites- LANDSAT, IRS series, SPOT, MODIS, TERRA, IKONOS, ERS etc.; Remote Sensing in India& Indian Space Programmes; Future Missions

Unit: IV

Aerial photographs: Definition, scope, advantages and limitations of aerial photograph, interpretation, recognition elements and use.

Reference &Text Books:

Campbell, J. B.(2002):*Introduction to Remote Sensing*. 5th ed. Taylor &Francis, London.

Cracknell, A. *etal.*(1990): *RemoteSensingYearBook*, TaylorandFrancis,London. 3.Curran, P.J. (1985): *PrinciplesofRemoteSensing*,Longman,London.

Deekshatulu,B.L.&Rajan,Y.S.(ed.)(1984):*RemoteSensing*.IndianAcd.ofScience,Bangalore.

Floyd,F.,Sabins,Jr.(1986):*RemoteSensing:PrinciplesandInterpretation*,W.H. Freeman, NewYork.

Guham,P.K.(2003):*RemoteSensingforBeginners*.AffiliatedEast-WestPressPvt. Ltd.,NewDelhi.

Hallert, B.(1960): *Photogrammetry*, McGrawHillBook Co.Inc.

Harry, C.A. (ed.)(1978):*DigitalImageProcessing*,IEEE ComputerSociety.

Hord,R.M.(1982):*DigitalImageProcessingofRemotelySensedData*,Academic Press, NewYork.

Leuder,D.R.(1959):*AerialPhotographicInterpretation:PrinciplesandApplication*. McGrawHill, NewYork.

Lillesand,T.M.andKiefer,R.W.(2000):*RemoteSensingandImageInterpretation*. 4thed. John Wileyand Sons, NewYork.

Nag,P.(Ed.)1992:*ThematicCartographyandRemoteSensing*,ConceptPub.Co., NewDelhi.

Reeves,R.G.(ed.)(1983):*ManualofRemoteSensing*,Vols.1&2,AmericanSociety ofPhotogrammetry&Remote Sensing, FallsChurch, Virginia.

Srivastava, G.S. (2014) Introduction to Geoinformetics, Mcgraw Hill Education (India) New Delhi.

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SEMESTER-I

(Total Marks: 100)

PAPER II-FUNDAMENTALS OF GEOGRAPHICAL INFORMATION SYSTEM

Unit: I

Introduction to GIS: Definition and scope of GIS; GIS and Remote Sensing interface; Components and elements of GIS; Development of GIS technology; Recent trends and applications of GIS; Open source GIS Hardware and software; Geographic objects: point, line, area and their computer representation; Analog and digital maps.

Unit: II

Functional Component: Data input/ capturing, storage and manipulation, query, data analysis and presentation, topology creation, data quality and errors in GIS.

Unit: III

Data Management and Structure: Geographic data: Spatial and non-spatial; Data models: Raster and vector; Database Management System (DBMS); Data Structures: Relational, hierarchical and network; Data input: Digitization of maps and imageries; Coordinate transformation; Attribute data generation.

Unit: IV

GIS and Spatial Analysis: Spatial overlay operations, network analysis and proximity analysis; 3D models; TIN, DEM, DTM Query in GIS, classification and reclassification, chart, report, presentation of GIS output.

Reference&TextBooks:

Burrough, P. A 1986: Principles of Geographical Information Systems For Land Resources Assessment, Clarandone Press, Oxford.

Campbell, J 1984: Introductory Cartography, Printers Hall Englewood Cliffs, N.J

Dent B.D 1985: Principles Of Thematic Map Design, Addition - Wesley, Reading, Mass.

Freeman, H AndGG.Pieroni 1980: Map Data Processing, Academic Press, New York.

Graeme F. & Bonham - Carter; Geographic Information Systems for Geoscientists;
Modelling with GIS, Pergamon.

Monmonier, M.A 1982: Computer Assisted Cartography - Principles And Prospects, Prentice Hall, Englewood Cliffs, NJ

Tomlinson, R.F Calkins, H.S AndD.F.Marble 1976: Computer Handling Of Geographic Data, UNESCO, Geneva.

R.P.Gupta Remote Sensing Technology And Geographic Information Systems Springer and Veslen.

Lo, C.P. and Yeung, A. K. W. (2002): *Concepts and Techniques ofGeographic Information Systems*. Prentice Hall of India, New Delhi.

Longley, P. and Batty, M. (eds.) (1996): *Spatial Analysis: Modelling in a GIS Environment*. GeoInformation International, Cambridge.

Longley, P., Goodchild, M.F., Maguire, D. and Rhind, D. (1999): *Geographic Information Systems. Principles, Techniques, Management, Applications*. John Wiley & Sons, New York.

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SEMESTER-I

(Total Marks: 100)

PAPER III- CARTOGRAPHY, GPS & PHOTOGRAMMETRY

Unit: I

Cartography: Defining cartography; Essentials of map making: Scale, coordinate system, map projection, map generalization and symbolization, map designing, Types and series of maps; Map legend symbols; Design and layout of maps; Toposheets numbering system.

Unit: II

Global Positioning System : Introduction to Global Positioning System; GPS satellites constellations; GPS segments: Space, Control, User; GPS antennas, signals and codes; GPS receivers; Error and Accuracy of GPS measurements; Application of GPS in surveying and mapping

Unit: III

Photogrammetry: Elements of photographic system – Aerial Photography Optic & Aerial camera and aerial films; Types of photographs (vertical, tilted, oblique); Geometric elements of vertical photographs; Relief displacement of vertical features; Image parallax; Parallax measurement ; measurements and slope.

Unit: IV

Stereophotogrammetry: Stereoscopic instruments (pocket stereoscope, mirror stereoscope); Making stereograms; Radial line methods, Aerial mosaics and mapping instruments; Photogrammetric mapping and mapping accuracy, Stereographic and model deformation.

Reference& Text Books:

A user's Guide to the Global Positioning System- cnada, Published by Authority Natural Resources Canada, 1995.

ESRI, 1994, Map Projections: Georeferenceing Spatial Data. Environmental Systems Research Institute, Inc. USA.

Robinson, H and et. al, 1995. Elements of Cartography, John Woky& Sons, INC New York.PPI - 19.

Taylor, D.R.F. (Eds.), 1980. The Computer in Contemporary Cartography. John Wiley and Songs, New York.

F.F. Sabins (1996):"Remote Sensing Principles and Interpretation", Waveland Pr. Inc.

Campbell J.B. (2002):"Introduction to Remote Sensing", Guilford Press.

Remote Sensing III Edition: American Society of Photogrammtery and Remote Sensing.

Jensen, John R. (2000): Remote Sensing of the Environment: An Earth Resource Perspective, New Jersey: Prentice Hall, 544 pages.

Mailing, D.H., 1973 Co-ordinate Systems and Map Projections, George Philip & Son Ltd.

Raisz, E., 1962 Principles of Cartography, McGraw Hill Books Co., Inc. NY.

Rhind, B. and Adams, T. (Ed.) Computers in Cartography, British Cartographic Society, London.

Robinson A.H. et al., 2002 Elements of Cartography, John Wiley & Sons, NY.

Agrawal, N.K.,Introduction to Global Position System, Hyderabad…

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SEMESTER-I

(Total Marks: 100)

PAPER IV-PRACTICAL (A):

Unit: I

A) REMOTE SENSING: Satellite data procurement, decoding of different satellite data; Identification of objects on multiband and FCC; Interpretation Of Thermal Data, Interpretation Of Micro Wave Data; Visual interpretation of a satellite image and separating physical and cultural features; Selection of resolution of image and its requisition.

Unit: II

B) GIS Familiarization with GIS software.; Spatial data input and Geo-referencing; Spatial data base creation; Creation of non-spatial data sets into DBF format; Linking of Spatial data with non-Spatial data sets; GIS analysis: Proximity, Thematic mapping and Over lay; 3D modeling: DEM, Slope and Aspect Overlay, buffer and proximity analysis; Output and report generation; Arc View; preparation of base map.

Unit: III

C) GPS & PHOTOGRAMMETRY:

GPS**:** Demonstration on GPS; Selection of datum, units and scale; GPS measurement: Collection of GCPs; Mobile mapping; Transfer of GPS data in to GIS software.

Photogrammetry: Determination of scale on aerial photograph, interpretation of single vertical aerial photographs: Stereo test; orientation of stereopair under mirror stereoscope; Height and Slope Measurements

Unit: IV

D) CARTOGRAPHY: Map Scales: Types and Conversion, Map Projection: Polyconic Projection, Mercator projection, UTM; Map Types: Dot, choropleth, isopleths; study and interpretation of SOI maps

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SEMESTER-II

(Total Marks: 100)

PAPER I- PRINCIPLES OF VISUAL & DIGITAL IMAGE PROCESSING

Unit: I

Visual Image Interpretation: Introduction and need of image interpretation; image quality; elements of image interpretation and convergence of evidence; multiple images in image interpretation; equipments of image interpretation

Unit: II

Digital Processing: Introduction and need of Digital Image Processing; image processing systems: hardware and software; Digital Image; Digital Image Data Format; Colour Composites; Best Band FCC Display.

Unit: III

Image Restoration & Image Enhancement: Radiometric and geometric distortions; Image Rectification: Geometric correction, radiometric correction, noise removal, atmospheric correction; Image enhancement, Contrast, Edge Enhancement & Image Transformation.

Unit: IV

Digital Image Classification: Unsupervised Classification & Supervised Classification; Image Fusion: Techniques and advantages

Reference & Text Books:

B. Chanda, D.DuttaMajumder, Digital Image Processing & Analysis, PHIDuda, R.D And P.E.Hart 1972: Pattern Classification And Scene Analysis, Wiley Interscience, NY.Hord M.P, 1982: Digital Image Processing Or Remotely Sensed Data, Academic Press.
Jain AK.1989: Fundamentals Of Digital Image Processing, Prentice Hall,
N.J Jensen,J.R 1986: Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice-Hall,
NYLevialdi, S (Ed) 1984: Digital Image Analysis, Pitman, London.
Nilblack, W 1986: An Introduction To Digital Image Processing, III Edition, Prentice Hall International.
P. Nag & M. Kudrat; Digital Remote Sensing, Concept Publishing.
Pratt, S.K.I978: Digital Image Processing, Wiley - Inter Science, New York.
Richard, J.A 1986: Remote Sensing Digital Image Analysis,
Springier Verlag, Berlin, Heidelberg.Rosenfeld, A AndA.C.Kek, 1982: Digital Picture Processing, Academic Press, New York.
Rosenfield A 1976: Topics In Applied Physics Digital Picture Analysis,
Springier Verlag, Berlin, Heridelberg.Schowengerdt, R.A 1983: Techniques For Image Processing And Classification In Remote Sensing,

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SEMESTER-II

(Total Marks: 100)

PAPER II- APPLICATION OF REMOTE SENSING IN GIS

Unit: I

Soil resources & Land Use: Basics of soil resources & land use/land cover, application of remote sensing & GIS in soil & land use/ land cover mapping, soil and land use survey, land transformation studies, monitoring urban sprawl, urban infrastructure mapping.

Unit: II

Surface & Ground Water Resources: Hydrological cycle, water sources, river system & river dynamics, basics of ground water and its hydro geology, application of remote sensing & GIS in different surface & underground water resources study, water quality assessment, different geo physical methods for ground water targeting, artificial recharge and rain water harvesting.

Unit: III

Forest Resources & Agriculture: Introduction of forest resource & its management; identification & classification of forest type & forest density; social forestry; agriculture practices of major crops/ horticulture & sericulture etc., stages of crops, duration of major agricultural crops, limitations & scope of agriculture in India and Developing countries.

Unit: IV

Environment & Disaster Management: Basics of environment, ecology, ecosystem & biosphere, environment and disaster relation, types of disaster, Disaster mitigation & management.

Reference & Text Books:

Bernhardsen (2003) Geographic Information Systems: An Introduction, 3ed, Wiley India Pvt. Ltd., New Delhi.

Demers (2004) Fundamentals of Geographic Information Systems 3ed Wiley India Pvt. Ltd., New Delhi.

Estes, J. E. and LW Senger, 1994, Remote Sensing Techniques for Environmental Analysis, Hamilton, Santa Barbara, California

Elangovan,K (2006)"GIS: Fundamentals, Applications and Implementations", New India Publishing Agency, New Delhi"208pp.

Joseph George (2003) Fundamentals of Remote Sensing, University Press. Hyderabad

Lo, C.P.andYeung AKW. (2004) Concepts and Techniques of GIS, Prentice - Hall of India, New Delhi. 7.

LO & YEUNG (2009) Concepts and Techniques of Geographic Information Systems, 2nd ed., PHI Learning Pvt. Ltd, New Delhi.

NRSA, 1995.IRS - IC, Data User Handbook, Hyderabad.

Sokhi, B.S. and SM Rashid, 1999, Remote Sensing of Urban Environment, Manak Publishers, New Delhi

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SEMESTER-II

(Total Marks: 100)

PAPER III- PRACTICAL (B):

Unit: I

A) VISUAL INTERPRETATION & DIGITAL IMAGE PROCESSING

Visual interpretation methods; Loading of image data, Data identification of objects, Study of Histogram; Image Enhancement Techniques: contrast enhancement, band rationing, edge enhancement, filtering. Conversion of digital data into image processing software format

Unit: II

B) APPLICATION OF REMOTE SENSING & GIS IN GEO SCIENCES

Physiographic analysis; basic elements of interpretation in terrain evaluation; Remote sensing data in identification, delineation and mapping of various landforms and their significance; Identification and delineation of different rock types and geologic structures; collection of surface & ground water samples & analysis of data; integration of surface & ground water data with remote sensing data, remote sensing & GIS in landuse/ land cover mapping

Unit: III

C) APPLICATION OF REMOTE SENSING & GIS IN NATURAL SCIENCES

Agricultural land use mapping using digital techniques & mapping of cropping pattern and cropping system analysis; Crop identification and crop acreage estimation; Creation of spatial and non – spatial data for land use change detection; mapping of waster and degraded lands, Application of microwave data in forest resources & soil sciences.

Unit: IV

D) APPLICATION OF REMOTE SENSING & GIS IN ENVIRONMENT AND DISASTER MANGEMENT

Ground truth data collection of disaster prone areas, mapping of disaster distribution on the study area, zonation map of disaster prone areas and risk analysis.

Reference&TextBooks:

Paul Raj Ponnian, Data Warehousing fundamentals, John Wiley
M.H.Dunhan, Data Mining Introductory and Advanced topics, Pearson Education
Han,Karnber, DaUi Mining Concepts and Techniques, Morgan Kaufmann
Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education
Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw Hill
Korth, Silberchatz, Sudarshan, Database System Concepts, McGraw Hill
Peter Rob and Coronel Database Systems, Design, Implementation & Management, Thompson Learning
C. J. Date, Longman, Introduction to Database Systems, Pearson Education
Timothy Budd, OOP , TMG 11. Bahrami, OOP
Omran A. Bukhares and A.K. Elmagarmid, Object Oriented Multidatabase System, Prentice Hall
Vijay Mukhi, Working with UNIX, BPB Publications
Galgotia, UNIX the Complete Book, A Guide for Professional users
Milan Milenkovic, Operating Systems Concepts and design, TMG

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SEMESTER-II

(Total Marks: 100)

Paper IV -PROJECT

Each batch of students shall go for a visit along with the subject teacher for a Field visit or to an Industrial Organization or a Research Institution. Each student shall prepare a report (approx. 100 pages) of their visit and submit it to the subject teacher for evaluation out of 200 marks.

Each Industrial/Field visit Report shall be duly certified by the subject teacher and the Head of the Department.

Each Industrial/Field Visit Report shall have to be submitted for evaluation within one week of the conclusion of the theory or practical exam whichever is later.

100 marks project may be selected from the following topics listed below

- Environmental management assessment
- Incidence of diseases hydrology
- Natural resources
- Mining exploration
- Mapping of wet lands, mangroves, biodiversity & biomass
- Metrology, Climate & Pollution
- Health inequalities, and family life
- Urban Geography topics
- Health problems and different diseases
- Social Inequality
- River Pollution and its management
- Traffic Snarl
- Drinking Water Problem
- Under ground water status
- Food Crisis
- Population Growth
- Junk Food and its Consequences
- Landuse and Land Cover Change
- Agricultural Land and its Problems
- Education and Illiteracy
- Global Environmental Issues
- Human Resource Development

Reference&TextBooks:

C.R. Kothari, Research Methodology Methods and Techniques, 2/e, VishwaPrakashan, 2006.
Bendat and Piersol, Random data: Analysis and Measurement Procedures, Wiley Interscience, 2001.
Shumway and Stoffer, Time Series Analysis and its Applications, Springer, 2000.
Jenkins, G.M., and Watts, D.G., Spectral Analysis and its Applications, Holden Day, 1986.
Richard I Levin amp; David S.Rubin, Statistics for Management, 7/e. Pearson Education, 2005.
Donald R. Cooper, Pamela S. Schindler, Business Research Methods, 8/e, Tata McGraw-Hill Co. Ltd., 2006.
Fuzzy Logic with Engg Applications, Timothy J.Ross, Wiley Publications, 2nd Ed[d]
Simulated Annealing: Theory and Applications (Mathematics and Its Applications, by P.J. van Laarhoven& E.H. Aarts[e] Genetic Algorithms in Search, Optimization, and Machine Learning by David E. Goldberg