INSTITUTE OF ADVANCED STUDIES IN EDUCATION
(DEEMED TO BE UNIVERSITY)

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SYLLABUS

SCHEME OF EXAMINATION AND COURSE OF STUDY

FACULTY OF HUMANITIES AND SOCIAL SCIENCES

Diploma in Geoinformatics

Session 2021-2022

Course Objectives:

To give the Exposure though Practical Learning in Remote sensing and GIS, practical understanding of RS and GIS on applications of Real world. Our practical assignments and mapping projects are designed by industry experts to get the industry orientated exposure for developing the ability to perform basic analysis on Geospatial Spatial data set.

Learning Outcomes: After completion of this course candidate will be hands on Geospatial technology as per industry requirements. Candidates would able to perform from the day first.

SCHEME OF EXAMINATION

Each theory paper	Marks 50
Internal Marks	Marks50
Dissertation/Thesis/Survey Report/Field Work, if any	100 Marks

1. The number of paper and the maximum marks for each paper practical shall be shown in the syllabus for the subject concerned. It will be necessary for a candidate to pass in the theory part as well as in the practical part (Whenever prescribed) of a subject /paper separately.
2. A candidate for a pass at each of the Previous and the Final Examination shall be required to obtain (i) at least 36% marks in the aggregate of all the paper prescribed for the examination and (ii) at least 40% marks in practical (s) whenever prescribed in the examination provided that a candidate fails to obtain at least 36% marks in each individual paper work. Whenever prescribed, he shall be deemed to have failed at the examination notwithstanding his having obtained the minimum percentage of marks required in the aggregate for the examination. No division shall be awarded at the previous examination. Division shall be awarded at the end of the Final Examination on the basis of combined marks obtained at the Previous and the Final Examination, as noted below:

    - First Division 60% of the aggregate marks taken together
    - Second Division 48% of the Previous and the Final Examination

    All the rest shall be declared to have passed the examination.

3. If a candidate clears any .paper(s)-Practical(s)/Dissertation prescribed at the Previous and or/final Examination after a continues period of .three years, then for the purpose of working out his division the minimum pass marks

only viz 36% (40% in the case of practical) shall be taken into account in respect of such paper(s) Practical(s)/ Dissertation are cleared after the expiry of the aforesaid period of 18 Month, provided that in case where a candidate requires more than 36% marks in order to reach the minimum aggregate as many marks out of those actually secured by him will be taken into account as would enable him to make the deficiency in the requisite minimum aggregate.

4. The Thesis/Dissertation/Survey Report/Field Work shall be written & typed and submitted in triplicate so as to reach the office of the Registrar at least 3 weeks before the Commencement of the theory examination. Only such candidate shall be permitted to offer Dissertation/Field Work/Survey Report/Thesis (if provided in the scheme of examination) In lieu of a paper as have secured at least 55% marks in the aggregate of all scheme and I and II semester examination taken in the case of semester scheme, irrespective of the number of paper in which a candidate actually appeared at the examination.

IASE (Deemed to be University), Sardarshahar, Churu

DEPARMENT OF GEOGRAPHY

FACULTY OF HUMANITIES AND SOCIAL SCIENCES

Diploma in Geoinformatics

Important points to be noted:

- The theory question paper will consist of Five Sections.
- Theory (External) – 50
- Internal Sessional Marks (Internal) – 50
  (Division of Sessional: Assignments – 25, 2 Terminal Test- 20,
  Attendance - 03, Co-curricular Activity- 02)
  - **(a)** Every subject paper has five (5) units, and every unit covers two (5) marks. A sessional work is to be done on every unit - **(5X5= 25 marks)**
  - **(b)** Two terminal Tests - **(10X2 = 20 marks)**
  - **(c)** Attendance of Theory/Practical Classes - **03 marks**
    (76%-84% - 01 mark)
    (85%-93% - 02 marks)
    (93%-100% - 03 marks)
  - **(d)** Co-curricular Activities - **02 marks**
    Cultural &Literary (01 mark)
    Games & Sharmdaan (01 mark)
- Total Marks – 400 (Four Papers : 100 Marks Each)
- Pass Marks – 36 percent.
- Please note that the Practical subject requires 40 % of marks to pass the examination separately
- Mandatory to pass the Internal and External (Written Exam) separately, Obtaining 36 Percent Marks.
- Duration of Examination: 3 Hours for Each Paper.

Note: Each theory paper must be allotted minimum six hours per week for teaching.

Practical : Distribution of marks will be as follows:

1. Laboratory and Map work test (4 hours duration) 40 marks
2. Record Work 25 marks
3. Viva-presentation /voce 10 marks
4. Field Survey Report & Viva-voce (15+10) 25 marks

Total 100 marks

N.B. 12 hours of teaching practical be provided per batch of 15 students per week.

INSTRUCTION FOR PRACTICAL EXAMINATION:

1. The record work should have 50 sheets (1/4th of 20"x30") and they should cover the total syllabus proportionately. The teacher should give fresh exercise every time so that the students may no undertake tracing of old exercises. The work must be done in the class room and signed on the same date. This would discourage completing the whole work at the nice of the examination. Emphasis should be laid on ink work.
2. 2 Viva-voce examination be held to judge the real knowledge of the students and to examine the authenticity of the record work, the marking on record word and its viva-voce be based on the original work of the candidate and not merely producing the record work get done by any other agency. Marks be deducted for the part of the syllabus not covered.
3. On an average about 20 students be examined in one day in Diploma in Geoinformatics. As far as possible one practical exercise, to set to judge the practical skill.

Note: A copy of the instructions to be sent to the examiners for their information.

Scheme of Examination of Diploma in Geoinformatics

Paper No.	Nomenclature of the Paper	Paper Code	INTERNAL SESSIONAL	THEORY (WRITTEN EXAM)	Max. Marks
Paper I	Geographical Information System.	DGI-101	50	50	100
Paper II	Digital Photogrammetry.	DGI-102	50	50	100
Paper III	Fundamentals of Remote Sensing	DGI-103	50	50	100
Paper IV	GPS and Light detection and ranging (LIDAR)	DGI-104	50	50	100
		Total	200	200	400

Process of Evaluation

- ✓ Theory Exams
- ✓ Practical's Exams
- ✓ Presentations
- ✓ Tree plantations (Geotagged)

There will be four theory papers and a practical in previous examination. Each of the theory papers will be of 80 marks. Each of the theory paper will be three hours duration. Candidates will be required to pass of both in theory and practical separately.

Geographical Information System

Core Course 01	**DGI : 101**
Max. Marks – 100	**Min. Pass Marks – 36**
Internal Max. Marks – 50	**Min. Pass Marks – 18**
Theory Marks – 50 Marks	**Min. Pass Marks – 18**

Unit 1

Fundamentals of Geographical Information System

Concepts and introduction, Basic concepts about spatial information; concept of geo-informatics; historical development and definitions of GIS; components of GIS, manual v/s automated GIS; hard ware and software requirement for GIS; terminology of GIS; GIS data formats.

Unit 2

Data Structure and Data Models

Types of data structure: spatial and non-spatial; vector data structure: point, line and area entities; raster data: image data; advantages and disadvantages of various data; data base management system (DBMS); data models: tabular, hierarchical, network, relational, object oriented.

Unit 3

Spatial Data Input

Methods of data capture; scanning and digitization of maps and satellite images; on screen digitization; map projections; datum and ellipsoids; data registration; editing; cleaning and topology building; errors and accuracies in GIS; attribute generation; linking spatial and non-spatial data

Unit 4

Data Storage

Data storage formats; data retrieval and compression techniques. Different applications of Compression and Decompression

Unit 5

Manipulation Analysis and Output

Different Data manipulation techniques; spatial data analysis: overlay operations buffering, interpolation methods, network analysis and suitability analysis. 3D GISDEM, DTM, DSM: query in GIS; factors and weights analysis; data output and presentation

GIS Practical:

GIS Software's& data handling

Graphic user interface of GIS software's: Open source and commercial; software and hardware interface and limitations; data input: spatial and non-spatial; scanning digitizing and; data import and export; data registration and making GIS layers.

Data transformation

Topology building, data editing and cleaning; geo-referencing; projection and datum; coordinate transformation; linking spatial and no-spatial data; data base creation; attribute handling.

Data base creation & data analysis

Spatial analysis: overlay, buffer, proximity and network analysis; quarry building: site suitability analysis; digital elevation models (DEM), digital terrain models (DTM), determination of slope aspect and height; data interpolation: point and line data; output generation; layout. Creation of elevation models: contours, spot heights; 3 D modeling.

References:

1. American Society of Photogrammetry (1992), Manual of Remote Sensing, 2nd ed., Falls Publisher, New York.
2. American Society of Photogrammetry, 1996 Multilingual Dictionary of Remote H.M., Wilson, Topographic Surveying.
3. John Wiley and Sons (1983) Sensing and Photogrammetry, New York.
4. VA Wolf, P.R. (1983), Elements of Photogrammetry, 2nd ed., McGraw-Hill, New York
5. Rampal KK. (1996), Handbook of Aerial photography and Interpretation. Concept Publishing Company, New Delhi

Digital Photogrammetry

Core Course 02 **DGI : 102**
Max. Marks – 100 **Min. Pass Marks – 36**
Internal Max. Marks – 50 **Min. Pass Marks – 18**
Theory Marks – 50 Marks **Min. Pass Marks – 18**

Unit 1

Basics of Photogrammetry

Historical development of photogrammetry; definition, terms and limitations; types of aerial photographs; fundamental concepts of flight planning; acquisition of aerial photos seasons and time: digital photogrammetry.

Unit2

Geometry of aerial photographs

Projections and properties: parallel, central and orthogonal; tilt; swing; crab; flight line; fiducial marks and fiducial axis, Principal point, Exposure station, Flight line, Plumb line, Isocentre

Unit 3

Aerial cameras

Lens, films and aerial photos Aerial cameras difference between aerial and normal photo cameras; photographic lenses and types; aerial films; photo scale; development and printing of photographs.

Unit 4

Stereo-Photogrammetry

Stereo-models: model points; model deformation; concept of orientation: interior and
exterior orientations; absolute and relative orientation; aerial triangulation; rectification.

Photogrammetry Practical's:

Types of aerial photographs; border information of aerial photographs; study of black &white, black & white IR and color IR photographs; determination of height using single, vertical aerial photographs; determination photo scale; preparation of photo index; numerical problem on aerial photographs: determination of number of strips and no. of photographs; preparation of base map from aerial photographs; identification of features/objects on different band aerial photographs. Determination of heights and slope and Height. With the help of Digital

Photogrammetric work station Interpretation of aerial photographs, preparation of land use land cover maps with the help of Photogrammetric Workstation, Large and Small scale Mapping. 3D (DTM, DEM and DSM) feature extraction from Satellite images and Aerial Photographs.

References:

1. American Society of Photogrammetry, 1992 Manual of Remote Sensing, 2nd edition, Falls Publisher, New York.
2. American Society of Photogrammetry, 1996 Multilingual Dictionary of Remote Sensing.
3. H.M., Wilson, Topographic Surveying, John Wiley and Sons, New York.
4. Wolf, P.R. 1983.Elements of Photogrammetry, 2nd edition, McGraw-Hill, New York
5. Rampal KK. 1996. Handbook of Aerial photography and Interpretation. Concept publishing company, New Delhi

Fundamentals of Remote Sensing

Core Course 03 **DGI : 103**
Max. Marks – 100 **Min. Pass Marks – 36**
Internal Max. Marks – 50 **Min. Pass Marks – 18**
Theory Marks – 50 Marks **Min. Pass Marks – 18**

Unit 1

Basics of Remote Sensing

Definition and scope; satellite remote sensing vs aerial photography; data acquisition; stages of remote sensing; historical development of remote sensing, Remote sensing data. IRS programs.

Unit 2

Physics of Remote Sensing and EMR Interactions

Electromagnetic radiation (EMR); electromagnetic spectrum Image Processing Pre and post processing with atmosphere: atmospheric haze, scattering and contrast reduction; interaction with earth surface; spectral signature, hemispheric reflectance, transmittance

Unit 3

Platforms and Sensors and Resolutions

Platforms: ground base, air borne, space borne; sensors: definitions and CCDs; types of sensors: optical, thermal and microwave; sensor systems: whiskbroom and push broom sensors used in IRS; Landsat; SPOT satellites; resolutions: spatial, spectral, temporal and radiometric

Unit 4

Earth resource satellites

Definitions and characteristics, Sun-synchronous and geostationary satellites, Indian Remote Sensing Satellites (IRS) series, LANDSAT series, SPOT series, IKONOS and Quick bird etc.; satellite data types: FCC and PAN image.

Unit 5

Application of Remote sensing data

Image classification scheme, Image classification Techniques, Land use land cover mapping, NDVI and its uses. Change detection and its uses.

Remote sensing Practical's:

Interpretation of remote sensing data, Study of PAN and FCC satellite imagery; study of thermal satellite data and interpretation of different objects; study of RADAR & SAR (Microwave) imagery interpretation of physical and cultural details from different satellite imageries: (IRS,LANDSAT& SPOT), Resolution merging, Temperature mapping with satellite Images, Working with Low and Haigh resolution Satellite Images. Study of Multispectral, Super spectral and Hyperspectral Images.

References:

1. American Society of Photogrammetry (1992), Manual of Remote Sensing, 2nd ed., Falls Publisher, New York.
2. American Society of Photogrammetry, 1996 Multilingual Dictionary of Remote H.M., Wilson, Topographic Surveying.
3. John Wiley and Sons (1983) Sensing and Photogrammetry, New York.
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5. Rampal KK. (1996), Handbook of Aerial photography and Interpretation. Concept Publishing Company, New Delhi

Global Positioning System & LIDAR

Core Course 04 **DGI : 104**
Max. Marks – 100 **Min. Pass Marks – 36**
Internal Max. Marks – 50 **Min. Pass Marks – 18**
Theory Marks – 50 Marks **Min. Pass Marks – 18**

Unit 1

Fundamental of GPS

Introduction of Global Positioning System, Satellite constellation, GPS signals and data, Geo-Positioning,

GPS Accuracy & Affecting Factors, Satellite Geometry, Satellite signals and its strength.

Fundamental of LiDAR

Electromagnetic Spectrum and Radiation, Introduction and objectives of LiDAR, Basic Concept of LiDAR technology, LiDAR Technology, Historical development of LiDAR technology, LiDAR platforms (terrestrial, aerial and Space, Terrestrial, Aerial (ALS),Space borne

Unit 2

Principle of LiDAR technology

Principle of LiDAR Technology, Types of LiDAR data, Basic architecture of LiDAR technology, Transmitter

Receiver and Control system, Latest laser scanners and specification.

Unit 3

Data Acquisition and Calibration

LiDAR System, System Specification, Data Storage, Data Acquisition consideration, Software for Quality Assessment, Lidar data acquision techniques and its density.

Unit 4

LiDAR data processing

Introduction and objectives of LiDAR data processing, Preprocessing, Post processing, Products of LiDAR application, DEM, DTM, DSM, Source of Errors in LiDAR data.

Unit 5

Application of LiDAR technology

Application of LiDAR for mapping and planning, LiDAR for volumetric analysis, LiDAR application for power sector, Application of LiDAR for smart city, LiDAR application for Topographical study

GPS practical's:

GPS data collection and integration with GIS, Surveying and Mapping, Navigation, Integrating GPS with Remote Sensing and GIS Military, L.B (Location Based Service) Mobile Mapping. Vehicle tracking, Seismic application Crystal deformation and tectonic movements

Lidar Practical's:

Software interaction with LiDAR tools, Vectorisation on raster, Add elevation to vector, Merging of dgn files, Terra solid family tools interaction, Opening, saving las, laz file, Making function key, Making , editing. ptc file ,Work on Mobile Lidar data

Work on Airborne Lidar data Building classification, Power line classification, Make vector of powerline wires and center line, Ground data correction (DEM), Contour generation, Ground and above ground data extraction, Data products-DEM,DTM, and DSM., Making topographic (DTM) Maps with Lidar data. Ground and above and above ground feature extraction from Point cloud data (Point Cloud Classification)

Assignments DGI

1. **GIS Assignment**
    1. Base Map preparation from open source data
    2. Thematic mapping with the help of Census data
    3. Village Map preparation of native place
    4. Smart city Model Dwarka new Delhi
    5. MINOR NOR PROJECT ON LULC
2. **Photogrammetry Assignment**
    1. Feature database file of point of sharp and medium undulation
    2. Regular interval Mass points, 50 and 100 by name
    3. Hard break lines and soft break lines on sharp and medium undulation
    4. DTM feature extraction photogrammetric techniques
    5. Complete DTM and Planimetry Model preparation
3. **Remote sensing Assignments**
    1. Preparation of Data Input for RS based LULC
    2. Image classification by unsupervised method

3. LULC cover Map preparation by supervised techniques
4. Vegetation health monitoring by NDVI techniques
5. Spatiotemporal analysis with the help of RS technology

4. Remote Sensing Assignments

1. Radiometric corrections of Satellite data
2. Geometric corrections of Satellite data
3. Image enhancements techniques
4. Band Rationing
5. PCA and Image filtering, Image contrast stretch

5. LiDAR /GPS Assignments

1. Coordinate collection from MAP INR
2. Map composition from Map INR and GIS softwares
3. Data collection by 500 radios
4. Point data classification-Planimetry (Building, Power pole)
5. Vectorization of Road feature by using LASS data.
6. Point data classification-DTM and contour generation by LASS data.

References:

1. Heywood I, Cornelius S, Carver S. 2000. Introduction to GIS. Addison. Burrough P.A. and Rachael A. McDonnell. Principles of Geographic Hall of India, New Delhi,
2. Wesley Longman, 2008 New York Information Systems, 2nd Ed.
3. Masood AS, 2006. , Introduction to GIS,
4. Allahabad Fazal S & Rahman A, 2007.
5. GIS Terminology, 2012 New Age International Publishers, New Delhi.
6. Freick A., 1995 GPS Satellite Surveying, 2nd Edition, John Wiley and Sons