Chaudhary Ranbir Singh University, Jind

(Established by Govt. of Haryana Legislature Act No. 18 of 2014)
(Recognized under Section 12(b) & 2 (f) of UGC Act, 1956)

Scheme and Syllabi of One Year

P G Diploma in Geoinformatics
In collaboration with
Skyline Institute of Geoinformatics, Rohtak

w.e.f. Academic Session 2024-25

Department of Geography
Chaudhary Ranbir Singh University, Jind

16.07.24

16/7/2024

DEPARTMENT OF GEOGRAPHY

Chaudhary Ranbir Singh University, Jind

Scheme of Examinations for PG Diploma in Geoinformatics w.e.f. 2024-25

Semester-I

Course Code	Title of Course	Contact Hours			Marks					Credit
		L	T	P	Maximum	External		Internal		
						Th	Pr	Th	Pr	
24PGDG-101	Geographic Information System	3	0	2	100	40	30	10	20	4
24PGDG-102	Fundamentals of Remote Sensing	3	0	2	100	40	30	10	20	4
24PGDG-103	Lidar and Its Applications	3	0	2	100	40	30	10	20	4
24PGDG-104	Digital Photogrammetry	3	0	2	100	40	30	10	20	4
Total					**400**	**160**	**120**	**40**	**80**	**16**

Semester-II

Course Code	Title of Course	Contact Hours			Marks					Credit
		L	T	P	Maximum	External		Internal		
						Th	Pr	Th	Pr	
24PGDG-201	Unmanned Aerial Vehicles (UAV's)	3	0	2	100	40	30	10	20	4
24PGDG-202	Global Positioning System	3	0	2	100	40	30	10	20	4
24PGDG-203	Internship	0	0	0	200	00	100	00	100	8
Total					**400**	**80**	**160**	**20**	**140**	**16**

16/7/2024

attribute generation, linking spatial and non-spatial data, Map projections, Datum and ellipsoid

PGDG-101

Geographic Information System

End Sem. Max. Marks (Theory): 40
Time: 2 Hrs.

End Sem. Max. Marks (Practicum): 30
Time: 3 Hrs.
Distribution of Marks

Lab Exercises:	15 marks
Practical Record book:	10 marks
Viva-Voce:	05 marks

Note (Th): **There will be nine questions in all. Question No. 1 is compulsory and consists of 8 subparts (short notes not exceeding 50 words each). Short notes shall cover entire syllabus. There will be 8 long questions, two from each unit. The candidate shall attempt FOUR long questions, selecting one from each unit. All questions carry 08 marks each.**

Note (Pr): **Unit V represents the practicum part of the syllabi.**
The examiner shall set six questions in all. The candidate shall attempt three questions in all. All questions carry 05 marks each.

Objective: The objective of the course is to provide exposure to students to the field of GIS and modern techniques of making maps, handing spatial and non spatial data electronically.

Outcome: The students shall acquire the skills in managing spatial and non spatial data electronically and hands on experience on 3D modeling in GIS.

UNIT-I

Basic concept, definition and introduction to geo-informatics and Geographic Information System. Historical development; Components, Hardware and Software requirement of Geographic Information System.

UNIT-II

GIS data formats: Spatial and Non-Spatial Data. Spatial Data Models: Vector data structure (Point, Line, Area Entities), Raster Data structure (Image data), their advantages and disadvantages. Database Management System (DBMS): Tabular, Hierarchical, Network, Relational and Object Oriented data models.

UNIT-III

Spatial Data Input: Method of data capture, scanning and digitizing of maps and satellite images, onscreen digitization, editing, cleaning and topology building, errors and accuracies in GIS, attribute generation, linking spatial and non-spatial data. Map projections, Datum and ellipsoids. Data Storage: Data storage formats, data retrieval and compression techniques, different application of compression and decompression.

UNIT-IV

Manipulation Analysis and Output: Different data manipulation techniques. Spatial data analysis: overlay operation buffering, interpolation methods, network analysis and suitability analysis. 3D GIS: DEM, DTM, DSM. Query in GIS, factors and weight analysis, data output and presentation.

12/7/2024

UNIT-V

GIS Software and Data handling: GUI's of GIS Software: Open source and commercial. Software and hardware interface and limitations. Data input: Spatial and non-spatial. Scanning, digitizing of maps and images, data import and export. Data registration and making of GIS layers.

Database creation and Data analysis: Spatial analysis (overlay, buffer and network analysis), Query building (site suitability analysis), Making and analysis of DEM, DTM, determination of slope aspect and height, Data interpolation (point, line and areal entity), output generation, 3D modeling, creation of contours, spot heights.

Suggested Readings:

1. Lo CP & Yeung AKW (2004): Concept and techniques of GIS, Prentice Hall Publications, India.
2. Heywood I, Conelius S & Carver S (2000): Introduction to GIS, Pearson Prentice Hall, London.
3. Addison, Burrough PA & Rachael A McDonnell (2006): Principles of Geographic Information Systems. Oxford University Press, Oxford.

16/7/2024

PGDG-102

Fundamentals of Remote Sensing

End Sem. Max. Marks (Theory): 40
Time: 2 Hrs.

End Sem. Max. Marks (Practicum): 30
Time: 3 Hrs.
Distribution of Marks

Lab Exercises:	15 marks
Practical Record book:	10 marks
Viva-Voce:	05 marks

Note (Th): **There will be nine questions in all. Question No. 1 is compulsory and consists of 8 subparts (short notes not exceeding 50 words each). Short notes shall cover entire syllabus. There will be 8 long questions, two from each unit. The candidate shall attempt FOUR long questions, selecting one from each unit. All questions carry 08 marks each.**

Note (Pr): **Unit V represents the practicum part of the syllabi.**
The examiner shall set six questions in all. The candidate shall attempt three questions in all. All questions carry 05 marks each.

Objective: The objective of the course is to provide exposure to students to the field of Remote Sensing, its stages, different satellite systems and image processing.

Outcome: The students shall acquire the understanding of Remote sensing process and image processing.

UNIT-I

Definition and scope of Remote Sensing, Satellite remote sensing v/s aerial photography, Data acquisition and stages of remote sensing, Historical development of Remote sensing, Evolution & trends in Remote Sensing, Applications.

UNIT-II

Electromagnetic Radiation (EMR), Electromagnetic spectrum (EMS), EMR quantities: energy, radiant flux, radiance, irradiance, existence, solid angle, radiant intensity, quantities; Radiation laws: Planck's Law, Stefan's Boltzmann Law, Wein's Displacement and Kirchhoff's Law; EMR Interaction: Interaction with atmosphere, atmospheric haze, scattering and contrast reduction; Interaction with earth surface: spectral signature, hemispheric reflectance, transmittance and absorption

UNIT-III

Sensors: definition; Types of sensors: optical, thermal & microwave; Sensor system: whiskbroom and push broom; ERS: definition and characteristics; Types of ERS: sun-synchronous and geostationary; Satellite Series: Indian Remote Sensing (IRS) series; LANDSAT series; SPOT series, IKONOS and Quick Bird.

UNIT-IV

Introduction; Images: analogue & digital; Pre-processing: geometric, radiometric and atmospheric; Image Enhancement: contrast stretching, Image Filtering; Image Classification: Supervised & unsupervised; Resolution: spatial, spectral and radiometric; Accuracy Assessment

Temporal.

16/7/2024

UNIT-V

Download Satellite Image (NASA-USGS); Import and Export Image; Layer Stacking in ArcGIS and ERDAS Imagine; Band Combination
Subset Image/Masking; Mosaic Image; False Color Composition (FCC) and True Color Composition (TCC); Model-maker (ERDAS & ArcGIS)
De-stripping; Haze Removal; Noise Removal; Contrast Stretching; Histogram Equalization; Cloud Masking (QGIS, ArcGIS); Pan-sharpening
LU/LC, Unsupervised Classification; Supervised Classification; Indices: NDVI, NDBI, NDWI (ArcGIS and ERDAS Imagine); Land Surface Temperature (ArcGIS and QGIS); Accuracy Assessment
Specialization Based Project

Suggested Readings:

1. American Society of Photogrammetry, Manual of Remote Sensing, 2nd ed, Falls
2. American Society of Photogrammetry, Multilingual Dictionary of Remote H.M.
3. Wilson, Topographic Surveying, John Wiley and Sons, New York.Church, Va.,
4. 1983 Remote Sensing and Photogrammetry, Falls Church, Va.,
5. 1984Wolf, P.R. 1983.Elements of Photogrammetry, 2nd ed, McGraw-Hill, NewYork . Rampal KK. 1996

16/7/2024

PGDG-103

Lidar and Its Applications

End Sem. Max. Marks (Theory): 40
Time: 2 Hrs.

End Sem. Max. Marks (Practicum): 30
Time: 3 Hrs.
Distribution of Marks

Lab Exercises:	15 marks
Practical Record book:	10 marks
Viva-Voce:	05 marks

Note (Th): **There will be nine questions in all. Question No. 1 is compulsory and consists of 8 subparts (short notes not exceeding 50 words each). Short notes shall cover entire syllabus. There will be 8 long questions, two from each unit. The candidate shall attempt FOUR long questions, selecting one from each unit. All questions carry 08 marks each.**

Note (Pr): **Unit V represents the practicum part of the syllabi.**
The examiner shall set six questions in all. The candidate shall attempt three questions in all. All questions carry 05 marks each.

Objective: The objective of the course is to provide exposure to students to the field of Lidar technology and its applications and data processing.

Outcome: The students shall acquire the skills of understanding Lidar data, its processing electronically and hands on experience.

UNIT-I

Introduction and objectives of LiDAR Basic Concept of LiDAR. Technology, Historical development of LiDAR technology, LiDAR. Platforms (terrestrial, aerial and Space) Introduction and objectives of LiDAR Basic Concept of LiDAR technology, Historical development of LiDAR technology, LiDAR. Platforms (terrestrial, aerial and Space)

UNIT-II

Types of LiDAR data, Basic architecture of LiDAR technology,
Transmitter, Receiver and, Control system, Latest laser scanner

UNIT-III

LiDAR System Specification, Data Storage, Data Acquisition
Software for Quality Assessment

UNIT-IV

Introduction and objectives of LiDAR data processing Preprocessing, Post Processing, Products of LiDAR application, DEM, DTM, DSM, Source of Errors in LiDAR data. Application of LiDAR in mapping and planning; volumetric Analysis, power sector, Smart city, Topographical study

UNIT-V

working with Lidar software and lass files, Handling tera tools, vectorization of Geographical features with the help of Point cloud files. Making topographic (DTM) Maps with Lidar data. Ground and above and Above ground feature extraction from Point cloud data (Point Cloud Classification)

12/7/2024

Suggested Readings:

1. Digital Elevation Model Technologies and Applications: The DEM Users Manual, 2nd Edition, David F. Maune, editor, 2007.
2. Bethesda, MD: American Society for Photogrammetry and Remote Sensing. Heidemann, Hans Karl. 2012.
4. Lidar Base Specification Version 1.0. U.S. Geological Survey Techniques and Methods, 11-
3. Kana, Timothy W., Bart J. Baca, and Mark L. Williams, 1988. "Chapter 2: Charleston Case Study." In Greenhouse Effect, Sea Level Rise and Coastal Wetlands, James G. Titus, editor, 1988.
5. EPA 230-05-86-013. Washington, D.C.: U.S. Environmental Protection Agency. National
4. Digital Elevation Program (NDEP). 2004.
6. Guidelines for Digital Elevation Data: Version 1.0. U.S. Geological Survey. Accessed November 2007
7. LiDAR Remote Sensing and Applications (Remote Sensing Applications Series) Paperback –12 December 2017 by Pinliang Dong (Author), Qi Chen (Author)
8. An Introduction to Lidar Technology, Data, and Applications, Jamie Carter, Keil Schmid, Kirk
5. Waters, Lindy Betzhold, Brian Hadley, Rebecca Mataosky, and Jennifer Halleran, NOAA
6. Coastal Services Center, 2012.

PGDG-104

Digital Photogrammetry

End Sem. Max. Marks (Theory): 40
Time: 2 Hrs.

End Sem. Max. Marks (Practicum): 30
Time: 3 Hrs.
Distribution of Marks

Lab Exercises:	15 marks
Practical Record book:	10 marks
Viva-Voce:	05 marks

Note (Th): **There will be nine questions in all. Question No. 1 is compulsory and consists of 8 subparts (short notes not exceeding 50 words each). Short notes shall cover entire syllabus. There will be 8 long questions, two from each unit. The candidate shall attempt FOUR long questions, selecting one from each unit. All questions carry 08 marks each.**

Note (Pr): **Unit V represents the practicum part of the syllabi.**
The examiner shall set six questions in all. The candidate shall attempt three questions in all. All questions carry 05 marks each.

Objective: The objective of the course is to provide exposure to students to the field of aerial photographyand modern techniques of aerial photo interpretation like digital photogrammetry.

Outcome: The students shall acquire the skills in managing and processing data acquired from aerial photography.

UNIT-I

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 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-II

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-III

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

UNIT-IV

Modelling: Digital Elevation model (DEM) generation, Digital terrain Modelling (DTM), Digital surface modelling (DSM), Triangulated irregular set of network (TIN). Orth photo Generation and its applications. Contours Generation and its application. Engineering application of Photogrammetric Products.

UNIT-V

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

16/7/2024

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.

Suggested Readings:

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

16/7/2024

PGDG-201

Unmanned Aerial Vehicles (UAV's)

End Sem. Max. Marks (Theory): 40
Time: 2 Hrs.

End Sem. Max. Marks (Practicum): 30
Time: 3 Hrs.
Distribution of Marks

Lab Exercises:	15 marks
Practical Record book:	10 marks
Viva-Voce:	05 marks

Note (Th): **There will be nine questions in all. Question No. 1 is compulsory and consists of 8 subparts (short notes not exceeding 50 words each). Short notes shall cover entire syllabus. There will be 8 long questions, two from each unit. The candidate shall attempt FOUR long questions, selecting one from each unit. All questions carry 08 marks each.**

Note (Pr): **Unit V represents the practicum part of the syllabi.**
The examiner shall set six questions in all. The candidate shall attempt three questions in all. All questions carry 05 marks each.

Objective: The objective of the course is to provide exposure to students to the field of aerial mapping and uses of modern techniques of mapping like Drone.

Outcome: The students shall acquire the skills of working and managing uses of Drone technology in the field of geoinformatics.

UNIT-I

Fundamental of Drone Technology: Working Principle of Drone, Types of Drones according to wings, Types of drones according to their sizes, Types of drones according to their payload capacity, Types of drones according to their power sources. Types of drones according to drone range, Components of Drone

UNIT-II

assembling a drone, energy source, drone Data Storage,
DGPS Signalization. DGPS Planning, Slandered operating procedure of drone flying

UNIT-III

Introduction and Objectives of flight planning. Flight Planning. Inspection, weather checklist, Types of drone Potential Uses of Drone, Documentation, Emergence Procedure. Guidelines for Drone flying, NPNT Drones, Licensing, flying permission, digital sky map Guidelines for drone flying. Certificate to fly a drone No-Fly zones in India (Red Zone),Do's and don't to be kept in mind while flying drones in India

UNIT-IV

Mining and Resource Management, Drones assist in monitoring large public events,
Border security, and patrolling high-risk areas. Urban Planning and Management, Scientific Research Surveillance and Security, Public Safety and Law Enforcement Site Surveying. Construction and Real Estate, track animal movements, and prevent poaching, Agriculture. Delivery Services, Infrastructure Inspection, Environmental Monitoring .Drones are used to monitor wildlife populations. Wildlife Conservation, Media and Entertainment, Crop Monitoring

10/7/2024

UNIT-V

Interaction with drone body parts, Drone Assembling, Drone application for drone flying Flight planning,DGPS planning,Study of digital sky map,Drone data processing SW interaction,Generation of contours,Generation of DEM,DTM, DSM,Orthophoto generation,Making GIS layers form ortho-photo, Live project Training

Suggested Readings:

1. Privacy, data protection and ethics for civil drone practice: A survey of industry, regulators and civil society organisations. Computer Law & Security Review, 32(4), 577–586. Fischhoff, B. (1975).
2. Furnham, A., & Boo, H. C. (2011) Science, technology and the future of small autonomous drones. Nature, 521(7553), 460.
3. A literature review of the anchoring effect. The Journal of Socio-Economics, 40(1), 35–42
4. Drones: The Complete Collection: Three Books in One. Drones: the Professional Drone Pilot's Manual, Drones: Mastering Flight Techniques, and Drones. 9 December 2017by Brian
6. Halliday (Author) Laforet Chris, the Drone Book (English, Paperback, Laforet Chris)

16/7/2024

PGDG-202

Global Positioning System

End Sem. Max. Marks (Theory): 40
Time: 2 Hrs.

End Sem. Max. Marks (Practicum): 30
Time: 3 Hrs.
Distribution of Marks

Lab Exercises:	15 marks
Practical Record book:	10 marks
Viva-Voce:	05 marks

Note (Th): **There will be nine questions in all. Question No. 1 is compulsory and consists of 8 subparts (short notes not exceeding 50 words each). Short notes shall cover entire syllabus. There will be 8 long questions, two from each unit. The candidate shall attempt FOUR long questions, selecting one from each unit. All questions carry 08 marks each.**

Note (Pr): **Unit V represents the practicum part of the syllabi.**
The examiner shall set six questions in all. The candidate shall attempt three questions in all. All questions carry 05 marks each.

Objective: The objective of the course is to provide exposure to students to the field of GPS and modern techniques of making maps, handing spatial and non spatial data electronically.

Outcome: The students shall acquire the skills in managing and processing the data collected through GPS.

UNIT-I

Introduction of Global Positioning System, Satellite constellation, GPS signals and data, Geo-Positioning, Basic concept of NAVSTAR and GLONAS, GALILEO, BeiDou, NavIC

UNIT-II

Basic geodesy, Geoid/datum/Ellipsoid, definition and basic concepts, Coordinate system, Map Scale, Scale factors, historical evolution and need for Control Segment, Space Segments, User Segment, GPS Positioning Types, Absolute Station Equipment: GPS receiver, GPs antenna. Radio and its types, Radio Antenna Cables.

UNIT-III

Satellites, Multi path, lonosphere, Troposphere, Satellite Geometry, Satellite signals and its strength, Distance from the reference receiver, Radio frequency (RF)Loss of Radio Transmission from base.

UNIT-IV

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

UNIT-V

Familiarization of different types of (GPS) Global positioning receivers; checking ofexisting map coordinates using single GPS receivers, collection of ground control points using single point receivers and relative point receivers; calculation of coordinates and removal of errors in observation; transferring data from GPS receiver to PC: plotting of GCPs on image and maps, Importing coordinates in to MAP, Use of MAPINR.

16/7/2024

Suggested Readings:

1. CP LO &Yeung AKw, 2004. Concepts and Techniques of GIS Prentice-Hall of India, New Delhi
2. Heywood I, Cornelius S, Carver S. 2000. Introduction to GIS. Addison Wesley Longman, New York
3. Burrough P.A, and Rachael A. McDonnell. Principles of Geographic Information Systems, 2nd Ed
5. Masood AS, 2006. Introduction to GIS, Allahabad f
6. azal S & Rahman A, 2007, GIS Terminology, New Age International Publishers, New Delhi
7. Leick A. 1995GPS Satellite Surveying, 2nd Edition, John Wiley and Sons
8. Leicka. A.: GPS Satellite Surveying, John Wiley & Sons, New York.
9. Terry-Karen Steede, 2002, Integration GIS and the Global Positioning System, ESRI Press
10. N. K. Agarwal, Essentials of GPS, Spatial Network Pvt Ltd

16/7/2024

PGDG-203

Internship

External Evaluation: 100		**Internal Evaluation: 100**	
Distribution of Marks		**Distribution of Marks**	
Report::	50 marks	Student interest:	50 marks
Viva-Voce:	50 marks	Viva-Voce:	50 marks

Note :

1. **The duration of the internship shall be 6 weeks.**
2. **The internal evaluation will be done by the person/supervisor of the organization/institute where student has completed his/her internship out of 100 amrks.**
3. **External evaluation will be done by the teacher of Department of Geography, CRSU nominated by the Chairperson out of 100 marks.**
4. **A student will inform and get approval from the Chairperson of Department before going for an internship. The internship will involve working with local industry (Govt. or Private Organization/Institution), business establishments, artists, craft persons or a professional (individual/organization).**
5. **Student will submit a copy of the report (a hard copy) to the Department within 15 days after the completion of internship.**
6. **The student has to submit a certificate of attendance and work done report from the organization/professional where at the internship was done.**
7. **The evaluation of the internship shall be done by a department teacher nominated by Chairperson of Department of Geography (internal) on the basis of the report and viva-voce. Marks will be awarded by internal examiner out of 100 marks.**

16/7/2024