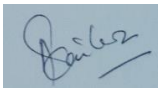
KRISHNA KANTA HANDIQUI STATE OPEN UNIVERSITY

Khanapara, Near Bodoland Guest house, Guwahati-22

SIX MONTH POST GRADUATE CERTIFICATE PROGRAMME IN GEOINFORMATICS

DETAILED SYLLABUS SUBMITTED FOR APPROVAL



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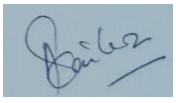
Six Month Post Graduate Certificate Programme in Geoinformatics

Programme Details:

The Post Graduate Certificate Programme in Geoinformatics is a six months programme with three theory papers and one practical paper, which is a part of the full course. The structure of the proposed programme is:

Programme Name	Duration	Eligibility	Course number and Title	Theory/ Practical	No. of Units	Credits	Contact hours	Marks	Language
Post Graduate Certificate Programme in Geoinformatics	6 Months	Graduate from any discipline	GI-01 Fundamentals of GIS	Theory	8	4	12 hours	100	English
			GI-02 Basics of Remote Sensing and Global Positioning System	Theory	10	4	12 hours	100	
			GI-03 Spatial Analysis and Applications	Theory	10	4	12 hours	100	
			GI-04 Hands on GIS and Remote Sensing Software	Practical		6	180 hours	100	
				Total		18	216 hours	400	



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COURSE 1
GI-01 Fundamentals of GIS

MARKS: 100

Credits - 4

UNIT 1: Basics of Geoinformatics **10**

Concept of Geoinformatics; Major Fields of Geoinformatics; Introduction to Cartography and Surveying; Significance of Geoinformatics; Multidisciplinary nature & applications of Geoinformatics.

Unit 2: Understanding Maps **10**

Definition of a map; Properties of maps; Types of maps; Present day significance of maps.

UNIT 3: Map Projection in GIS **10**

Map Projection Systems; Map Projections for Hemispheres and the World; Map Projections for Continents and Regions; Universal Transverse Mercator projection; International Terrestrial Reference Frame in GIS.

Unit 4: Basics of Geodesy and Spatial Referencing Systems **10**

Shape and size of the earth; Ellipsoids and Datum; Co-ordinate Systems

UNIT 5: Introduction to Geographic Information Systems **20**

Basic Concepts of Geographic Information Systems; Components of a GIS; Advantages of GIS; Social and Institutional Context of GIS; Contemporary Development of GIS.

UNIT 6: Introduction to database management system **10**

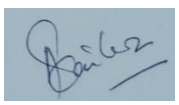
Overview of database in computer science; Basics of database system; Fundamentals of geo-database management system; Creation of geo-database for applications in geo-informatics.

Unit 7: GIS Data Types **15**

Raster Data, Vector Data, TIN; Topological Relationships; Raster & Vector Data Formats.

Unit 8: Sources and Nature of Geospatial data **15**

Spatial and non-spatial Data; DEM (SRTM, GTOPO, GLOBE, LiDAR) and Other Data Sources; Data Input Output Processes and Devices; Data Verification, Correction and Storage; Data Conversion in GIS.



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Course: 2

GI-02 Basics of Remote Sensing and Global Navigation Satellite System

Credits - 4 **MARKS: 100**

UNIT- 1: Introduction to Remote Sensing **10**

Introduction to Remote Sensing; Concepts and Definition; History and Development; EMR Spectrum; EMR Interaction with Earth's atmosphere and Earth's surface; Spectral Signature and resolutions.

UNIT- 2: Remote Sensing Platforms and Sensors **10**

Platforms and Sensors: History of Space Imaging; Sensors and their characteristics; Types of Satellites: Meteorological Satellites; Remote Sensing in India: India's Remote Sensing Programme, Future Missions; Overviews of Imageries from various Satellites.

UNIT- 3: Remote Sensing Data Products **10**

Data Products; Data characteristics; Overview of imageries from various products; Accessing Remote Sensing Data

UNIT- 4: Fundamentals of Thermal Remote Sensing **10**

Concept of Thermal Remote Sensing; Thermal Inertia: Temperature from Radiance Values; Thermal Sensors and Scanners; Optomechanical CCD Arrays: Uncooled Infrared Detectors, Cooled Infrared Detectors; Interpretation of Thermal Scanner Imagery; Application of Thermal data.

UNIT- 5: Introduction to Microwave Remote Sensing **10**

Basic Concept of Microwave Remote Sensing; Microwave Sensors; Spectral and Spatial Resolution; Microwave Data Sets; Application of Microwave Satellite Data.

UNIT- 6: What and why of Hyperspectral of Remote Sensing **10**

Hyperspectral Remote Sensing: Basic concepts, Satellites, Sensors; Spectral and Spatial Resolution; Data characteristics and Applications of Hyperspectral Data Cubes.

UNIT- 7: Aerial Photographs **10**

Basic Concepts of Aerial Photography; Types of Aerial Photography: Vertical photographs, Oblique Photographs; Photogrammetry

UNIT- 8: Image Enhancements and Interpretation **10**

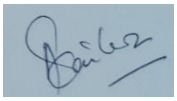
Basic idea of image enhancement techniques; Elements of Image Interpretation; Techniques of Visual and Digital Interpretation.

UNIT 9: Basics of Global Navigation Satellite System **10**

Introduction to Global Positioning System; GPS Satellites Constellations: GPS segments; GLONASS, Galileo, GAGAN, IRNSS; GPS Antennas, Signals and Codes; GPS Receivers: Types of Receivers; Modes of Measurements.

UNIT 10: GPS Data and Applications **10**

Factors Affecting Accuracy of GPS Data, Post Processing of data; GPS surveys and applications.



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COURSE 3

GI-03 SPATIAL ANALYSIS AND APPLICATION IN GEOINFORMATICS

Credit: 4 **MARKS: 100**

UNIT-1: Spatial Data Modeling & Database Management **10**

Introduction to Data Analysis; Database Query; Geospatial Measurements; Neighbourhood Operations; Overlay Operations: Types of Overlays in Raster; Surface Analysis; Network Analysis

UNIT-2: Data Analysis **10**

Introduction to Data Analysis basics; Database Queries; Geospatial Measurements; Neighbourhood Operations, Overlay Operations; Surface Analysis Uses of DEM / DTM / DSM; Network Analysis.

UNIT- 3: Geoprocessing Functions and Tools **10**

Vector overlay; Raster overlay; Spatial Buffering; Union and Intersection; Spatial Autocorrelation; Weighted Regression.

UNIT-4: Analytical Modeling and Output **10**

Analytical Modeling basics; Process Models: Physical and Environmental Process Modeling, Decision Making Process Modelling, Human Process Modelling; Output of GIS: Maps as output; Spatial Decision Support Systems; Some functional applications of a GIS.

UNIT- 5: Basics of Image Processing-I **10**

Introduction to Digital Image Processing (DIP); DIP software Systems: User interface of DIP software, Conversion of Digital Data in DIP Software; Image properties: Spatial resolution, Radiometric resolution, Image histogram; Data preparation: Geometric corrections, Radiometric corrections; reprojection and resampling of digital data; Subsetting digital images.

UNIT- 6: Basics of Image Processing-II **10**

Geo-referencing Data; Pattern Recognition in Digital Image Processing; Image enhancement: Image filtering, Band ratio, Principal component analysis

UNIT- 7: Basics of Image Classification **10**

Introduction to Image Classification; Unsupervised Classification, Supervised Classification.

UNIT- 8: Accuracy Assessment in Image Classification **10**

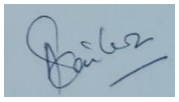
Concept of Accuracy Assessment**:** Need for accuracy assessment; Types of accuracy assessment.

UNIT- 9: Geoinformatics for Natural Resources Assessments **10**

Application of Geoinformatics in land use / land cover classification systems; Mapping and change detection analysis; Geo-environmental studies; biotic resource assessments.

UNIT-10: Geoinformatics for Environmental Studies, Planning and Development **10**

Geoinformatics for environmental pollution and climate change studies; Floods and drought Prone Area mapping; Early warning systems for disasters and hazards; Rural and urban infrastructure survey; Mapping and planning.



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COURSE 3
GI-04 HANDS ON GIS AND REMOTE SENSING SOFTWARE

MARKS: 100

Credit: 6

PRACTICALS IN GEOGRAPHIC INFORMATION SYSTEMS

Exercise 1- Geo-reference of maps and imageries
Exercise 2- Graphical Representation of Spatial data (Raster/Vector Method)
Exercise 3- Sub-setting an area of interest from a satellite image
Exercise 4- Import / Export of files in different formats
Exercise 5- Creating DEM/TIN surface from vector/ raster data
Exercise 6- Multi Criteria decision making for site selection

PRACTICALS IN GPS

Exercise 7- Data collection in GPS
Exercise 8- Processing of GPS data in the software

PRACTICALS IN REMOTE SENSING & IMAGE INTERPRETATION

Exercise 9- Introduction to maps and satellite imageries
Exercise 10- Identification of different Features using TM, FCC and Thermal Imagery
Exercise 11- Layer stacking and mosaicing Images
Exercise 12- Interpretation of different bands of satellite imageries
Exercise 13- Image to image rectification and image to map registration
Exercise 14- Image enhancement techniques, Filtration: High, Low frequency
Exercise 15- Classification: Supervised and Unsupervised methods.

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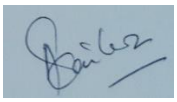

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