One Year P.G. Dip. in Remote Sensing and GIS
Banaras Hindu University
Department of Geography, Faculty of Science

Distribution of Courses and Credits in Various Semesters

Semester-I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GID101</td>
<td>Fundamentals of Geomorphology &amp; Cartography</td>
<td>5</td>
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<tr>
<td>GID102</td>
<td>Principles of Remote Sensing</td>
<td>5</td>
</tr>
<tr>
<td>GID103</td>
<td>Fundamentals of GIS</td>
<td>5</td>
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<tr>
<td>GID104</td>
<td>Remote Sensing I (Practical)</td>
<td>3</td>
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<tr>
<td>GID105</td>
<td>GIS Analysis I (Practical)</td>
<td>3</td>
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<td><strong>Total</strong></td>
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Semester-II

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<tr>
<td>GID201</td>
<td>Advances in Remote Sensing and GIS</td>
<td>5</td>
</tr>
<tr>
<td>GID202</td>
<td>Digital Image Processing</td>
<td>5</td>
</tr>
<tr>
<td>GID203</td>
<td>Remote Sensing and GIS Applications</td>
<td>5</td>
</tr>
<tr>
<td>GID204</td>
<td>Remote Sensing II (Practical)</td>
<td>3</td>
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<tr>
<td>GID205</td>
<td>GIS Analysis II (Practical)</td>
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<tr>
<td>GID206</td>
<td>Project/Dissertation*</td>
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<td><strong>Grand Total of Credits</strong></td>
<td><strong>48</strong></td>
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*to be submitted 35-45 days after the last theory/practical examination whichever is later, but 15 days before the official reopening of the university after summer vacation

One Year PG Diploma in Remote Sensing and GIS
Department of Geography, Banaras Hindu University Varanasi-221005, U.P.

FIRST SEMESTER

GID101- Fundamentals of Geomorphology and Cartography (5 Credits)

**Lithosphere:** Earth’s Interior and Crust; Rocks; Volcanism; Earthquakes; Faults, Folds and Topography; Mountain Building; Types of Mountains.

**Geomorphic Processes and Landforms:** Geomorphic Processes—Weathering, Mass Movements, Erosion, Transportation and Deposition; Anthropogenic Process; Landforms in Humid, Arid, Karst, Glacial and Coastal Environments; Geomorphic Processes and Landforms in relation to Natural Resources, Natural Hazards and Disasters, Human Settlements and Economic Activities.

**Cartography:** Earth’s Size and Shape—Spheroidal and Geoidal Earth; Spheroidal and Geoidal Datums; Co-ordinate Systems—Cartesian, Rectangular and Geographical; Grid Systems; Map Projections—Polyconic, Albers Conical Equal Area, LCC, Mercator and UTM.
**Reference & Text Books:**

5. Fairbridge, R.W. (Ed.) 1968 Encyclopaedia of Geomorphology,

**GID102 - Principles of Remote Sensing (5 Credits)**

**Basics:** Electromagnetic Radiation as Remote Sensing Medium—Interactions with atmosphere and matter, Remote Sensing Regions and Bands; General Mechanism of Remote Sensing Data Recording; General Characteristics of Remote Sensing Platforms; General Characteristics of Remote Sensing Sensors

**Data Characteristics:** Spectral Characteristics of Common Natural Objects; Atmospheric Effects on Remote Sensing Data; Spectral Signatures and Spectral Response Patterns; Resolutions of Remote Sensing Data; Characteristics of Raw Remote Sensing Data

**Aerial Photos:** Basic Infrastructure and specification of Aerial photographs; Types, Scale, Resolution; Geometric properties of Single Aerial Vertical Aerial Photo; Stereoscopy; Stereoscopic Parallax; Relief Displacement

**Remote Sensing Data Interpretation:** Nature of Qualitative Information and Sequence in Interpretation; Elements of Image Interpretation; Elements of Image Patterns—Landforms, Drainage, Erosion Details;

**Reference & Text Books:**


**GID103 - Fundamentals of GIS (5 Credits)**

**Basics:** Definitions of GIS and Related Terms; Development of GIS; Components of GIS; Geographical Data Characteristics and GIS; Coordinate Systems, Datums and Projections in GIS.

**Data Structures and Data Base Design:** Digital representation of Geographic Data; Raster and Vector models for Geographic Data Representation and Conversion; Digitization—Methods and Errors; Topology Building; GIS Data Standards—Concepts and Components; Data and Information Sources for GIS; GIS Data Base Management Systems--Conceptual and Logical Data Modelling; Spatial Data Quality and Error Analysis; GIS Customization.

**Application Methodologies:** Spatial Analysis through GIS; DEM/DTM and Derivatives; Remote Sensing Data and GIS Integration; GIS Project Design and Planning Methodologies; GIS Information Products.

**Reference & Text Books:**


**GID104 - Remote Sensing-I (3 Credits)**
Identification of Forms and Features from Stereograms; Preparation of Thematic Maps from Remote Sensing Data—Lithology, Structure, Geomorphic Mapping; Land Use, Soils, Groundwater Potential Zones through on-screen digitization

**GID105 – GIS-I (3 Credits)**
Georeferencing; Creation of PGDB; Creation of Shape Files, Layers; On-Screen Digitization of Polygons, Points and Lines and adding Attributes; Conversions and Topology; Spatial Analysis

**SECOND SEMESTER**

**GID201 - Advances in Remote Sensing and GIS (5 Credits)**
Thermal and Microwave Remote Sensing; Factors affecting Thermal Imagery; Thermal Data Interpretation—Qualitative and Quantitative; Principles of Microwave Remote Sensing; Characteristics of Microwave Remote Sensing Data
Recent Advances in Remote Sensing: Hyperspectral Remote Sensing; LIDAR; Image Fusions; Object oriented classification; Digital Photogrammetry and Information Extraction Techniques
Spatial Analysis and Modeling; Network Analysis and Shortest Route Characteristics; Spatial Decision Support System; Multi-criteria Decision Analysis; Spatial Data Infrastructures (NSDIs)
Recent Advances in GIS: 3D Virtual GIS; Internet and WEB GIS; GPS in GIS Applications; Mobile Computing; Interoperability and Open GIS; Internet GIS; Cartographic Animation.

Reference and Text Books:

GID202 - Digital Image Processing (5 Credits)

Pre-processing Operations: History and Architecture of Computer; Digital Image, Digital Data Format, LUT; Image Restoration; Noise Reduction; Radiometric Correction of Data; Geometric Correction of Data; Linear and Non-linear Transformations for Geometric Corrections; Histogram Significance

Image Enhancements: Radiometric Enhancement; Spatial Enhancements; Contrast stretching—Linear and Non-linear Methods; Multi-band Enhancement Techniques—Band Ratios, Vegetation Indices, PCA, Spatial Filtering; Resolution Merge Techniques or Image Fusion

Thematic Information Extraction Procedures: Multi-spectral Patterns; Spectral Discrimination and Signature Bank; Parametric and Non-parametric Classifiers; Supervised and Unsupervised Classification Methods; Multi-date Data Analysis and Change Detection Processes, Accuracy Assessment
Reference and Text Books:


GID203 - Remote Sensing and GIS Applications (5 Credits)

**Remote Sensing Applications:** Natural Resource Mapping; Environmental Mapping and Monitoring; Geomorphic/Geological Mapping—Lithology and Structure; Mineral Resource Identification and Assessment; Land Use Mapping; Evaluation of Surface Water Resources; Ground Water Exploration; Flood Zones; Surface Runoff Estimation; Glacier Mapping; Disease and Stress Detection; Soils and Soil Salinity Mapping; Crop Types and Crop Yield Estimations.

**GIS Applications:** Rural and Urban Land Use; Rural and Urban Change; Rural and Urban Information System; GIS in Planning; Forest Fire Mapping; GIS in Health Services and Disease Mapping; Solid Waste Management; Wild Life Habitat Suitability Studies; Shortest Path Characteristics; Spatial Decision Support System.

Reference and Text Books:


**GID204 - Remote Sensing-II (3 Credits)**

Data Import; Geometric Corrections and Geo-referencing of Data; Enhancements; Subsetting; Vegetation Indices; Use of Filters and PCA; Supervised and Unsupervised Classifications; Map Composition; Microwave Data Processing and Interpretation; DEM/DTM creation and 3D Visualization and Virtual Image

**GID205 – GIS-II (3 Credits)**

Coverages in ArcInfo; Editing of Coverages; Source Data Registration; Spatial Modeling and Analysis; Query building; Network Analysis; TIN/DEM models and derivatives; 3D Virtual GIS; GPS and Total Station Survey and Plotting

**GID206 - Project Work/Dissertation* (6 Credits)**

To be finalized and assigned at the end of First Semester; laboratory and/or field work based; to be done in the department/elsewhere; to be submitted 35 to 45 days after the last theory/practical examination whichever is later but definitely 15 days before the reopening of the university after summer vacation

*Specialization in:

(i) GIS data organization and analysis
(ii) GIS Web Services
(iii) Natural Resource & Environment Mapping and Monitoring
(iv) Spatial Decision Support System
(v) Digital Image Analysis and Accuracy Assessment
(vi) Automated Information Extraction Methods
(vii) Rural and Urban Land Use Planning