

VIDYASAGAR UNIVERSITY

Midnapore, West Bengal



CURRICULUM & SYLLABUS (DRAFT) OF

B. Sc. (HONOURS) MAJOR IN GEOINFORMATICS

4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2026-2027)

Based on

**Curriculum & Credit Framework for Undergraduate Programmes
(CCFUP), 2023 & NEP, 2020**

B.Sc. (Hons.) Single Major in Geoinformatics

Program Outcomes (POs)

PO ID	Outcome Title	Description
PO-1	Foundational Knowledge	Physics of Remote Sensing and EMR, Mathematics, and Geography to solve complex geospatial problems.
PO-2	Technical Proficiency	Advanced knowledge in industry-standard software (QGIS, ArcGIS, ERDAS, MapInfo, TNTmips) and hardware (GPS, Total Station, UAV (Drone based mapping)).
PO-3	Analytical Skills	Design and execute of digital image processing and spatial data modeling.
PO-4	Modern Tool Usage	Concept and application of Web GIS, Cloud-based applications for realtime spatial data distribution.
PO-5	Research & Ethics	Conduct independent research with scientific integrity, adhering to data privacy and copyright laws.

Course Outcomes (COs) – Major Courses

Sem	Code	Major Course Title	Course Outcomes (COs)
I	MJ-01	Fundamentals of Remote Sensing	- Explain EMR-Atmosphere interactions. - Evaluate sensor/platform resolutions. - Perform visual image interpretation.
II	MJ-02	Platforms and Sensors	- Manage Vector and Raster data structures. - Execute georeferencing & projections. - Perform spatial queries & geoprocessing.
III	MJ-03	Fundamentals of Geographic Information System (GIS)	- Solve spatial problems via linear equations. - Applying statistics for error analysis. - Use computational logic for data.
III	MJ-04	Aerial Photography and Photogrammetry	- Generate DEM and Orthophotos - Apply Photogrammetry in mapping and modeling - Understand digital photogrammetry principles
IV	MJ-05	Numerical Methods & Computation Techniques - I	- Implement integration for surface modeling. - Model spatial trends using regression. - Use matrix algebra for transformations.
IV	MJ-06	Digital Image Processing	- Interpret processed images for mapping and spatial analysis. - Understand basic digital image processing concepts. - Apply image enhancement, filtering, and classification techniques.
IV	MJ-07	Advanced Cartography	- Design professional thematic maps. - Implement dynamic labeling/symbology. - Produce print-ready digital atlases.
V	MJ-08	GNSS	- Understand GPS & GNSS signal architecture. - Operate DGPS for precision surveying. - Post-process field data for error removal.

V	MJ-09	Research Methods and Techniques	- Introduce fundamental concepts, approaches, and ethics of research - Develop skill in research design, data analysis, and interpretation - Train students in scientific writing and presentations
V	MJ-10	Web GIS & Cloud Computing	- Develop maps via JavaScript APIs. - Configure Map Servers (GeoServer). - Utilize Google Earth Engine (GEE).
VI	MJ-11	Microwave and Thermal Remote Sensing	- Explain Radar backscatter principles. - Process SAR data for terrain analysis. - Understand the thermal behavior of earth materials
VI	MJ-12	LIDAR and Hyperspectral Remote Sensing	- Process 3D point cloud datasets. - Differentiate ground vs. structure returns. - Create high-res Terrain Models (DTM).
VI	MJ-13	Surveying and field-based research	- Mastering Total Station/Auto-level setup. - Create topographic/contour maps. - Field-based survey and Data report
VII	MJ-14	Advanced Spatial Data Modeling	- Design MCDA for site suitability. - Model dynamic runoff/urban sprawl. - Evaluate model uncertainty/sensitivity.
VII	MJ-15	Machine Learning in Geoinformatics	- Applying Supervised/Unsupervised logic. - Use Random Forest/SVM for LULC. - Implement Deep Learning for feature ID.
VIII	MJ-16	Geostatistics and Big Data	- Perform Kriging/Variogram analysis. - Manage NoSQL geospatial databases. - Identify spatial hotspots/autocorrelation.

Course Outcomes (COs) – Minor Courses

Sem	Code	Minor Course Title	Course Outcomes (Upon completion, students will be able to...)
I	MI-01	Fundamentals of Geoinformatics	- Define the integrated roles of Remote Sensing, GIS, and GPS in modern mapping. - Identify the hardware and software components required for a geospatial workstation. - Relate geospatial technology to sustainable development goals.
II	MI-02	Remote Sensing and Image Interpretation	- Describe the EMR spectrum and atmospheric windows for earth observation. - Interpret satellite images using visual keys like texture, pattern, and shadow. - Perform basic digital image enhancement and classification techniques.
III	MI-03	GIS Programming and Automation	- Write basic Python scripts to automate repetitive spatial data tasks. - Use logical operators and loops to query and update attribute databases. - Develop custom tools for data conversion and batch processing.

IV	MI-04	Spatial Analysis and Modeling	- Execute vector and raster-based spatial analysis (buffering, overlay, proximity). - Create Digital Elevation Models (DEMs) and derive slope/aspect maps. - Apply Multi-Criteria Decision Analysis (MCDA) for simple site-selection problems.
V	MI-05	GPS and GNSS Surveying	- Explain the working principles of satellite-based positioning systems. - Operate handheld and differential GPS units for field data collection. - Import and differentially correct field data within a GIS environment.
VI	MI-06	Photogrammetry and LiDAR	- Understand the geometry of aerial photography and relief displacement. - Process LiDAR point cloud data to create Digital Terrain Models (DTMs). - Perform 3D measurements of height and volume from stereo-pairs.
VII	MI-07	Geoinformatics in Water Resource Management	- GIS-Based Water Resource Management - Surface water mapping - Groundwater potential zone mapping - Surface water mapping, groundwater potential zone mapping - Flood and drought assessment.
VIII	MI-08	Geoinformatics-Based Project Work	- Formulate a research problem that requires geospatial solutions. - Integrate multi-source data to perform original spatial analysis. - Produce a professional technical report and a series of thematic maps.

Course Specific Outcomes (CSOs)

CSO ID	Outcome Category	Description (The student will be able to...)
CSO-1	Multi-Sensor Integration	Synthesize data from multiple platforms (Optical, Microwave/SAR, and LiDAR) to create comprehensive 3D environmental and urban models.
CSO-2	Automated Spatial Analytics	Develop autonomous geoprocessing workflows using Python and R to handle “Big Data” challenges that cannot be solved with standard desktop GIS tools.
CSO-3	Geospatial Solution Design	Architect end-to-end Web GIS solutions, from database schema design and server-side configuration to front-end interactive map visualization.
CSO-4	Precision Field Engineering	Execute high-precision geodetic surveys by integrating DGPS/GNSS observations with Total Station measurements for engineering-grade site mapping.
CSO-5	Decision Support Modeling	Build complex Multi-Criteria Decision Analysis (MCDA) models to provide scientific solutions for disaster mitigation, urban sprawl, and natural resource management.
CSO-6	Scientific Intelligence	Apply Machine Learning and Deep Learning algorithms for automated feature extraction (e.g., building footprints, crop health) from high-resolution satellite imagery.

Curriculum & Credit Structure

B.Sc. (Hons.) Single Major in Geoinformatics

Year	Semester	Major (Core Discipline)	Minor Discipline	AEC	SEC	MDC	VAC	Internship / Project	Total Credit/ No. of Courses
1 st Year	I	Major-1	Minor-1	English Communication-1	SEC-1	MDC-1	VAC-1 (ENVS)	-	20/6
	II	Major-2	Minor-2	MIL (Bengali/Hindi)-1	SEC-2	MDC-2	VAC-2	Community Service	24/7
2 nd Year	III	Major-3, Major-4	Minor-3	English Communication-2	SEC-3	MDC-3	-	-	20/6
	IV	Major-5, Major-6, Major-7	Minor-4	MIL (Bengali/Hindi)-2	-	-	-	Internship / Apprenticeship (Major Disc.)	22/6
3 rd Year	V	Major-8, 9, 10 + Elective-1	Minor-5	-	-	-	-	-	20/5
	VI	Major-11, 12, 13 + Elective-2	Minor-6	-	-	-	-	-	20/5
4 th Year	VII	Major-14, 15 + Elective-3	Minor-7	-	-	-	-	Project-1 (4 Cr)	20/5
	VIII	Major-16 + Elective-4	Minor-8	-	-	-	-	Project-2 (8 Cr)	20/4
- Students shall be awarded Bachelor Degree (Hons. with Research) in the Major Discipline securing 166credits - Students not opting Research shall complete Three (03) additional papers (Major Electives -5 in Sem. - VII and Major Electives - 6, 7 in Sem. - VIII One (01) - Major Discipline & Two (02) Minor Disciplines - (1 & 2) Disciplines to be selected from given Subject bunch/group.									

Bachelor of Science (Honours) Single Major in Geoinformatics

(Under CCFUP, 2023)

Syllabus for 1st Year

Sem	Paper Type	Paper Title	Credit	L-T-P	IA	CA	ESE	Total
I	Major-1	Fundamentals of Remote Sensing	4	3-0-1	10	05	60	75
	Minor-1	Fundamentals of Geoinformatics	4	3-1-0	10	05	60	75
	AEC-1	Communicative English -1 (common for all programmes)	2	2-0-0	05	05	40	50
	SEC-1	Computer Basics and Applications	3	2-0-1	05	05	40	50
	MDC-1	Multidisciplinary Course -1 (to be chosen from the list)	3	3-0-0	05	05	40	50
	VAC-1	Environmental Studies (ENVS) (common for all programmes)	4	4-0-0	10	40	50	100
II	Major-2	Platforms and Sensors	4	3-0-1	10	05	60	75
	Minor-2	Remote Sensing and Image Interpretation	4	3-0-1	10	05	60	75
	AEC-2	MIL (Bengali/Hindi)-1	2	2-0-0	05	05	40	50
	SEC-2	Land Surveying (Practical)	3	2-1-0	05	05	40	50
	MDC-2	Multi-Disciplinary Course-02 (to be chosen from the list)	3	3-0-0	05	05	40	50
	VAC-2	Value Added Course-02 (to be chosen from the list)	4	4-0-0	05	05	40	50
	Summer Intern.	Community Service	4	0-0-4	-	-	50	50

Syllabus for 2nd Year

Sem	Paper Type	Paper Title	Credit	L-T-P	IA	CA	ESE	Total
III	Major-3	Fundamentals of Geographic Information System (GIS)	4	3-1-0	10	05	60	75
	Major-4	Aerial Photography and Photogrammetry	4	3-0-1	10	05	60	75
	Minor-3	GIS Programming and Automation	4	2-0-2	10	05	60	75
	AEC-3	Communicative English -2 (common for all programmes)	2	2-0-0	05	05	40	50
	SEC-3	Computer Programming (R/Python) (Practical)	3	2-0-1	05	05	40	50
	MDC-3	Multidisciplinary Course -3 (to be chosen from the list)	3	2-1-0	05	05	40	50
IV	Major-5	Numerical Methods & Computation-I	4	3-1-0	10	05	60	75
	Major-6	Digital Image Processing	4	0-0-4	10	05	60	75
	Major-7	Advanced Cartography (Practical)	4	0-0-4	10	05	60	75
	Minor-4	Spatial Analysis and Modeling	4	3-0-1	10	05	60	75
	AEC-4	MIL (Bengali/Hindi)-2 (common for all programmes)	2	2-0-0	05	05	40	50
	Intern	Internship / Apprenticeship	4	0-0-4	-	-	50	50

Syllabus for 3rd Year

Sem	Paper Type	Paper Title	Credit	L-T-P	IA	CA	ESE	Total
V	Major-8	GNSS	4	3-0-1	10	05	60	75
	Major-9	Research Methods and Techniques	4	3-0-1	10	05	60	75
	Major-10	Web GIS and Cloud Computing	4	3-0-1	10	05	60	75
	Elect-1	Geoinformatics in Natural Resource Management Or Geoinformatics in Disaster Management	4	4-0-0	10	05	60	75
	Minor-5	GPS and GNSS Surveying	4	2-0-2	10	05	60	75
VI	Major-11	Microwave and Hyperspectral remote sensing	4	3-0-1	10	05	60	75
	Major-12	LIDAR and Hyperspectral Remote Sensing	4	3-0-1	10	05	60	75
	Major-13	Surveying and field-based research	4	2-0-2	10	05	60	75
	Elect-2	Geoinformatics in Urban & Regional Planning Or Geoinformatics in Precision Agriculture	4	4-0-0	10	05	60	75
	Minor-6	Photogrammetry and LiDAR	4	2-0-2	10	05	60	75

Syllabus for 4th Year

Sem	Paper Type	Paper Title	Credit	L-T-P	IA	CA	ESE	Total
VII	Major-14	Advanced Spatial Data Modeling	4	3-1-0	10	05	60	75
	Major-15	Machine Learning in Geoinformatics	4	2-0-2	10	05	60	75
	Elect-3	Application of Geoinformatics in Forestry/ Application of Geoinformatics in Dumping Site Suitability	4	4-0-0	10	05	60	75
	Minor-7	Geoinformatics in Water Resource Management	4	2-0-2	10	05	60	75
	Project-1	Research Methodology	4	4-0-0	10	05	60	75
VIII	Major-16	Geostatistics and Big Data	4	3-1-0	10	05	60	75
	Elect-4	Landslide Susceptibility Mapping/ Flood Vulnerability Mapping	4	3-0-1	10	05	60	75
	Minor-8	Geoinformatics-Based Project Work	4	0-0-4	-	-	75	75
	Project-2	Dissertation / Research Project	12	0-0-12	-	-	150	150

Abbreviations:

- **IA:** Internal Assessment | **CA:** Continuous Assessment | **ESE:** End Semester Exam

SEMESTER – I

MJ-01: Fundamentals of Remote Sensing

Course Objectives:

- To introduce the scientific principles of remote sensing.
- To develop understanding of satellite systems and sensor technologies.
- To enable interpretation and application of remotely sensed data.

Course Outcomes:

- Students will understand the scientific principles of remote sensing, identify various satellite systems, interpret satellite imagery, and apply RS data for environmental and resource analysis.

Course Contents

MJ-01T: Fundamentals of Remote Sensing

1. Concept and Scope of Remote Sensing: Definitions, Process and Characteristics of Remote Sensing System, Advantages and limitations.
2. Concept of Electromagnetic Radiation (EMR): Wavelength-frequency-energy relationship of EMR, EMR Spectrum and its properties, EMR wavelength regions and their applications, Atmospheric windows, Spectral signatures.
3. Fundamental laws governing the science: Sources of Energy, Radiation laws: Stefan- Boltzman law, Wien's law, Kirchhoff's law etc., Black body and Real body, Radiant temperature & Kinetic temperature.
4. Energy Interaction in the atmosphere: Scattering, absorption, transmission, atmospheric windows.
5. Energy Interactions with Earth Surface Features: Spectral Reflectance Curve, Concept of spectral signatures.

MJ-01P: Fundamentals of Remote Sensing – Lab

1. Introduction to GIS Software and Satellite Imagery: Introduction to the GIS software interface; loading, opening, and visualizing Landsat and Sentinel satellite imagery; understanding spectral bands; and identifying True Color Composite (TCC), False Color Composite (FCC), and Standard False Color Composite (SFCC) band combinations.
2. Satellite Image Preparation and Clipping: Downloading and preparing satellite imagery; band selection and layer stacking for image visualization.
3. Prepare LULC map using visual image interpretation; Identify water bodies, vegetation, agriculture land, built-up areas.
4. Generate NDVI map; Perform basic classification and calculate area statistics; Prepare final LULC/NDVI thematic map.

References

- Campbell, J. B., & Wynne, R. H. (2011). Introduction to remote sensing (5th ed.). Guilford Press.
- Gonzalez, R. C., & Woods, R. E. (2018). Digital image processing (4th ed.). Pearson.
- Jensen, J. R. (2015). Introductory digital image processing: A remote sensing perspective (4th ed.). Pearson.
- Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). Remote sensing and image interpretation (7th ed.). Wiley.

MI-01: Fundamentals of Geoinformatics

Course Objectives

- To develop a comprehensive understanding of the theoretical foundations and components of geoinformatics.
- To examine spatial data structures, geodetic frameworks, and data acquisition techniques in detail.
- To build analytical and critical skills for spatial data handling, integration, and interpretation.
- To introduce geospatial thinking for solving real-world geographical problems.

Course Outcomes

After successful completion, students will be able to, critically explain geoinformatics architecture, components, and data models, analyze and interpret spatial datasets using GIS-based techniques, integrate multi-source geospatial data (RS, GPS, field data) for analysis, apply GIS tools and methods for basic spatial decision-making and problem-solving.

Course Contents

MI-01T: Fundamentals of Geoinformatics

1. Concept, scope, and evolution of geoinformatics; integration of GIS, Remote Sensing, and GPS/GNSS; spatial thinking and applications in planning, environment, and governance.
2. Types of spatial data; vector (point, line, polygon, topology) and raster (grid, resolution) models; TIN, surface, and network data models.
3. Earth shape (geoid, spheroid, ellipsoid); datums (WGS84); coordinate systems and map projections; spatial reference systems and transformations.
4. Data sources (primary and secondary); remote sensing acquisition; digitization; data quality, errors, and metadata standards.

MI-01P: Fundamentals of Geoinformatics - Lab

1. Introduction to GIS software, interface, tools, workspace, and spatial data creation (point, line, polygon) with attribute table management.
2. Georeferencing of maps/images, coordinate system assignment, and projection transformation.
3. Digitization of features and performing basic spatial queries (attribute and location-based).
4. Map composition and layout design, raster data visualization, and basic overlay and buffer analysis.

References

- Lillesand, T.M., Kiefer, R.W. & Chipman, J.W. – *Remote Sensing and Image Interpretation*
- Sabins, F.F. – *Remote Sensing: Principles and Interpretation*
- Paul R. Wolf – *Elements of Photogrammetry*
- American Society of Photogrammetry – *Manual of Photogrammetry*
- M. Anji Reddy – *Textbook of Remote Sensing and GIS*
- Aronoff, S. (1989). Geographic information systems: A management perspective. WDL Publications.
- Bolstad, P. (2016). GIS fundamentals: A first text on geographic information systems (5th ed.). Eider Press.
- Burrough, P. A., & McDonnell, R. A. (1998). Principles of geographical information systems. Oxford University Press.
- Heywood, I., Cornelius, S., & Carver, S. (2011). An introduction to geographical information systems, Pearson.
- Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic information science and systems (4th ed.). Wiley.

AEC-01: English Communication – I

(As per Common Syllabus prescribed by Vidyasagar University)

SEC-01: Computer Fundamentals (Practical)

Course Objectives

- To develop basic computer handling skills.
- To provide hands-on training in office applications.

- To introduce internet tools and data management.
- To prepare students for digital academic and professional work.

course Outcomes (COs)

After completing this course, students will be able to, operate a computer system efficiently, prepare professional documents, spreadsheets, and presentations, perform basic data analysis using spreadsheet tools, use internet and email for academic communication, manage digital files and resources effectively.

Course Contents

1. Understanding hardware components; Starting and shutting down a computer; File and folder creation, renaming, deleting; Copy, move, and organize files; Using Control Panel settings.
2. Creating and formatting documents; Font formatting, paragraph alignment, line spacing; Page setup and margins; Inserting tables, images, shapes; Header, footer, and page numbering; Mail merge basics.
3. Creating worksheets; Basic formulas (SUM, AVERAGE, COUNT, MAX, MIN); Cell formatting; Sorting and filtering; Creating charts (bar, pie, line); Basic data analysis.
4. Creating slides; Slide layout and design; Inserting text, images, charts; Slide transitions and animations; Slide show settings.
5. Using web browsers; Searching academic resources; Downloading and uploading files; Creating and managing email account; Sending email with attachment; Introduction to Google Drive.

References

- Sinha, P. K., & Sinha, P. (2010). Computer fundamentals (6th ed.). BPB Publications.
- Norton, P. (2013). Introduction to computers (7th ed.). McGraw-Hill.
- Lambert, J. (2019). Microsoft Office 365 step by step. Microsoft Press.
- Miller, M. (2017). Computer basics: Absolute beginner's guide (8th ed.). Que Publishing.
- Guerrero, H. (2019). Excel data analysis: Modeling and simulation. Springer.

MDC–01 (Multidisciplinary Course) (Any One)

(As per Common Syllabus prescribed by Vidyasagar University)

1. Indian Constitution
2. Social value and Ethics
3. Sports and fitness
4. Basics of Information Technology (IT)
5. Basics of Accounting
6. NGO and its Operations
7. Business Organisation

VAC–01: Environmental Studies (ENVS)

(As per Common Syllabus prescribed by Vidyasagar University)

SEMESTER – II

MJ-02: Platforms and Sensors

Course Objectives

- To develop fundamental knowledge of satellite platforms, remote sensing sensors, and their characteristics.
- To understand sensor resolutions, spectral characteristics, satellite data formats, and image interpretation concepts.
- To develop skills in identifying, acquiring, and using satellite data from different Earth observation missions.

Course Outcomes

- Students will be able to understand satellite platforms and sensor characteristics, interpret different types of satellite data, and acquire suitable datasets for geospatial applications.

Course Content

MJ-2T: Platforms and Sensors

1. Types and Characteristics of Sensor: Imaging and non-imaging sensors, Active and passive sensors
2. Sensor Resolution and Remote Sensing Concepts: Spatial, spectral, radiometric, and temporal resolution; scale and mapping units; single-band and multi-band concepts; relationship between sensor resolution and image interpretation.
3. Overview of Indian satellites (IRS, Cartosat, Resourcesat); Landsat missions; Data formats (Raster and vector data, pixel concept); Satellite data acquisition and downloading sources.
4. Satellite Specifications and Applications: Characteristics and applications of selected satellite missions including IRS, Landsat, and SPOT; overview of high-resolution satellites such as IKONOS, Cartosat, QuickBird, OrbView, GeoEye and WorldView; Introduction to recent Earth observation satellite missions and emerging high-resolution satellite systems.

MJ-2P: Platforms and Sensors – Lab

1. Study of Sensor Resolutions: Practical comparison of spatial, spectral, radiometric, and temporal resolutions of selected satellite sensors; understanding scale, mapping units, and single-band and multi-band concepts.
2. Satellite Data Formats and Pixel Concepts: Study and visualization of raster and vector data using GIS/remote sensing software; examination of pixel size, pixel values, bands, and multi-band raster datasets.
3. Satellite Image Interpretation and Application: Visualization and interpretation of satellite images from different sensors; comparison of image quality and feature identification; selection of suitable satellite datasets for land-use/land-cover mapping

References

- Campbell, J. B., & Wynne, R. H. (2011). *Introduction to Remote Sensing* (5th ed.). Guilford Press.
- Jensen, J. R. (2015). *Introductory Digital Image Processing: A Remote Sensing Perspective* (4th ed.). Pearson.
- Lillesand, T., Kiefer, R. W., & Chipman, J. (2015). *Remote Sensing and Image Interpretation* (7th ed.). Wiley.
- Joseph, G. (2005). *Fundamentals of Remote Sensing* (2nd ed.). Universities Press.
- Nag, P., & Kudrat, M. (1998). *Digital Remote Sensing*. Concept Publishing Company.
- Richards, J. A., & Jia, X. (2006). *Remote Sensing Digital Image Analysis: An Introduction* (4th ed.). Springer.
- Weng, Q. (2010). *Remote Sensing and GIS Integration: Theories, Methods, and Applications*. McGraw-Hill.

MI-02: Remote Sensing and Image Interpretation

Course Objectives

- To understand the principles of electromagnetic radiation and remote sensing systems.
- To examine sensor characteristics and data acquisition methods.
- To develop skills in visual and digital image interpretation.
- To analyze satellite data using image processing techniques.

Course Outcomes

Students will be able to, explain the principles of remote sensing and sensor technologies, interpret satellite imagery using visual and digital methods, apply image processing techniques including classification and enhancement, perform change detection and assess accuracy of results, utilize remote sensing data for real-world applications.

Course content

MI-02T: Remote Sensing and Image Interpretation

1. Electromagnetic radiation, interaction with Earth features, spectral signatures of water, soil, and vegetation.
2. Passive and active sensors; airborne and satellite platforms; spatial, spectral, temporal, and radiometric resolution.
3. Visual interpretation elements (tone, texture, pattern, shape, size, association); digital interpretation basics.
4. Image enhancement and filtering; supervised and unsupervised classification techniques.

MI-02P: Remote Sensing and Image Interpretation - Lab

1. True and False Color Composite (FCC) generation and visualization of satellite imagery.
2. Image classification using supervised and unsupervised techniques.
3. NDVI calculation for vegetation analysis.
4. Change detection analysis using multi-temporal data.

References

- Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). Remote sensing and image interpretation (7th ed.). Wiley.
 - Jensen, J. R. (2007). Remote sensing of the environment: An earth resource perspective (2nd ed.). Pearson.
 - Jensen, J. R. (2015). Introductory digital image processing: A remote sensing perspective (4th ed.). Pearson.
 - Canada Centre for Remote Sensing. (2009). Fundamentals of remote sensing. Natural Resources Canada.
 - Campbell, J. B., & Wynne, R. H. (2011). Introduction to remote sensing (5th ed.). Guilford Press.
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AEC-02 (Bengali / Hindi)

(As per Common Syllabus prescribed by Vidyasagar University)

SEC-02: Land Surveying (Practical)

Course Objectives

- To introduce students to modern electronic surveying instruments.
- To develop hands-on skills in operating a Total Station.
- To perform field data collection and basic survey computations.
- To prepare students for professional land and engineering surveys.

Course Outcomes (COs)

After completing this course, students will be able to, operate a Total Station instrument independently, conduct field surveys using modern techniques, perform coordinate and area calculations, transfer field data into GIS-compatible formats, apply Total Station data in mapping and infrastructure planning.

Course Content

1. Definition and components of Total Station (TS), Prismatic Compass and Dumpy Level; Principle of Electronic Distance Measurement (EDM); Parts of Total Station; Components and functions of Prismatic Compass and Dumpy Level.
2. Centering and levelling; Temporary and permanent adjustments of Total Station, Prismatic Compass and Dumpy Level; Setting up over a known point; Input of coordinates;
3. Measurement of horizontal and vertical angles; Distance measurement; Bearing measurement using Prismatic Compass; Levelling using Dumpy Level.
4. Radiation method; Resection method; Traverse survey using Total Station and Prismatic Compass; Stake-out

method; Topographic survey; Differential and profile levelling using Dumpy Level.

References

- Anderson, J. M., & Mikhail, E. M. (1998). Surveying: Theory and practice (7th ed.). McGraw-Hill.
- Bolstad, P. (2016). GIS fundamentals: A first text on geographic information systems (5th ed.). Eider Press.
- Clark, D. (2001). Plane surveying (5th ed.). CBS Publishers.
- Ghilani, C. D., & Wolf, P. R. (2018). Elementary surveying: An introduction to geomatics (15th ed.). Pearson.
- Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic information systems and science (4th ed.). Wiley.
- Punmia, B. C., Jain, A. K., & Jain, A. K. (2005). Surveying (Vol. 2). Laxmi Publications.
- Schofield, W., & Breach, M. (2007). Engineering surveying (6th ed.). Butterworth-Heinemann.
- Subramanian, R. (2014). Surveying and leveling. Oxford University Press.
- Venugopal, C. (2007). Basic surveying. Universities Press.

MDC-02 (Multidisciplinary Course) (Any One)

(As per the Common Syllabus prescribed by Vidyasagar University)

1. Nation, Culture & India
2. Gender Studies
3. Community Nutrition & Public Health
- 4. Physical and Cultural Geography of Bengal**
5. Natural Resource Management
6. Digital Technologies
7. Financial Literacy and Household Decision-Making

VAC-2 (Value Added Course) (Any One)

(As per the Common Syllabus prescribed by Vidyasagar University)

1. Human Rights
2. Yoga and Wellness
- 3. Disaster Management**

Summer Intern

CS: Community Service (activities to be decided by the Colleges)
