

National Education Policy-2020

**Common Minimum Syllabus for Uttarakhand State
Universities and Colleges**

SKILL ENHANCEMENT COURSE

Mapping Techniques

2025

For Undergraduate Courses

**DEPARTMENT OF GEOGRAPHY
DSB CAMPUS, KUMAUN UNIVERSITY
NAINITAL**

List of Papers (SEC) with semester wise titles

Semester 1 -	MT.SEC-01	Introduction to Mapping and Cartography
Semester 2 -	MT.SEC-02	Digital Mapping Tools and Software
Semester 3 -	MT.SEC-03	Mapping Techniques and Data Representation
Semester 4 -	MT.SEC-04	Remote Sensing and Satellite Data in Mapping
Semester 5 -	MT.SEC-05	Mapping for Specific Applications
Semester 6 -	MT.SEC-06	Research Methodology and Project Work

COMMITTEE OF BOARD OF STUDY

Sl. No.	Name and address of external experts/member	
1	Prof. S. Sreekesh, Centre for the Study of Regional Development, School of Social Sciences, Jawahar Lal University, Delhi Email: sreekesh@mail.jnu.ac.in, sreekesh@jnu.ac.in Mob. No. 9013575858	Expert
2	Prof. A. R. Siddiqui, Department of Geography, University of Allahabad, Allahabad, E-mail: arsiddiqui1970@yahoo.com , azizrs@yahoo.com Mobile No. 9450608208	Expert
3	Prof. B. W. Pandey Department of Geography, Delhi School of Economics, University of Delhi 110007. Email: bwpandey@geography.du.ac.in Mobile No.- 9560525260	Expert
4	Prof. Anita Pande, Department of Geography, DSB Campus, Kumaun University, Nainital, Email: anita.ku.ntl@gmail.com Mob. No. 9411793991	Member
5	Prof. T. B Singh Govt. Girls' PG College of Commerce, Haldwani Email: drtbsingh1961@gmail.com Mob. No. 9456109466	Member
6	Prof. Anjali Punera, <i>Government Degree College, Kotabagh, District – Nainital</i> Email: dranjlipunera@gmail.com Mob. No. 9837852832	Member
7	Prof. R C Joshi, Department of Geography, DSB Campus, Kumaun University, Nainital, Email: hod.geog23dsb@gmail.com Mob. No. 8958811453	Head and convener

DRAFT SYLLABUS PREPARATION COMMITTEE

S.N.	NAME	DESIGNATION	DEPARTMENT	AFFILIATION
1.	DR. R. C. JOSHI	PROFESSOR AND HEAD	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL
2.	DR. ANITA PANDE	PROFESSOR	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL
3.	DR. MANISHA TRIPATHI	ASSOCIATE PROFESSOR	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL
4.	DR. MOHAN LAL	ASSISTANT PROFESSOR	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL
5.	DR. PRAKASH CHANYAL	ASSISTANT PROFESSOR	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL
6.	DR. VINITA JOSHI	ASSISTANT PROFESSOR (c)	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL
7.	DR. D. S. PARIHAR	ASSISTANT PROFESSOR (c)	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL
8.	DR. MASOOM REZA	ASSISTANT PROFESSOR (c)	GEOGRAPHY	KUMAUN UNIVERSITY, NAINITAL

PROGRAMME PREREQUISITES

Any student in B.A./B.Sc./B.Com programme (undergraduate level) can opt for Skill Enhancement Course as per university rules.

Program Outcome (POs):

1. Understanding of the Fundamental Principles of Mapping - Develop a strong foundational knowledge of mapping, cartography, and geographic data visualization.
2. Design Effective Maps - Learn to create clear, accurate, and proper visualisation of maps that communicate spatial information.
3. Use of Geographic Information Systems (GIS) - Gain proficiency in using GIS software and tools for mapping, spatial analysis, and data management.

4. Application of Remote Sensing Techniques in Mapping - Understand and apply remote sensing data (e.g., satellite, UAV, LiDAR) in conjunction with GIS to solve real-world problems.
5. Integration of Cartographic and GIS Concepts for Decision Making - Synthesize GIS, mapping, and remote sensing knowledge for spatial decision-making and practical applications in various sectors (e.g., urban planning, disaster management).

Program Specific Outcomes (PSO):

PSO 1: Mapping Fundamentals and Cartography Skills - Demonstrate knowledge of the history and evolution of maps, types of maps, and cartographic principles. Apply map elements such as symbols, scales, projections, and coordinate systems to design maps that effectively communicate spatial data.

PSO 2: Cartographic Design and Visualization - Understand and apply principles of map design including visual hierarchy, color theory, typography, and spatial layout. Use digital mapping tools, including GIS software, to create and analyze various types of maps based on real-world data.

PSO 3: Geographic Information Systems (GIS) Expertise - Gain hands-on experience in GIS tools for data input, management, and analysis (including spatial queries and overlay analysis). Create and customize thematic maps using GIS for detailed spatial analysis and decision-making.

PSO 4: Remote Sensing Data Application - Understand different types of remote sensing data (optical, radar, LiDAR) and their applications in environmental monitoring, land-use mapping, and agriculture. Integrate remote sensing data with GIS platforms to generate detailed, accurate maps for various applications like disaster management, urban planning, and agriculture.

DEPARTMENT OF GEOGRAPHY

B.A./B.Sc./B.Com.

SKILL ENHANCEMENT COURSE (SEC-1) Introduction to Mapping and Cartography

Programme: Under Graduate in Arts/Science		Year: I	Semester: I
Subject: Skill Enhancement		Course Code: MT.SEC-01	Course Title: Introduction to Mapping and Cartography
Course Outcomes 1. Understand the fundamental concepts and significance of mapping and cartography. 2. Identify and analyze different types of maps and their applications. 3. Develop skills in understanding coordinate systems and map projections.			
Theory- (Credit-1)	Distribution of marks according the University rule.		
Total No. of Lectures – Tutorials – Practical (in hours per week): 1-0-1		15 hrs for 1 credit theory, 30 hrs for 1 credit practical	
Unit	Course Content		Lectures
Unit – I	Overview of Mapping and Cartography: Definition and Importance of Mapping; History and Evolution of Maps; Types of Maps		06
Unit – II	Map Elements: Title, Legend, Scale, Compass, and Introduction to Coordinate Systems (Latitude, Longitude, and Global Coordinate Systems; Introduction to Projections and Distortions Projected Coordinate Systems).		09
Practical (Credit-1)	Map reading, Base map preparation and understanding of coordinate system (WGS84, NAD83 AND UTM)		30

Suggested Readings

- Robinson, A. H. (1995) Elements of Cartography, John Wiley & Sons.
- Slocum, T. A. (2009) Thematic Cartography and Geovisualization, Pearson.
- Longley, P. A. (2015) Geographic Information Science & Systems, Wiley.

DEPARTMENT OF GEOGRAPHY
B.A./B.Sc./B.Com.
SKILL ENHANCEMENT COURSE (SEC-1) Digital Mapping Tools and Software

Programme: Under Graduate in Arts/Science		Year: I	Semester: II
Subject: Skill Enhancement		Course Code: MT.SEC-02	Course Title: Digital Mapping Tools and Software
Course Outcomes 1. Develop an understanding of digital mapping and GIS concepts. 2. Gain hands-on experience with GIS software tools such as QGIS/ArcGIS. 3. Learn to create and edit simple digital maps and analyze spatial data.			
Theory- (Credit-1)	Distribution of marks according the University rule.		
Total No. of Lectures – Tutorials – Practical (in hours per week): 1-0-1		15 hrs for 1 credit theory, 30 hrs for 1 credit practical	
Unit	Course Content		Lectures
Unit – I	A brief Revision of Semester - I (Introduction to Mapping and Cartography)		2
	Introduction to Digital Mapping: Transition from Paper Maps to Digital Mapping; Basic Functions of Digital Mapping Tools; Introduction to Geospatial Data and GIS (Geographic Information Systems).		7
Unit – II	Introduction to GIS Software: Overview of GIS Tools (e.g., QGIS, ArcGIS); Basic GIS Interface and Functions; Importing and Viewing Spatial Data.		6
Practical (Credit - 1)	Creating and Editing Simple Maps Using GIS: Adding Layers, Points, Lines, and Polygons; Introduction to Spatial Data Formats (Shapefiles, GeoJSON), Basic Data Analysis in GIS: Simple Queries and Data Filtering; Creating Basic Thematic Maps.		30

Suggested Readings

- Bolstad, P. (2016) GIS Fundamentals: A First Text on Geographic Information Systems, XanEdu.
- DeMers, M. N. (2017) Fundamentals of Geographic Information Systems, Wiley.

DEPARTMENT OF GEOGRAPHY

B.A./B.Sc./B.Com.

SKILL ENHANCEMENT COURSE (SEC-1) Mapping Techniques and Data Representation

Programme: Under Graduate in Arts/Science		Year: II	Semester: III
Subject: Skill Enhancement		Course Code: MT.SEC-03	Course Title: Mapping Techniques and Data Representation
Course Outcomes 1. Enhance proficiency in advanced mapping techniques and cartographic design. 2. Understand the different geospatial data types and their applications.			
Theory- (Credit-1)	Distribution of marks according the University rule.		
Total No. of Lectures – Tutorials – Practical (in hours per week): 1-0-1			15 hrs for 1 credit theory, 30 hrs for 1 credit practical
Unit	Course Content		Lectures
Unit – I	A brief Revision of Semester - II (Digital Mapping Tools and Software)		3
	Advanced Mapping Techniques: Use of Symbology and Cartographic Design; Layering, Labelling, and Annotation in GIS; Design and Layout of Thematic Maps (Choropleth, Graduated Symbol, etc.)		6
Unit – II	Geospatial Data Types: Raster vs. Vector Data; Spatial Data Structures and Attributes; Working with Satellite Imagery and Aerial Photography		6
Practical (Credit-1)	Map Projections and Distortion: Distortions in Shape, Area, Distance, and Direction; Selecting Appropriate Projections for Different Maps. Data Classification and Visualization: Techniques for Classifying Spatial Data; Cartographic Visualization		30

Suggested Readings

- Dent, B. D. (2009) Cartography: Thematic Map Design, McGraw-Hill.
- Tobler, W. (2002) Geographical Information Science, Springer.

DEPARTMENT OF GEOGRAPHY

B.A./B.Sc./B.Com.

SKILL ENHANCEMENT COURSE (SEC-1) Remote Sensing and Satellite Data in Mapping

SKILL ENHANCEMENT: COURSE (SEM-IV) Remote Sensing and Satellite Data in Mapping		
Programme: Under Graduate in Arts/Science	Year: II	Semester: IV
Subject: Skill Enhancement	Course Code: MT.SEC-04	Course Title: Remote Sensing and Satellite Data in Mapping
Course Outcomes 1. Understanding of remote sensing data and their characteristics 2. Application of Remote Sensing Data in Map making.		
Theory- (Credit-1)	Distribution of marks according the University rule.	
Total No. of Lectures – Tutorials – Practical (in hours per week): 1-0-1 15 hrs for 1 credit theory, 30 hrs for 1 credit practical		
Unit	Course Content	Lectures
Unit – I	A brief Revision of Semester - III (Mapping Techniques and Data Representation)	3
	Introduction to Remote Sensing: Principles of Remote Sensing; Types of Sensors (Passive and Active); Applications of Remote Sensing in Mapping.	6
Unit – II	Satellite Imagery and Aerial Photography: Types of Satellite Imagery (Multispectral, Panchromatic, etc.); Using Satellite Data in Mapping and Analysis; Image Pre-processing Techniques (Enhancement, Filtering).Types and fundamentals of Air Photo interpretation	6
Practical (Credit-1)	Image Classification and Analysis: Image Interpretation and Feature Extraction; Supervised and Unsupervised Classification; Change Detection Techniques, Application of LiDAR (Light Detection and Ranging) in creating digital elevation models (DEMs) and analyzing the terrain.	30

Suggested Readings

- Jensen, J. R. (2013) Remote Sensing of the Environment, Pearson.
- Lillesand, T. M. (2015) Remote Sensing and Image Interpretation, Wiley.

DEPARTMENT OF GEOGRAPHY
B.A./B.Sc./B.Com.
SKILL ENHANCEMENT COURSE (SEC-1) Mapping for Specific Applications

Programme: Under Graduate in Arts/Science		Year: III	Semester: V
Subject: Skill Enhancement		Course Code: MT.SEC-05	Course Title: Mapping for Specific Applications
Course Outcomes 1. Understand and apply mapping techniques for urban planning and land use analysis. 2. Develop skills in environmental mapping, including natural resource assessment and impact analysis. 3. Utilize mapping tools for disaster management, risk assessment, and emergency response planning.			
Theory- (Credit-1)	Distribution of marks according the University rule.		
Total No. of Lectures – Tutorials – Practical (in hours per week): 1-0-1		15 hrs for 1 credit theory, 30 hrs for 1 credit practical	
Unit	Course Content		Lectures
Unit – I	A brief Revision of Semester - IV (Remote Sensing and Satellite Data in Mapping)		3
	Urban and Land Use Mapping: Mapping for Urban Planning; Land Use Mapping and Change Detection.		6
Unit – II	Environmental Mapping: Natural Resource Mapping (Water Bodies, Forests, etc.); Environmental Impact Assessment Mapping; Disaster Management and Risk Mapping, Emergency Response Mapping.		6
Practical (Credit-1)	Landuse/land cover (LULC), Land, water and Forest Mapping		30

Suggested Readings

- Goodchild, M. F. (2016) GIS and Environmental Modeling, Oxford University Press.
- Burrough, P. A. (2015) Principles of Geographical Information Systems, Oxford.

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B.A./B.Sc./B.Com.

SKILL ENHANCEMENT COURSE (SEC-1) Research Methodology and Project Work

Programme: Under Graduate in Arts/Science		Year: III	Semester: VI
Subject: Skill Enhancement		Course Code: MT.SEC-06	Course Title: Research Methodology and Project Work
Course Outcomes 1. Application of GIS techniques for spatial analysis. 2. Develop skills in project planning, data collection, and map making. 3. Execute an independent or group GIS-based mapping project related to urban, environmental, or disaster management.			
Theory- (Credit-1)	Distribution of marks according the University rule.		
Total No. of Lectures – Tutorials – Practical (in hours per week): 1-0-1		15 hrs for 1 credit theory, 30 hrs for 1 credit practical	
Unit	Course Content		Lectures
Unit – I	Preparation of Project outline: Introduction, Statement of Problem, objectives, Literature review, data source and methodology, Hypothesis, Research Design, Research Ethics, chapterisation schemes and references.		15
Practical (Credit-1)	Capstone Project: Field survey-based project dissertation preparation using GIS (Independent or Group Project on a relevant topic viz. Physical landscape, Urban, Environmental, Disaster, etc). (Students are required to prepare 15–20-pages dissertation and must be submitted it in hard copy in the Department one week before the commencement of the Theory Examinations. The evaluation and viva –voce examination will be conducted by the department as per the university guideline.)		30

Note: In 6th semester the fresh entry (those who have not opted at least two previous semesters of this course) is not Allowed.

Suggested Readings

- Longley, P. A. (2015) Geographic Information Science & Systems, Wiley.
- Tomlin, C. (2013) GIS and Cartographic Modeling, Esri Press.