

Structure and Detailed Syllabus

for

Undergraduate Course

in

Geography

Under Curriculum and Credit Framework for Undergraduate Programmes
(CCFUP) - NEP 2020



With effect from Academic Session 2023-24

Kazi Nazrul University

Asansol 713 340

West Bengal

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Draft Syllabus for Undergraduate Course in Geography under Curriculum and Credit Framework for Undergraduate Programmes (CCFUP) - NEP 2020 vide approval of structure and syllabus taken at the Meeting of the **Undergraduate Board of Studies (UGBOS) in Geography**, Kazi Nazrul University, held on **05.07.2023** and as resolved at the Workshop held on **03.08.2023**, and also as per UGBOS Meeting held on **22.08.2024**.

Scheme for the Curriculum under CCFUP (As per NEP 2020)

✧ **Major Course (MJC)**

- BSCGEOMJ101 - Fundamentals of Physical Geography**
- BSCGEOMJ201 - Fundamentals of Human Geography**
- BSCGEOMJ301 - Climatology**
- BSCGEOMJ302 - Cartography and Surveying**
- BSCGEOMJ401 - Soil and Biogeography**
- BSCGEOMJ402 - Remote Sensing, GIS and GNSS**
- BSCGEOMJ501 - Economic and Transport Geography**
- BSCGEOMJ502 - Statistical Techniques in Geography**
- BSCGEOMJ503 - Basic Field Training and Field Report**
- BSCGEOMJ601 - Geographical Thought**
- BSCGEOMJ602 - Geography of India and West Bengal**
- BSCGEOMJ603 - Population and Settlement Geography**
- BSCGEOMJ604 - Advanced Remote Sensing and GIS**
- BSCGEOMJ701 - Advanced Geomorphology, Hydrology and Oceanography**
- BSCGEOMJ702 - Urban and Regional Planning**
- BSCGEOMJ703 - Advanced Analytical Techniques in Geography**
- BSCGEOMJ704 - Outreach Programme in Contemporary Issues**
- BSCGEOMJ801 - Environmental Geography**
- BSCGEOMJ802 - Geography of Development**
- BSCGEOMJ803 - Agricultural Geography and Landuse Planning**
- BSCGEOMJ804 - Social and Political Geography**

✧ **Skill Enhancement Course (SEC)**

- BSCGEOSE101 - Elementary Practicals in Physical Geography**
- BSCGEOSE201 - Elementary Practicals in Human Geography**
- BSCGEOSE401 - Computer Applications in Geography**



❖ **Summer Internship (SI)**

SI601 - Summer Internship

❖ **Research Project/ Dissertation (RP)**

BSCGEORP801 - Research Methodology and Ethics

BSCGEORP802 - Research Project/ Dissertation

❖ **Minor Course (MNC)**

BSCHGEOMN101 - Fundamentals of Physical Geography

BSCHGEOMN201 - Fundamentals of Human Geography

BSCHGEOMN301 - Climate Change: Vulnerability and Adaptations

BSCHGEOMN401 - Geospatial Science and Technology

BSCHGEOMN501 - Sustainable Resource Development

BSCHGEOMN701 - Geotourism

BSCHGEOMN801 - Rural Development

❖ **Multidisciplinary Course (MDC): Courses for other Disciplines across the Faculties**

MDC104 - Disaster Management

MDC301 - Bharatavarsha - A Land of Rare Natural Endowments

❖ **Ability Enhancement Course (AEC-1): Pool of Communication Courses offered in Semester I**

AECE101 - English Communication

AECB101 - Bengali Communication

AECH101 - Hindi Communication

AECU101 - Urdu Communication

❖ **Value Added Course (VAC-2): Pool of Courses offered in Semester IV for all Disciplines across all Faculties**

VAC401 - Yoga And Health

VAC402 - Social Values and Ethics

VAC403 - Digital and Technological Solutions

VAC404 - Understanding India

VAC405 - Sustainable Development: Issues and Challenges

VAC406 - Goods and Services Tax

VAC407 - Basics of Indian Constitution



✧ Credits and Marks Distribution Scheme for Course Structure under CCFUP: UG Geography

Discipline Code: **BSCGEO**

Semester	Course Type and Details	Course Code and Name	Credits	Credit Pattern (L-T-P)	Marks Distribution				
					Continuous Assessment Marks		End Semester Marks		Total Marks
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam	
I Marks: 350 Credits: 20	Major MJC-1	BSCGEOMJ101: Fundamentals of Physical Geography	5	4 - 1 - 0	----	30	----	70	100
	Minor MNC-1	Choose from the Pool of Minor Courses offered in 1 st Semester by other Disciplines within the Faculty	5	4 - 1 - 0	----	30	----	70	100
	MD Multidisciplinary Course (MDC-1)	Choose from the Pool of Multidisciplinary Courses offered in 1 st Semester across the Faculties (See Pool)	3	2 - 1 - 0	----	15	----	35	50
	AE Ability Enhancement Course (AEC-1)	English/ MIL Communication (See Pool)	4	4 - 0 - 0	----	15	----	35	50
	SE Skill Enhancement Course (SEC-1)	BSCGEOSE101: Elementary Practicals in Physical Geography	3	0 - 0 - 6	30	----	20	----	50
II Marks: 350 Credits: 20	Major MJC-2	BSCGEOMJ201: Fundamentals of Human Geography	5	4 - 1 - 0	----	30	----	70	100
	Minor MNC-2	Choose from the Pool of Minor Courses offered in 2 nd Semester by other Disciplines within the Faculty (Corresponding Course Code of Minor opted in 1 st Semester)	5	4 - 1 - 0	----	30	----	70	100
	MD Multidisciplinary Course (MDC-2)	Choose from the Pool of Multidisciplinary Courses offered in 2 nd Semester across the Faculties (See Pool)	3	2 - 1 - 0	----	15	----	35	50



	Course Type and Details	Course Code and Name	Credits	Credit Pattern (L-T-P)	Marks Distribution					
					Continuous Assessment Marks		End Semester Marks		Total Marks	
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam		
	VA Value Added Course (VAC-1)	VAC201: Environment Studies	4	4 - 0 - 0	----	15	----	35	50	
	SEC Skill Enhancement Course (SEC-2)	BSCGEOSE201: Elementary Practicals in Human Geography	3	0 - 0 - 6	30	----	20	----	50	
Students exiting the programmes after securing 40 credits will be awarded UG Certificate in the relevant Discipline/ Subject, provided they secure following 4 credits in work-based vocational courses/ summer internship during 1 st year										
II	VC VCC-1	VC201: Vocational Course	(Any One)	4	0 - 0 - 8	30	----	20	----	50
	SI SIC-1	SI201: Summer Internship								
III	Major MJC-3	BSCGEO MJ301: Climatology	5	3 - 0 - 4	30	15	20	35	100	
	Major MJC-4	BSCGEO MJ302: Cartography and Surveying	5	0 - 0 - 10	60	----	40	----	100	
	Minor MNC-3	Choose from the Pool of Minor Courses offered in 3 rd Semester by other Disciplines within the Faculty (See Pool)	5	4 - 1 - 0	----	30	----	70	100	
	MD Multidisciplinary Course (MDC-3)	Choose from the Pool of Multidisciplinary Courses offered in 3 rd Semester across the Faculties (See Pool)	3	2 - 1 - 0	----	15	----	35	50	



Semester	Course Type and Details	Course Code and Name			Marks Distribution				
					End Semester Marks		End Semester Marks		Total Marks
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam	
III	AE Ability Enhancement Course (AEC-2)	English Communication	4	4 - 0 - 0	----	15	----	35	50
IV Marks: 400 Credits: 22	Major MJC-5	BSCGEOMJ401: Soil and Biogeography	5	3 - 0 - 4	30	15	20	35	100
	Major MJC-6	BSCGEOMJ402: Remote Sensing, GIS and GNSS	5	3 - 0 - 4	30	15	20	35	100
	Minor MNC-4	Choose from the Pool of Minor Courses offered in 4 th Semester by other Disciplines within the Faculty (See Pool)	5	4 - 1 - 0	----	30	----	70	100
	SEC Skill Enhancement Course (SEC-3)	BSCGEOSE401: Computer Applications in Geography	3	0 - 0 - 6	30	----	20	----	50
	VA Value Added Course (VAC-2) (Any One)	VAC401: Yoga And Health	4	4 - 0 - 0	----	15	----	35	50
		VAC402: Social Values and Ethics		4 - 0 - 0	----	15	----	35	
		VAC403: Digital and Technological Solutions		4 - 0 - 0	----	15	----	35	
VAC404: Understanding India		4 - 0 - 0		----	15	----	35		
VAC405: Sustainable Development: Issues and Challenges		4 - 0 - 0		----	15	----	35		
VAC406: Goods and Services Tax	4 - 0 - 0	----	15	----	35				
VAC407: Basics of Indian Constitution	4 - 0 - 0	----	15	----	35				



	Course Type and Details	Course Code and Name	Credits	Credit Pattern (L-T-P)	Marks Distribution					
					Continuous Assessment Marks		End Semester Marks		Total Marks	
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam		
Students exiting the programmes after securing 84 credits will be awarded UG Diploma in the relevant Discipline/ Subject, provided they secure following 4 credits in work-based vocational courses/ summer internship during 2 nd year										
IV Marks: 450 Credits: 26	VC VCD-1	VC401: Vocational Course	(Any One)	4	0 - 0 - 8	30	----	20	----	50
	SI SID-1	SI401: Summer Internship								
V Marks: 400 Credits: 20	Major MJC-7	BSCGEOMJ501: Economic and Transport Geography	5	3 - 0 - 4	30	15	20	35	100	
	Major MJC-8	BSCGEOMJ502: Statistical Techniques in Geography	5	3 - 0 - 4	30	15	20	35	100	
	Major MJC-9	BSCGEOMJ503: Basic Field Training and Field Report	5	0 - 0 - 10	60	----	40	----	100	
	Minor MNC-5	Choose from the Pool of Minor Courses offered in 5 th Semester by other Disciplines within the Faculty (See Pool)	5	4 - 1 - 0	----	30	----	70	100	
VI Marks: 450 Credits: 22	Major MJC-10	BSCGEOMJ601: Geographical Thought	5	3 - 0 - 4	30	15	20	35	100	
	Major MJC-11	BSCGEOMJ602: Geography of India and West Bengal	5	3 - 0 - 4	30	15	20	35	100	
	Major MJC-12	BSCGEOMJ603: Population and Settlement Geography	5	3 - 0 - 4	30	15	20	35	100	
	Major MJC-13	BSCGEOMJ604: Advanced Remote Sensing and GIS	5	3 - 0 - 4	30	15	20	35	100	



	Course Type and Details	Course Code and Name	Credits	Credit Pattern (L-T-P)	Marks Distribution				Total Marks
					End Semester Marks		End Semester Marks		
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam	
	SI SIMC-1	SI601: Summer Internship	2	0 - 0 - 4	30	----	20	----	50
Total Credit and Marks		Total Credit	126		Total Marks				2350
Students who want to undertake 3-year UG programme will be awarded UG Degree in the relevant Discipline/ Subject upon securing 126 credits .									
4-Year UG Degree (Honours)									
VII Marks: 500 Credits: 25	Major MJC-14	BSCGEOMJ701: Advanced Geomorphology, Hydrology and Oceanography	5	3 - 0 - 4	30	15	20	35	100
	Major MJC-15	BSCGEOMJ702: Urban and Regional Planning	5	3 - 0 - 4	30	15	20	35	100
	Major MJC-16	BSCGEOMJ703: Advanced Analytical Techniques in Geography	5	0 - 2 - 6	60	----	40	----	100
	Major MJC-17	BSCGEOMJ704: Outreach Programme in Contemporary Issues	5	0 - 2 - 6	60	----	40	----	100
	Minor MNC-6	Choose from the Pool of Minor Courses offered in 7 th Semester by other Disciplines within the Faculty (See Pool)	5	4 - 1 - 0	----	30	----	70	100
VIII Marks: 500 Credits: 22	Major MJC-18	BSCGEOMJ801: Environmental Geography	5	3 - 0 - 4	30	15	20	35	100
	Major MJC-19	BSCGEOMJ802: Geography of Development	4	2 - 0 - 4	30	15	20	35	100
	Major MJC-20	BSCGEOMJ803: Agricultural Geography and Landuse Planning	4	2 - 0 - 4	30	15	20	35	100



Semester	Course Type and Details	Course Code and Name	Credits	Credit Pattern (L-T-P)	Marks Distribution				Total Marks
					End Semester Marks		End Semester Marks		
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam	
VIII	Major MJC-21	BSCGEOMJ804: Social and Political Geography	4	2 - 0 - 4	30	15	20	35	100
	Minor MNC-7	Choose from the Pool of Minor Courses offered in 8 th Semester by other Disciplines within the Faculty (See Pool)	5	4 - 1 - 0	----	30	----	70	100
Total Credit and Marks		Total Credit	173		Total Marks				3350
Students who want to undertake 4-year UG Honours program will be awarded UG Degree (Honours) in the relevant Discipline/ Subject provided they secure 173 credits .									
4-year UG Degree (Honours with Research)									
VII	Major MJC-14	BSCGEOMJ701: Advanced Geomorphology, Hydrology and Oceanography	5	3 - 0 - 4	30	15	20	35	100
	Major MJC-15	BSCGEOMJ702: Urban and Regional Planning	5	3 - 0 - 4	30	15	20	35	100
	Major MJC-16	BSCGEOMJ703: Advanced Analytical Techniques in Geography	5	0 - 2 - 6	60	----	40	----	100
	Major MJC-17	BSCGEOMJ704: Outreach Programme in Contemporary Issues	5	0 - 2 - 6	60	----	40	----	100
	Minor MNC-6	Choose from the Pool of Minor Courses offered in 7 th Semester by other Disciplines within the Faculty (See Pool)	5	4 - 1 - 0	----	30	----	70	100
Marks: 500 Credits: 25									



VIII	Major MJC-18	BSCGEOMJ801: Environmental Geography	5	3 - 0 - 4	30	15	20	35	100
	RP Research Project (RPC--1)	BSCGEORP801: Research Methodology and Ethics	4	4 - 0 - 0	----	30	----	70	100
	RP Research Project (RPC--1)	BSCGEORP802: Research Project/ Dissertation	8	0 - 0 - 16	120	----	80	----	200
	Minor MNC-7	Choose from the Pool of Minor Courses offered in 8th Semester by other Disciplines within the Faculty (See Pool)	5	4 - 1 - 0	----	30	----	70	100
Total Credit and Marks		Total Credit	173		Total Marks				3350
<p>Students who want to undertake 4-year UG Honours with Research program will be awarded UG Degree (Honours with Research) in the relevant Discipline / Subject provided they secure 173 credits.</p>									



Semester wise Pool of Minor Courses offered by GEOGRAPHY for other Disciplines within the Faculty									
Semester	Course Type and Details	Course Code and Name	Credits	Credit Pattern (L-T-P)	Marks Distribution				
					Continuous Assessment Marks		End Semester Marks		Total Marks
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam	
I	Minor MNC-1	BSCHGEOMN101: Fundamentals of Physical Geography	5	4 - 1 - 0	----	30	----	70	100
II	Minor MNC-2	BSCHGEOMN201: Fundamentals of Human Geography	5	4 - 1 - 0	----	30	----	70	100
III	Minor MNC-3	BSCHGEOMN301: Climate Change: Vulnerability and Adaptations	5	4 - 1 - 0	----	30	----	70	100
IV	Minor MNC-4	BSCHGEOMN401: Geospatial Science and Technology	5	4 - 1 - 0	----	30	----	70	100
V	Minor MNC-5	BSCHGEOMN501: Sustainable Resource Development	5	4 - 1 - 0	----	30	----	70	100
VII	Minor MNC-6	BSCHGEOMN701: Geotourism	5	4 - 1 - 0	----	30	----	70	100
VIII	Minor MNC-7	BSCHGEOMN801: Rural Development	5	4 - 1 - 0	----	30	----	70	100

Note: Minor Courses (MNC): Students of a particular UG Course will choose from the Pool of Minor Courses offered by disciplines other than the major discipline opted by the student within the faculty. The student is required to opt the same Minor Discipline in the 2nd semester which he had opted in 1st semester. **Explanation:** If a student of GEOGRAPHY Major, opts for a Minor Course offered by Chemistry in 1st semester then that student is required to continue with the Minor Course offered by Chemistry for 2nd semester as Minor Course in the 2nd semester.



Semester wise Pool of Multidisciplinary Courses offered by GEOGRAPHY for other Disciplines across the Faculties									
Semester	Course Type and Details	Course Code and Name	Credits	Credit Pattern (L-T-P)	Marks Distribution				Total Marks
					Continuous Assessment Marks		End Semester Marks		
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam	
I	MD Multidisciplinary Course (MDC-1)	MDC104: Disaster Management	3	2 - 1 - 0	----	15	----	35	50
III	MD Multidisciplinary Course (MDC-3)	MDC301: Bharatavarsha - A Land of Rare Natural Endowments	3	2 - 1 - 0	----	15	----	35	50
Pool of Communication Courses offered as Ability Enhancement Courses in Semester I									
I	AEC-1 Ability Enhancement Course	AECE101: English Communication	4	4 - 0 - 0	----	15	----	35	50
		AECB101: Bengali Communication	4	4 - 0 - 0	----	15	----	35	50
		AECH101: Hindi Communication	4	4 - 0 - 0	----	15	----	35	50
		AECU101: Urdu Communication	4	4 - 0 - 0	----	15	----	35	50
Marks: 50 Credits: 4									



Semester wise Pool of Multidisciplinary Courses offered for all Disciplines across the Faculties									
Semester	Course Type and Details	Course Code and Name (Offered By Discipline)	Credits	Credit Pattern (L-T-P)	Marks Distribution				Total Marks
					Continuous Assessment Marks		End Semester Marks		
					Practical Exam	Theoretical Exam	Practical Exam	Theoretical Exam	
I	MD Multidisciplinary Course (MDC-1) (Any One)	MDC101: Physical Science (Physics)	3	2 - 1 - 0	----	15	----	35	50
		MDC102: E-Commerce (BBA)	3	2 - 1 - 0	----	15	----	35	50
		MDC103: Human Rights (Political Science)	3	2 - 1 - 0	----	15	----	35	50
		MDC104: Disaster Management (Geography)	3	2 - 1 - 0	----	15	----	35	50
		MDC105: Fitness and Wellness (Physical Education)	3	2 - 1 - 0	----	15	----	35	50
		MDC106: Application of Bio-Science (Zoology)	3	2 - 1 - 0	----	15	----	35	50
		MDC107: Film Appreciation (English)	3	2 - 1 - 0	----	15	----	35	50
		MDC108: Accounting for All (Commerce)	3	2 - 1 - 0	----	15	----	35	50
		MDC109: Exploring Early Medieval Bengal: C.7th Century CE to 1206 CE (History)	3	2 - 1 - 0	----	15	----	35	50
		MDC110: Bangla Sahitya O Sanskriti (Bengali)	3	2 - 1 - 0	----	15	----	35	50
		MDC111: Money and Banking (Economics)	3	2 - 1 - 0	----	15	----	35	50
		MDC112: Patrakarita (Hindi)	3	2 - 1 - 0	----	15	----	35	50
		MDC113: Business Mathematics (Mathematics)	3	2 - 1 - 0	----	15	----	35	50
		MDC114: Indian Society (Sociology)	3	2 - 1 - 0	----	15	----	35	50
		MDC115: Yoga for Daily Life (Philosophy)	3	2 - 1 - 0	----	15	----	35	50
		MDC116: Electronic Measurements (Electronics)	3	2 - 1 - 0	----	15	----	35	50



		MDC117: Information and Communication Technology (Computer Science)	3	2 - 1 - 0	----	15	----	35	50
		MDC118: Introduction to Local Flora (Botany)	3	2 - 1 - 0	----	15	----	35	50
		MDC119: Information and Media Literacy (Computer Applications)	3	2 - 1 - 0	----	15	----	35	50
		MDC120: Personal Finance (Commerce)	3	2 - 1 - 0	----	15	----	35	50
II Marks: 50 Credits: 3	MD Multidisciplinary Course (MDC-2) (Any One)	MDC201: Mathematical Science (Mathematics)	3	2 - 1 - 0	----	15	----	35	50
		MDC202: Business Environment (BBA)	3	2 - 1 - 0	----	15	----	35	50
		MDC203: Basic Statistics (Statistics)	3	2 - 1 - 0	----	15	----	35	50
		MDC204: Understanding Medieval Bengal Select Themes: 1206 CE-1727 CE (History)	3	2 - 1 - 0	----	15	----	35	50
		MDC205: Personal Finance (Commerce)	3	2 - 1 - 0	----	15	----	35	50
		MDC206: Nutrition and Public Health (Nutrition)	3	2 - 1 - 0	----	15	----	35	50
		MDC207: Educational Philosophy (Education)	3	2 - 1 - 0	----	15	----	35	50
		MDC208: Stress Management (Psychology)	3	2 - 1 - 0	----	15	----	35	50
		MDC209: Social Media and Cyber Awareness (Computer)	3	2 - 1 - 0	----	15	----	35	50
		MDC210: Adhunik Bangla Sahitya (Bengali)	3	2 - 1 - 0	----	15	----	35	50
		MDC211: Nazrul Sangeet (Nazrul Sangeet)	3	2 - 1 - 0	----	15	----	35	50
		MDC212: E-Waste Management (Electronics)	3	2 - 1 - 0	----	15	----	35	50
		MDC213: Chemical Science (Chemistry)	3	2 - 1 - 0	----	15	----	35	50
		MDC214: Critical Survey of Sanskrit Language (Sanskrit)	3	2 - 1 - 0	----	15	----	35	50
MDC215: Asnaf - E -Adab (Urdu)	3	2 - 1 - 0	----	15	----	35	50		
MDC216: Anuvad Vigyan (Hindi)	3	2 - 1 - 0	----	15	----	35	50		
MDC217: Herbal Home Remedies (Botany)	3	2 - 1 - 0	----	15	----	35	50		



III Marks: 50 Credits: 3	MD Multidisciplinary Course (MDC-3) (Any One)	MDC301: Bharatavarsha - A Land of Rare Natural Endowments (Geography)	3	2 - 1 - 0	----	15	----	35	50
		MDC302: The Vedangas and other Streams of Indian Knowledge System (Sanskrit)	3	2 - 1 - 0	----	15	----	35	50
		MDC303: Indian Astronomy (Physics)	3	2 - 1 - 0	----	15	----	35	50
		MDC304: Indian Health Sciences (Zoology)	3	2 - 1 - 0	----	15	----	35	50
		MDC305: Indian Mathematics (Mathematics)	3	2 - 1 - 0	----	15	----	35	50
		MDC306: Indian Education (Education)	3	2 - 1 - 0	----	15	----	35	50
		MDC307: Indian Polity and Economy (Political Science)	3	2 - 1 - 0	----	15	----	35	50
		MDC308: Methodology of Indian Knowledge System (Philosophy)	3	2 - 1 - 0	----	15	----	35	50



Programme: B.Sc.		Year: I		Semester: I	
Discipline: Geography					
Course Name: Fundamentals of Physical Geography					
Course Code: BSCGEOMJ101					
Course Type: Major (Theoretical)		Course Details: MJC-1		L-T-P: 4 - 1 - 0	
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		---	30	---	70
Course Objectives:					
<ul style="list-style-type: none"> ✧ The course offers basic knowledge about the principal characteristics of the Earth's physical environment. ✧ To provide fundamental knowledge of the different aspects of Geomorphology, along with the ability to objectively identify and characterize the different Earth surface processes that have influenced the landscape expressions and landform assemblages and vital roles in the occurrence of several natural hazards. 					
Learning Outcome:					
<ul style="list-style-type: none"> ✧ Students shall obtain an overview of the causes of various geophysical and geomorphic phenomena, their impression on the land surface, and their effect on the habitable world. ✧ The students will definitely assist people regarding risk reduction from any geomorphic hazards. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ The obtained knowledge is vital to provide a foundation for future studies in Physical Geography or Earth System Sciences. ✧ This knowledge will help to provide inputs on the basic concepts that underlie much of the United Nations Sustainable Development Goals on clean water, land, natural resources, and human impacts on the physical environment. 					
Sub units	Topics to be covered				No. of Lectures
Unit I: The Earth and its Physical Environment [30 Hours]					
1.1	Earth as a Planet: Theories on the origin of the Earth (Immanuel Kant and Pierre-Simon Laplace)				2
1.2	The Solid Earth: Earth's tectonic and structural evolution through geological timescales; Basics of Geochronology				4
1.3	Thermal and physical state of the Earth's interior with special reference to seismological evidence; Genesis of earthquake; Vulcanicity and related landforms				4
1.4	Continental drift and seafloor spreading with special reference to Paleomagnetism; Isostasy (Models of Airy, Pratt and their applicability)				4
1.5	Earth's atmosphere: Insolation; Pressure belts; Planetary wind system; Greenhouse effect and global warming				4
1.6	Earth's hydrosphere: Global hydrological cycle; Ocean circulation - major ocean currents (Atlantic and Pacific)				4



1.7	Earth's biosphere: Major Biomes of the world (Tropical Rainforest, Temperate Grassland and Tundra); Classification of forest (Champion)	4
1.8	Earth's pedosphere: Concept of Zonal, Azonal and Intrazonal Soil; Soil erosion and conservation	4
Unit II: Earth Surface Dynamics and Processes [30 Hours]		
2.1	Basic concepts of Geomorphology (W.D. Thornbury); Scales in Geomorphology	4
2.2	Plate Tectonics and associated landforms: Processes and landforms at plate margins and plate interiors	4
2.3	Degradational processes: Weathering, mass wasting and resultant landforms	4
2.4	Models of landscape evolution: Views of Davis, Penck, and Hack	4
2.5	Development of river network and landforms on uniclinal and folded structures	4
2.6	Development of landforms on igneous rocks: Granite and basalt; Landforms on sedimentary rocks: Sandstones and limestones	4
2.7	Surface processes and landforms: Fluvial, Aeolian and fluvio-aeolian, Glacial and glacio-fluvial	4
2.8	Coastal processes and landforms	2

✧ Course Evaluation:

- **Continuous Assessment: 30 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]

1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [30 Marks]

2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [30 Marks]

- **End Semester Examination: 70 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer Two questions carrying **10 marks** out of given **three** questions; Five questions carrying **5 marks** each out of given **eight** questions; Ten questions carrying **2 marks** each out of given **fourteen** questions; Five questions carrying **1 mark** each out of given **eight** questions.

✧ References

Agrawal, D.P. and Yadava, M.G. (1995): Dating the Human Past, IS PQS Monograph Series No. 1, Indian Society for Prehistoric and Quaternary Studies, Department of Archaeology, Deccan College, Pune.



- Ahmad, E. (1982): Physical geography (Geophysical Portion), Kalyani Publishers, New Delhi.
- Anderson, R.S. and Anderson, S.P. (2010): Geomorphology: The Mechanics and Chemistry of Landscapes, Cambridge University Press, Cambridge.
- Barry, R.G. and Chorley R.J. (2009): Atmosphere Weather and Climate, 9th Ed, Routledge.
- Bierman, P.R. and Montgomery, D.R. (2014): Key Concepts in Geomorphology, W.H. Freeman and Company Publishers, New York.
- Biswas, T.D. and Mukherjee, S.K. (1987): Textbook of Soil Science, Tata-McGraw-Hill.
- Bloom, A. L. (2002): Geomorphology: A Systematic Analysis of Late Cenozoic Landforms, Prentice Hall, Upper Saddle River, New Jersey.
- Brown, G.C. and Mussett, A.E. (1993): The Inaccessible Earth (An integrated view to its structure and composition), Chapman & Hall, London.
- Bunting, B.T. (1965): The Geography of Soil, Hutchison University Library, London.
- Chorley, R.J. (Ed.) (1969): Water, Earth, and Man: A Synthesis of Hydrology, Geomorphology and Socio-Economic Geography, Methuen, London.
- Chorley, R.J. and Kennedy, B.A. (1971): Physical Geography: A Systems Approach, Prentice Hall, Upper Saddle River, New Jersey.
- Condie, K.C. (2003): Plate Tectonics and Crustal Evolution, Butterworth-Heinemann, Oxford, Burlington.
- Cox, A. and Hart, R.B. (1986): Plate Tectonics: How it Works, Blackwell Scientific Publications, Oxford.
- Critchfield, H.J. (2008): General Climatology, 4th Edition, Pearson Education India.
- Gabler, B., Gabler, R.E., Petersen, J.F. and Trapasso, L.M. (2007): Essentials of Physical Geography, Thomson-Brooks/Cole.
- Gerrard, A.J. (1988): Rocks and Landforms, Unwin Hyman, London.
- Goudie, A.S. (Ed) (2004): Encyclopedia of Geomorphology, vol. 1 and 2, Routledge.
- Gregory, K.J. and Lewin, J. (2014): The Basics of Geomorphology: Key Concepts, SAGE Publications Ltd.
- Gutiérrez, M. (2013): Geomorphology, CRC Press, Boca Ranton, Florida.
- Hawking, S. (1988): A Brief History of Time: From the Big Bang to Black Holes, Bantam Books.
- Holmes, A. (1978): Principles of Physical Geology, Van Nostrand Rheinhold, New York.
- Huggett, R.J. (2011): Fundamentals of Geomorphology, Routledge, New York.
- Joffe, J.S. (1949): The ABC of Soils, Pedology Publications, New Brunswick, New Jersey.
- Kale, V.S. and Gupta, A. (2001): Introduction to Geomorphology, Orient Longman, Kolkata.
- Keary, P. and Vine, M. (1997): Global Tectonics, Blackwell Scientific Publications, Oxford.
- Lowrie, W. (2007): Fundamentals of Geophysics, Second Edition, Cambridge University Press, UK.



MacDonald, G. (2001): Biogeography: Introduction to Space, Time, and Life, Wiley.

Ollier. C. (1969): Weathering, Second Edition, Longman, London.

Pinet, P.R. (2006): Invitation to Oceanography, 4th Edition, Jones & Bartlett Pub., New York.

Selby, M.J. (1985): Earth's Changing Surface: An Introduction to Geomorphology, Clarendon Press, Oxford.

Strahler, A.H. and Strahler A.N. (1992): Modern Physical Geography, John Wiley & Sons, New York.

Summerfield, M.A. (1991): Global Geomorphology: An Introduction to the Study of Landforms, John Wiley and Sons Ltd., New York.

Thorn, C. (1988): Introduction to Theoretical Geomorphology, Unwin Hyman, Boston.

Thornbury, W.D. (1960): Principles of Geomorphology, John Wiley & Sons, New York.

Whittow, J.B. (1984): The Penguin Dictionary of Physical Geography, Penguin Books, London.

Wooldridge, S.W. and Morgan, R.S. (1937): An Outline of Geomorphology: The Physical Basis of Geography, Longman, London.

Young, A. (1972): Slopes, Oliver and Boyd, Edinburg.

WEBSITES:

British Society for Geomorphology (Publications): <https://www.geomorphology.org.uk/publications/>

Earth Introduction: <https://solarviews.com/eng/earth.htm>

Geological Society of India: <https://www.geosocindia.org/>

Geological Survey of India: <https://www.gsi.gov.in/>

Geomorphology Specialty Group, American Association of Geographers: <https://aag-gsg.org/>

Indian Institute of Geomorphologists (IGI): <https://indiageomorph.org/>

International Association of Geomorphologists (IAG): <http://www.geomorph.org/>

Plaeomap Project: <http://www.scotese.com/>

Science Education Resource Center at Carleton College (Teaching about Geochronology):
<https://serc.carleton.edu/NAGTWorkshops/time/geochronology.html>

The Basics of Geomorphology | Online Resources: <https://study.sagepub.com/gregoryandlewin>

This Dynamic Earth: the story of Plate Tectonics (USGS):
<https://pubs.usgs.gov/gip/dynamic/dynamic.html>



Programme: B.Sc.		Year: I		Semester: I			
Discipline: Geography							
Course Name: Fundamentals of Physical Geography							
Course Code: BSCHGEOMN101							
Course Type: Minor (Theoretical)		Course Details: MNC-1		L-T-P: 4 - 1 - 0			
Course Credit: 5		Full Marks: 100		CA Marks		ESE Marks	
				Practical	Theoretical	Practical	Theoretical
		---	30	---	70		
<p>Course Objectives:</p> <ul style="list-style-type: none"> ✧ The course offers basic knowledge about the principal characteristics of the Earth's physical environment. ✧ To provide fundamental knowledge of the different aspects of Geomorphology, along with the ability to objectively identify and characterize the different Earth surface processes that have influenced the landscape expressions and landform assemblages and vital roles in the occurrence of several natural hazards. 							
<p>Learning Outcome:</p> <ul style="list-style-type: none"> ✧ Students shall obtain an overview of the causes of various geophysical and geomorphic phenomena, their impression on the land surface, and their effect on the habitable world. ✧ The students will definitely assist people regarding risk reduction from any geomorphic hazards. 							
<p>Professional Skill Development:</p> <ul style="list-style-type: none"> ✧ The obtained knowledge is vital to provide a foundation for future studies in Physical Geography or Earth System Sciences. ✧ This knowledge will help to provide inputs on the basic concepts that underlie much of the United Nations Sustainable Development Goals on clean water, land, natural resources, and human impacts on the physical environment. 							
Sub units	Topics to be covered				No. of Lectures		
Unit I: The Earth and its Physical Environment [30 Hours]							
1.1	Earth as a Planet: Theories on the origin of the Earth (Immanuel Kant and Pierre-Simon Laplace)				2		
1.2	The Solid Earth: Earth's tectonic and structural evolution through geological timescales; Basics of Geochronology				4		
1.3	Thermal and physical state of the Earth's interior with special reference to seismological evidence; Genesis of earthquake; Vulcanicity and related landforms				4		
1.4	Continental drift and seafloor spreading with special reference to Paleomagnetism; Isostasy (Models of Airy, Pratt and their applicability)				4		
1.5	Earth's atmosphere: Insolation; Pressure belts; Planetary wind system; Greenhouse effect and global warming				4		
1.6	Earth's hydrosphere: Global hydrological cycle; Ocean circulation - major ocean currents (Atlantic and Pacific)				4		



1.7	Earth's biosphere: Major Biomes of the world (Tropical Rainforest, Temperate Grassland and Tundra); Classification of forest (Champion)	4
1.8	Earth's pedosphere: Concept of Zonal, Azonal and Intrazonal Soil; Soil erosion and conservation	4
Unit II: Earth Surface Dynamics and Processes [30 Hours]		
2.1	Basic concepts of Geomorphology (W.D. Thornbury); Scales in Geomorphology	4
2.2	Plate Tectonics and associated landforms: Processes and landforms at plate margins and plate interiors	4
2.3	Degradational processes: Weathering, mass wasting and resultant landforms	4
2.4	Models of landscape evolution: Views of Davis, Penck, and Hack	4
2.5	Development of river network and landforms on uniclinal and folded structures	4
2.6	Development of landforms on igneous rocks: Granite and basalt; Landforms on sedimentary rocks: Sandstones and limestones	4
2.7	Surface processes and landforms: Fluvial, Aeolian and fluvio-aeolian, Glacial and glacio-fluvial	4
2.8	Coastal processes and landforms	2

✧ Course Evaluation:

- **Continuous Assessment: 30 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]

1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [30 Marks]

2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [30 Marks]

- **End Semester Examination: 70 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer Two questions carrying **10 marks** out of given **three** questions; Five questions carrying **5 marks** each out of given **eight** questions; Ten questions carrying **2 marks** each out of given **fourteen** questions; Five questions carrying **1 mark** each out of given **eight** questions.

✧ References

Agrawal, D.P. and Yadava, M.G. (1995): Dating the Human Past, IS PQS Monograph Series No. 1, Indian Society for Prehistoric and Quaternary Studies, Department of Archaeology, Deccan College, Pune.



- Ahmad, E. (1982): Physical geography (Geophysical Portion), Kalyani Publishers, New Delhi.
- Anderson, R.S. and Anderson, S.P. (2010): Geomorphology: The Mechanics and Chemistry of Landscapes, Cambridge University Press, Cambridge.
- Barry, R.G. and Chorley R.J. (2009): Atmosphere Weather and Climate, 9th Ed, Routledge.
- Bierman, P.R. and Montgomery, D.R. (2014): Key Concepts in Geomorphology, W.H. Freeman and Company Publishers, New York.
- Biswas, T.D. and Mukherjee, S.K. (1987): Textbook of Soil Science, Tata-McGraw-Hill.
- Bloom, A. L. (2002): Geomorphology: A Systematic Analysis of Late Cenozoic Landforms, Prentice Hall, Upper Saddle River, New Jersey.
- Brown, G.C. and Mussett, A.E. (1993): The Inaccessible Earth (An integrated view to its structure and composition), Chapman & Hall, London.
- Bunting, B.T. (1965): The Geography of Soil, Hutchison University Library, London.
- Chorley, R.J. (Ed.) (1969): Water, Earth, and Man: A Synthesis of Hydrology, Geomorphology and Socio-Economic Geography, Methuen, London.
- Chorley, R.J. and Kennedy, B.A. (1971): Physical Geography: A Systems Approach, Prentice Hall, Upper Saddle River, New Jersey.
- Condie, K.C. (2003): Plate Tectonics and Crustal Evolution, Butterworth-Heinemann, Oxford, Burlington.
- Cox, A. and Hart, R.B. (1986): Plate Tectonics: How it Works, Blackwell Scientific Publications, Oxford.
- Critchfield, H.J. (2008): General Climatology, 4th Edition, Pearson Education India.
- Gabler, B., Gabler, R.E., Petersen, J.F. and Trapasso, L.M. (2007): Essentials of Physical Geography, Thomson-Brooks/Cole.
- Gerrard, A.J. (1988): Rocks and Landforms, Unwin Hyman, London.
- Goudie, A.S. (Ed) (2004): Encyclopedia of Geomorphology, vol. 1 and 2, Routledge.
- Gregory, K.J. and Lewin, J. (2014): The Basics of Geomorphology: Key Concepts, SAGE Publications Ltd.
- Gutiérrez, M. (2013): Geomorphology, CRC Press, Boca Ranton, Florida.
- Hawking, S. (1988): A Brief History of Time: From the Big Bang to Black Holes, Bantam Books.
- Holmes, A. (1978): Principles of Physical Geology, Van Nostrand Rheinhold, New York.
- Huggett, R.J. (2011): Fundamentals of Geomorphology, Routledge, New York.
- Joffe, J.S. (1949): The ABC of Soils, Pedology Publications, New Brunswick, New Jersey.
- Kale, V.S. and Gupta, A. (2001): Introduction to Geomorphology, Orient Longman, Kolkata.
- Keary, P. and Vine, M. (1997): Global Tectonics, Blackwell Scientific Publications, Oxford.
- Lowrie, W. (2007): Fundamentals of Geophysics, Second Edition, Cambridge University Press, UK.



MacDonald, G. (2001): Biogeography: Introduction to Space, Time, and Life, Wiley.

Ollier. C. (1969): Weathering, Second Edition, Longman, London.

Pinet, P.R. (2006): Invitation to Oceanography, 4th Edition, Jones & Bartlett Pub., New York.

Selby, M.J. (1985): Earth's Changing Surface: An Introduction to Geomorphology, Clarendon Press, Oxford.

Strahler, A.H. and Strahler A.N. (1992): Modern Physical Geography, John Wiley & Sons, New York.

Summerfield, M.A. (1991): Global Geomorphology: An Introduction to the Study of Landforms, John Wiley and Sons Ltd., New York.

Thorn, C. (1988): Introduction to Theoretical Geomorphology, Unwin Hyman, Boston.

Thornbury, W.D. (1960): Principles of Geomorphology, John Wiley & Sons, New York.

Whittow, J.B. (1984): The Penguin Dictionary of Physical Geography, Penguin Books, London.

Wooldridge, S.W. and Morgan, R.S. (1937): An Outline of Geomorphology: The Physical Basis of Geography, Longman, London.

Young, A. (1972): Slopes, Oliver and Boyd, Edinburg.

WEBSITES:

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This Dynamic Earth: the story of Plate Tectonics (USGS):
<https://pubs.usgs.gov/gip/dynamic/dynamic.html>



Programme: B.Sc.		Year: I		Semester: I	
Discipline: Geography					
Course Name: Elementary Practicals in Physical Geography					
Course Code: BSCGEOSE101					
Course Type: SEC (Practical)		Course Details: SEC-1		L-T-P: 0 - 0 - 6	
Course Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	---	20	---
Course Objectives:					
<ul style="list-style-type: none"> ✧ This course is an initiative to impart knowledge on the basic concept of the practicals in Physical Geography to students so that they can apply it to solve geographical problems in the field. ✧ To orient the students towards identifying and analysing various facets of geographical features and processes from maps and field. 					
Learning Outcome:					
<ul style="list-style-type: none"> ✧ Students will learn about the application of scale in geographic studies. ✧ Students will be able to interpret landform structures with the help of geological maps and learn to identify minerals and rocks, the fundamental element of landforms. ✧ Upon completing this course, students will understand the interpretation techniques of topographical maps and their application. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ The acquired knowledge is beneficial for future studies in physical geography. ✧ This obtained knowledge will provide essential inputs in skill development, which will place the students in their professional life in the near future. 					
Sub units	Topics to be covered				Lab work hours
Unit I: Scale, Minerals and Rocks [20 Hours]					
1.1	Concept and classification of map scales (Linear, Diagonal and Vernier)				12
1.2	Megascopic identification of (a) Mineral samples: Bauxite, Calcite, Chalcopyrite, Feldspar, Galena, Gypsum, Hematite, Magnetite, Mica, Quartz, Talc, Tourmaline; and (b) Rock samples: Granite, Basalt, Dolerite, Pegmatite, Limestone, Shale, Sandstone, Conglomerate, Slate, Phyllite, Schist, Gneiss, Quartzite, Marble				8
Unit II: Basic Geological and Geomorphological Exercises [40 Hours]					
2.1	Measurement of dip and strike using clinometer; Analysis of geological maps (Horizontal, Uniclinal and folded structure along with intrusions and unconformities)				20



2.2	Preparation of data inventory in Physical Geography (Seismic data, Hydro-meteorological data, Soil data); Landform identification from Google Earth; Measurement of pebble shape using slide caliper	20
Unit III: Topographical Maps [30 Hours]		
3.1	Survey of India topographical maps: History, indexing vis-a-vis scale (old and open series); Information on the margin of maps	04
3.2	Extraction and interpretation of geomorphic information from topographical maps of plateau region (Open and Defence Series maps, RF 1:50k): Construction and interpretation of relief (superimposed, projected and composite) profiles and river profiles (cross and longitudinal), delineation of drainage basins, stream ordering (Horton and Strahler) and bifurcation ratio on a drainage basin; Morphometric techniques in 10 cm x 12 cm area: Relative Relief (after G.H. Smith, 1935), Average Slope (after C.K. Wentworth, 1930), Drainage Density and Stream Frequency (after R.E. Horton, 1945)	26

✧ Course Evaluation:

• Continuous Assessment: 30 Marks

1. Practical records: An A3 or tabloid-size (11 inch x 15 inch) laboratory notebook, comprising class assignments of all practical topics must be prepared and duly signed by the teacher. The exercises are to be drawn in pencil with photocopied representations of source materials where necessary. Screenshots for unit 2.2 should be given in the laboratory notebook where necessary. All texts are to be handwritten. [5 Marks]

2. Viva-voce based on the laboratory notebook. [10 Marks]

3. Practical Exercises: Internal assessment to be conducted on the basis of above three units. [15 Marks]

• End Semester Examination: 20 Marks

1. Written test: In the End Semester Examination, students have to answer the questions set from the above three units, except unit 2.2. [15 Marks]

2. Viva-voce based on laboratory notebook. [5 Marks]

✧ References

Alvi, Z. (1994): A Textbook of Practical Geography, Vikas Publishing House Pvt. Ltd., New Delhi.

Bygott, J. (1964): Introduction to Mapwork and Practical Geography, Harper Collins Distribution Services, London.

Chouhan, P. (2013): Topographical Maps: Analysis and Interpretation, Readers Service, Kolkata.



Dackombe, R.V. and Gardiner, V. (1983): Geomorphological Field Manual, George Allen and Unwin, London.

Doornkamp. J.C. and King C.A.M. (1971): Numerical Analysis in Geomorphology: An Introduction, St. Martin's Press, New York.

Farndon, J. (2012): The Illustrated Guide to Rocks & Minerals, Southwater.

Garnett, A. (1955): The Geographical Interpretation of Topographical Maps, George G. Harrap & Co. Ltd., London.

Ishtiaq, M. (1994): Practical Geography, Jawahar Publishers & Distributors, New Delhi.

Khan, Md. Z.A. (1998): Text Book of Practical Geography, Concept Publishing Company, New Delhi.

Maltman, A. (1990): Geological Maps: An Introduction, Open University Press, Buckingham.

Bolton. T. (2009) (reprint): Geological Maps: Their Solution and Interpretation, Cambridge Univ. Press.

McCullagh, P. (1978): Modern Concept in Geomorphology, Oxford University Press, London.

Pillent, C. (2002): Smithsonian Handbooks: Rocks & Minerals, Dorling Kindersley.

Platt, J.I. and Challinor, J. (1956): Simple Geological Structures (A Series of Notes and Map Exercises), Thomas Murby & Co, London.

Saha, P.K. and Basu, P. (2009): Advanced Practical Geography, Books and Allied (P) Ltd., Kolkata

Sarkar, A. (1997): Practical Geography: A Systematic Approach, Orient Longman Ltd., Hyderabad.

Scheffers, A.M., May, S.M. and Kelletat, D.H. (2015): Landforms of the World with Google Earth: Understanding our Environment, Springer.

Sen, P.K. (1993): Geomorphological Analysis of Drainage Basin, The University of Burdwan, Burdwan.

Singh, Gopal (1998): Map Work and Practical Geography, Vikas Publishing, New Delhi.

Singh, L.R. (2005): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.

Singh, R.L. and Singh, R.P.B. (1991): Elements of Practical Geography, Kalyani Pub., New Delhi.

Sinha, M.M.P. and Bala, S. (2021): Advanced Cartography and Practical Geography, Rajesh Publications, New Delhi.

Sorrell, C.A. and Sandström, G.F. (2001): Rocks and Minerals: A Guide to Field Identification, St. Martin's Press.

Vaidyanadhan, R. and Subbarao, K.V. (2016): Landforms of India from Topomaps and Images, Revised Second Edition (Digital Edition), Geological Society of India.

WEBSITES:

BHOOMI GeoPortal: <http://www.bhoomigeoportal-nbsslup.in/>

British Society for Geomorphology (Publications): <https://www.geomorphology.org.uk/publications/>

Central Water Commission: <https://cwc.gov.in/>



Dartmouth Flood Observatory: <https://floodobservatory.colorado.edu/>

Data Portal (National Center for Seismology): <https://seismo.gov.in/data-portal>

Earthquake Catalog (USGS): <https://earthquake.usgs.gov/earthquakes/search/>

European Soil Data Centre (ESDAC): <https://esdac.jrc.ec.europa.eu/>

India Meteorological Department: www.imd.gov.in

India Water Resources Information System: <https://indiawris.gov.in/>

Intergovernmental Panel on Climate Change: www.ipcc.ch

Irrigation & Waterways Department, Government of West Bengal: <https://wbiwd.gov.in/>

National Atlas and Thematic Mapping Organisation: <https://portal.natmo.gov.in/en/>

National Bureau of Soil Survey and Land Use Planning: <https://nbsslup.icar.gov.in/>

Soil & Land Use Survey of India (SLUSI): <https://slusi.da.gov.in/>

Sol, National Survey and Mapping Organization: <https://indiamaps.gov.in/login>

Programme: UG		Year: I		Semester: I	
Discipline: Geography					
Course Name: Disaster Management					
Course Code: MDC104					
Course Type: MD (Theoretical)		Course Details: MDC-1		L-T-P: 2 - 1 - 0	
Course Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		---	15	---	35
Course Objectives:					
<ul style="list-style-type: none"> ✧ This course has been framed with an intention to broaden the dimensions of disaster science education. ✧ It is innovative and knowledge oriented to attract bright students to critically understand the strengths and weaknesses of disaster management approaches, planning, and programming in India. 					
Learning Outcome:					
<ul style="list-style-type: none"> ✧ Students will have in-depth knowledge about the different parameters during any disaster, which are critical to all life forms, especially humans, in a sustainable way. ✧ Students will familiarize about the mitigation measures to prevent and mitigate different disasters. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ The students will definitely assist people regarding risk reduction from any disaster. ✧ This knowledge will help to provide inputs on the basic concepts that underlie much of the United Nations Sustainable Development Goals on reducing the adverse effects of natural disasters. 					



Sub units	Topics to be covered	No. of Lectures
Unit I: Basic Concepts and Management [15 Hours]		
1.1	Basic concepts: Definition and types of hazard and disaster (Natural, quasi-natural and man-made); Vulnerability, Risk and Capacity; Cascading disasters and compound events	3
1.2	Disaster Risk Reduction (DRR) strategy: Pre-disaster, disaster and post-disaster phase - Preparedness, rehabilitation, reconstruction and recovery; Community-based DRR; National Disaster Management Guidelines and Disaster Management Act-2005	5
1.3	Global initiatives: SDG 11 - Target 5 (Reduce the adverse effect of natural disasters), Sendai Framework (DRR), Global Facility for Disaster Reduction and Recovery (GFDRR)	3
1.4	National initiatives: Role of institutional framework in disaster management (NDMA-SDMA-DDMA, NDRF, Civic volunteers, NIDM); Disaster Management Support by NRSC, ISRO Bhuvan Portal (Real-time GIS-based disaster database of India)	4
Unit II: Disaster Specific Case Studies [15 Hours]		
2.1	Earthquake: Factors, vulnerability, consequences and management. Tsunami: Factors, vulnerability and management; Role of Indian Tsunami Early Warning Centre (ITEWC); Case study of Indian Ocean Tsunami 2004	4
2.2	Floods: Meteorological and Outburst Floods (GLOF, LLOF, Avalanche) - causes, consequences and management; Case study of Bengal's Millennium Flood, 2000. Drought: Meteorological, hydrological and agricultural droughts - factors, vulnerability and management	3
2.3	Landslide: Factors and vulnerability; Major problems and mitigation strategy for landslides in Himalayan region; Case study of Darjeeling landslides. Cyclone: Tropical cyclone and storm surge - factors, vulnerability and management	4
2.4	Mining disasters: Open cast and shaft mining - vulnerability and management; Case study of Asansol-Raniganj coalfield. Industrial disasters: Gas and radiation leaks, oil spills - vulnerability and management	4

✧ Course Evaluation:

● Continuous Assessment: 15 Marks

1. Project report: One Project Report is to be prepared and submitted based on any one case study among the above disasters from West Bengal, incorporating a preparedness plan. The report should be prepared on secondary data and handwritten on A4 page in candidates' own words, not exceeding 2,000 words excluding references. [10 Marks]

2. Viva-voce based on project report [5 Marks]

● End Semester Examination: 35 Marks

The end semester examination shall be conducted based on written test.



Question Pattern: Students have to answer One questions carrying **10 marks** out of given **two** questions; Two questions carrying **5 marks** each out of given **four** questions; Five questions carrying **2 marks** each out of given **eight** questions; Five questions carrying **1 mark** each out of given **eight** questions.

✧ References

BOOKS:

Central Water Commission (1987): Flood Atlas of India. CWC, New Delhi.

Central Water Commission (1989): Manual of Flood Forecasting. New Delhi.

Clague, J.J. and Stead, D. (Eds.) (2012): Landslides: Types, Mechanisms and Modeling. Cambridge University Press.

Coch, N.K. (1994): Geohazards: Natural and Human, Pearson College.

Dewan, A. (2013): Floods in a Megacity: Geospatial Techniques in Assessing Hazards, Risk and Vulnerability, Springer, Dordrecht.

Government of India (2008): Vulnerability Atlas of India, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India.

Government of India (2011): Disaster Management in India, Ministry of Home Affairs, New Delhi.

Gupta, H.K. (2013): Disaster Management, University Press.

Kapur, A. (2010): Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.

Modh, S. (2010): Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.

NDMA (2009) National Policy on Disaster Management 2009. National Disaster Management Authority (NDMA), Ministry of Home Affairs, Government of India.

Nishith, R. and Singh, A.K. (2012): Disaster Management in India: Perspectives, Issues and Strategies. New Royal Book Company, Lucknow.

NITI Aayog (2021): Report of the Committee constituted for formulation of strategy for Flood Management Works in entire country and River Management Activities and works related to Border Areas (2021-26). National Institution for Transforming India, New Delhi.

Ramkumar, M. (2009): Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency, New Delhi.

Singh, R.B. (2005): Risk Assessment and Vulnerability Analysis, IGNOU, New Delhi.

Singh, R.B. (ed.) (2006): Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.

Singh, S. and Singh, J. (2013): Disaster Management, Pravalika Publications, Allahabad.

Sinha, A. (2001): Disaster Management: Lessons Drawn and Strategies for Future, New United Press, New Delhi.



Smith, K. (2013): Environmental Hazards: Assessing Risk and Reducing Disaster, 6th ed, Routledge.

UNDRR (2020): Human Cost of Disasters. An Overview of the last 20 years (2000-2019). Centre for Research on the Epidemiology of Disasters (CRED), United Nations Office for Disaster Risk Reduction (UNDRR).

Wadge, G. (1994): Natural Hazards and Remote Sensing. Proceedings sponsored by the Natural Environment Research Council and National Remote Sensing Centre Limited.

WEBSITES:

Dartmouth Flood Observatory: floodobservatory.colorado.edu

USGS Earthquake Hazards Programme: earthquake.usgs.gov

India Meteorological Department Cyclone Page:

mausam.imd.gov.in/imd_latest/contents/cyclone.php

India Universities and Institutions Network for Disaster Risk Reduction (IUIN-DRR):

iuin-drr.nidm.gov.in/Home

National Disaster Management Authority (NDMA): ndma.gov.in

ESSO-Indian National Centre for Ocean Information Services (INCOIS): incois.gov.in

International Centre for Integrated Mountain Development: icimod.org

National Center for Seismology: seismo.gov.in

United Nations Office for Disaster Risk Reduction: undrr.org

Irrigation & Waterways Department, Government of West Bengal: wbiwd.gov.in

Central Water Commission: cwc.gov.in

Disaster Management Support Services, RSAA/NRSC/ISRO: bhuvan-app1.nrsc.gov.in/bhuvandisaster



Programme: B.Sc.		Year: I		Semester: II	
Discipline: Geography					
Course Name: Fundamentals of Human Geography					
Course Code: BSCGEOMJ201					
Course Type: Major (Theoretical)		Course Details: MJC-2		L-T-P: 4 - 1 - 0	
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		---	30	---	70
<p>Course Objectives:</p> <ul style="list-style-type: none"> ✧ To have a complete understanding of human aspects of geographical phenomena and their interface within the realm of our environment. ✧ To impart fundamental knowledge about Population Geography and basic concepts in Settlement Geography. 					
<p>Learning Outcome:</p> <ul style="list-style-type: none"> ✧ At the end of this course, it is expected that students will be able to understand the social environment from local to global perspectives. ✧ Students will be able to describe and evaluate relevant issues to the needs of the contemporary world. 					
<p>Professional Skill Development:</p> <ul style="list-style-type: none"> ✧ This knowledge will provide students with a wide range of professional skills applicable to various fields. ✧ It will prepare them for careers in urban planning, public policy, community development, international development, and social research. 					
Sub units	Topics to be covered				No. of Lectures
Unit I: Nature and Principles of Human Geography [30 Hours]					
1.1	Nature, scope and recent trends; Development and branches of human geography				3
1.2	Approaches to Human Geography: Resource, locational, landscape, environmental				4
1.3	Evolution of Man-Nature interaction: Hunting and Food gathering, Pastoral nomadism, Agrarian society and industrial society				4
1.4	Human adaptation to environment: Case studies of Eskimo and Masai; Primitive people of India (Santhal and Nagas)				6
1.5	Space and Society: Concept of culture and its components, innovation, diffusion and convergence of culture				3
1.6	Race and ethnic groups: Concept, origin and distribution				4
1.7	Language and religion: Origin, diffusion and distribution				4



1.8	Cultural realms of the world and their characteristics	2
Unit II: Population, Settlement and Development [30 Hours]		
2.1	Population geography and demography; Population growth and distribution; Population composition (Age-Sex composition)	4
2.2	Theories of population: Malthusian and demographic transition; Population-resource regions (W. Zelinsky and E.A. Ackerman)	4
2.3	Population and environment relations with special reference to development-environment conflict (Multi-purpose river valley projects)	2
2.4	Origin and growth of rural settlements; Social morphology and rural house types in India; Types and patterns of rural settlements	6
2.5	Origin and growth of urban settlements; Functional classification of urban settlements; Morphology of urban settlements: Models of Burgess, Hoyt, Harris and Ullman	6
2.6	Trends and patterns of world urbanization (ancient and modern)	2
2.7	Poverty and inequality: Concept, causes and consequences; Food Security in Indian context	3
2.8	Indicators of social well-being; Human development	3

✧ Course Evaluation:

- **Continuous Assessment: 30 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]

1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [30 Marks]

2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [30 Marks]

- **End Semester Examination: 70 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer Two questions carrying **10 marks** out of given **three** questions; Five questions carrying **5 marks** each out of given **eight** questions; Ten questions carrying **2 marks** each out of given **fourteen** questions; Five questions carrying **1 mark** each out of given **eight** questions.

✧ References

Bhende, A.S. and Kanitkar, T. (2015): Principles of Population Studies, Himalaya Publishing House, Mumbai.

Blij, H.D. (1992): Human and Economic Geography, Macmillan Publishing Company.



- Carter, H. (1981): *Urban Geography*, 3rd edition, Arnold-Heinemann, New Delhi.
- Chandna, R.C. (2016): *Geography of Population: Concepts, Determinants and Patterns*, Kalyani Publishers.
- Clarke, J.I. (1972): *Population Geography*, Pergamon Press, Oxford.
- Daniel, P.A., and Hopkinson, M.F. (1989): *The Geography of Settlement*, Oliver & Boyd, London.
- Fellmann, J.D., Getis, A., Getis, J. and Malinowski, J.C. (2005): *Human Geography: Landscapes of Human Activities*, McGraw Hill Higher Education, Boston.
- Fouberg, E.H., Murphy, A.B. and de Blij H.J. (2015): *Human Geography: People, Place, and Culture*, 11th ed, Wiley.
- Ghosh, S. (1998): *Introduction to Settlement Geography*, Sangam Books Ltd.
- Goodall, B. (1987): *The Penguin Dictionary of Human Geography*, Penguin Books, London.
- Gould, W.T.S. (2015). *Population and Development*, Routledge.
- Gregory, D., Johnston, R., Pratt, G., Watts, M., Whatmore, S. (Eds.) (2009): *The Dictionary of Human Geography*, 5th ed, Wiley.
- Hussain, M. (2003): *Human Geography*, Rawat Publications, Jaipur.
- Knox, P.L. and Marston, S.A. (2014): *Human Geography: Places and Regions in Global Context*, 6th ed, Pearson Education Limited.
- Knox, P.L. and McCarthy, L.M. (2011): *Urbanization: An Introduction to Urban Geography*, 3rd ed, Pearson Education Ltd.
- Mandal, R.B. (2001): *Introduction to Rural Settlement*, 2nd ed, Concept Publishing Company.
- Maurya, S.D. (2012): *Human Geography*, Pravalika Publications, Allahabad.
- Moseley, W.G., Perramond, E., Hapke, H.M. and Laris, P. (2013): *An Introduction to Human-Environment Geography: Local Dynamics and Global Processes*, Wiley-Blackwell.
- Norton, W. (2014): *Human Geography*, 8th ed, Oxford University Press.
- Pickering K.T. and Owen L.A. (1997): *An Introduction to Global Environmental Issues*, 2nd edition, Routledge, London.
- Ramachandran, R. (2010): *Urbanisation and Urban Systems of India*, Oxford University Press, New Delhi.
- Rubenstein, J.M. (2016): *The Cultural Landscape: An Introduction to Human Geography*, 12th ed, Pearson Education Limited.
- Short, R.J. (2017): *Human Geography: A Short Introduction*, 2nd ed, Oxford University Press.
- Singh, L.R. (2005): *Fundamentals of Human Geography*, Sharda Pustak Bhawan, Allahabad.
- Singh, R.B. (Ed.) (1995): *Studies in Environment and Development*, Rakesh Prakashan, Varanasi.
- Singh, R.Y. (1994): *Geography of Settlement*, Rawat Publications, Jaipur.



Smith, D.M. (1982): Human Geography: A Welfare Approach, Edward Arnold, London.

UNDP (2001-04): Human Development Report, Oxford University Press.

WEBSITES:

Census of India: <https://censusindia.gov.in/census.website/data/census-tables>

Civil Registration System: <https://dc.crsorgi.gov.in/crs/>

Directorate of Census Operations, West Bengal: <https://westbengal.census.gov.in/>

Government of India Data Platform: <https://www.data.gov.in/>

International Institute for Population Sciences: <https://www.iipsindia.ac.in/>

Ministry of Statistics and Programme Implementation (GoI): <https://www.mospi.gov.in/>

Socio-Economic Statistics India: <https://www.indiastat.com/>

UNDP India: <https://www.undp.org/india>

Programme: B.Sc.	Year: I		Semester: II		
Discipline: Geography					
Course Name: Fundamentals of Human Geography					
Course Code: BSCGEOMN201					
Course Type: Minor (Theoretical)	Course Details: MNC-2		L-T-P: 4 - 1 - 0		
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		---	30	---	70
<p>Course Objectives:</p> <ul style="list-style-type: none"> ✧ To have a complete understanding of human aspects of geographical phenomena and their interface within the realm of our environment. ✧ To impart fundamental knowledge about Population Geography and basic concepts in Settlement Geography. 					
<p>Learning Outcome:</p> <ul style="list-style-type: none"> ✧ At the end of this course, it is expected that students will be able to understand the social environment from local to global perspectives. ✧ Students will be able to describe and evaluate relevant issues to the needs of the contemporary world. 					
<p>Professional Skill Development:</p> <ul style="list-style-type: none"> ✧ This knowledge will provide students with a wide range of professional skills applicable to various fields. ✧ It will prepare them for careers in urban planning, public policy, community development, international development, and social research. 					



Sub units	Topics to be covered	No. of Lectures
Unit I: Nature and Principles of Human Geography [30 Hours]		
1.1	Nature, scope and recent trends; Development and branches of human geography	3
1.2	Approaches to Human Geography: Resource, locational, landscape, environmental	4
1.3	Evolution of Man-Nature interaction: Hunting and Food gathering, Pastoral nomadism, Agrarian society and industrial society	4
1.4	Human adaptation to environment: Case studies of Eskimo and Masai; Primitive people of India (Santhal and Nagas)	6
1.5	Space and Society: Concept of culture and its components, innovation, diffusion and convergence of culture	3
1.6	Race and ethnic groups: Concept, origin and distribution	4
1.7	Language and religion: Origin, diffusion and distribution	4
1.8	Cultural realms of the world and their characteristics	2
Unit II: Population, Settlement and Development [30 Hours]		
2.1	Population geography and demography; Population growth and distribution; Population composition (Age-Sex composition)	4
2.2	Theories of population: Malthusian and demographic transition; Population-resource regions (W. Zelinsky and E.A. Ackerman)	4
2.3	Population and environment relations with special reference to development-environment conflict (Multi-purpose river valley projects)	2
2.4	Origin and growth of rural settlements; Social morphology and rural house types in India; Types and patterns of rural settlements	6
2.5	Origin and growth of urban settlements; Functional classification of urban settlements; Morphology of urban settlements: Models of Burgess, Hoyt, Harris and Ullman	6
2.6	Trends and patterns of world urbanization (ancient and modern)	2
2.7	Poverty and inequality: Concept, causes and consequences; Food Security in Indian context	3
2.8	Indicators of social well-being; Human development	3

◇ Course Evaluation:

- **Continuous Assessment: 30 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]



1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [30 Marks]
 2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [30 Marks]
- **End Semester Examination: 70 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer Two questions carrying **10 marks** out of given **three** questions; Five questions carrying **5 marks** each out of given **eight** questions; Ten questions carrying **2 marks** each out of given **fourteen** questions; Five questions carrying **1 mark** each out of given **eight** questions.

✧ References

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- Blij, H.D. (1992): Human and Economic Geography, Macmillan Publishing Company.
- Carter, H. (1981): Urban Geography, 3rd edition, Arnold-Heinemann, New Delhi.
- Chandna, R.C. (2016): Geography of Population: Concepts, Determinants and Patterns, Kalyani Publishers.
- Clarke, J.I. (1972): Population Geography, Pergamon Press, Oxford.
- Daniel, P.A., and Hopkinson, M.F. (1989): The Geography of Settlement, Oliver & Boyd, London.
- Fellmann, J.D., Getis, A., Getis, J. and Malinowski, J.C. (2005): Human Geography: Landscapes of Human Activities, McGraw Hill Higher Education, Boston.
- Fouberg, E.H., Murphy, A.B. and de Blij H.J. (2015): Human Geography: People, Place, and Culture, 11th ed, Wiley.
- Ghosh, S. (1998): Introduction to Settlement Geography, Sangam Books Ltd.
- Goodall, B. (1987): The Penguin Dictionary of Human Geography, Penguin Books, London.
- Gould, W.T.S. (2015). Population and Development, Routledge.
- Gregory, D., Johnston, R., Pratt, G., Watts, M., Whatmore, S. (Eds.) (2009): The Dictionary of Human Geography, 5th ed, Wiley.
- Hussain, M. (2003): Human Geography, Rawat Publications, Jaipur.
- Knox, P.L. and Marston, S.A. (2014): Human Geography: Places and Regions in Global Context, 6th ed, Pearson Education Limited.
- Knox, P.L. and McCarthy, L.M. (2011): Urbanization: An Introduction to Urban Geography, 3rd ed, Pearson Education Ltd.



- Mandal, R.B. (2001): Introduction to Rural Settlement, 2nd ed, Concept Publishing Company.
- Maurya, S.D. (2012): Human Geography, Pravalika Publications, Allahabad.
- Moseley, W.G., Perramond, E., Hapke, H.M. and Laris, P. (2013): An Introduction to Human-Environment Geography: Local Dynamics and Global Processes, Wiley-Blackwell.
- Norton, W. (2014): Human Geography, 8th ed, Oxford University Press.
- Pickering K.T. and Owen L.A. (1997): An Introduction to Global Environmental Issues, 2nd edition, Routledge, London.
- Ramachandran, R. (2010): Urbanisation and Urban Systems of India, Oxford University Press, New Delhi.
- Rubenstein, J.M. (2016): The Cultural Landscape: An Introduction to Human Geography, 12th ed, Pearson Education Limited.
- Short, R.J. (2017): Human Geography: A Short Introduction, 2nd ed, Oxford University Press.
- Singh, L.R. (2005): Fundamentals of Human Geography, Sharda Pustak Bhawan, Allahabad.
- Singh, R.B. (Ed.) (1995): Studies in Environment and Development, Rakesh Prakashan, Varanasi.
- Singh, R.Y. (1994): Geography of Settlement, Rawat Publications, Jaipur.
- Smith, D.M. (1982): Human Geography: A Welfare Approach, Edward Arnold, London.
- UNDP (2001-04): Human Development Report, Oxford University Press.

WEBSITES:

- Census of India: <https://censusindia.gov.in/census.website/data/census-tables>
- Civil Registration System: <https://dc.crsorgi.gov.in/crs/>
- Directorate of Census Operations, West Bengal: <https://westbengal.census.gov.in/>
- Government of India Data Platform: <https://www.data.gov.in/>
- International Institute for Population Sciences: <https://www.iipsindia.ac.in/>
- Ministry of Statistics and Programme Implementation (GoI): <https://www.mospi.gov.in/>
- Socio-Economic Statistics India: <https://www.indiastat.com/>
- UNDP India: <https://www.undp.org/india>



Programme: B.Sc.		Year: I		Semester: II	
Discipline: Geography					
Course Name: Elementary Practicals in Human Geography					
Course Code: BSCGEOSE201					
Course Type: SEC (Practical)		Course Details: SEC-2		L-T-P: 0 - 0 - 6	
Course Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	---	20	---
Course Objectives:					
<ul style="list-style-type: none"> ✧ To develop students' aptitude for acquiring basic skills of carrying out fieldwork for collecting demographic and socio-economic data. ✧ To guide students to learn the science and art of collecting, processing and interpreting the data. 					
Learning Outcome:					
<ul style="list-style-type: none"> ✧ Students shall be able to identify the socio-environmental problems of a locality through field experience in future. ✧ The students will efficiently extract, represent, analyse and interpret demographic and socio-economic data. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ The acquired knowledge is beneficial for future studies in human geography. ✧ This obtained knowledge will provide essential inputs in skill development, which will place the students in their professional life in the near future. 					
Sub units	Topics to be covered				Lab work hours
Unit I: Data Collection and Representation [30 Hours]					
1.1	Sources of demographic and socio-economic data; Data access from Census of India web portal; Preparation of questionnaire or schedule for collecting data through a household survey; Interview with special reference to focused group discussions				18
1.2	Preparation of maps showing population density by choropleth; Rural and urban population by dots and spheres; Population growth rates by line graph (Annual and Decadal)				12
Unit II: Data Analysis and Interpretation [30 Hours]					
2.1	Measurement of inequality by Lorenz curve and Gini coefficient; Analysis of occupation structure by pie diagram				14
2.2	Computation of Human Development Index (HDI), Multidimensional Poverty Index (MPI) and representation				16
Unit III: Topographical Maps [30 Hours]					



3.1	Study of correlation between physical and cultural features from Survey of India 1:50k topographical maps using transect chart and scatter plots	14
3.2	Analysis of transport and settlements: Transport network analysis by detour index and Nearest neighbour analysis of settlement patterns from toposheets	16

✧ Course Evaluation:

• Continuous Assessment: 30 Marks

1. Practical records: An A3 or tabloid-size (11 inch x 15 inch) laboratory notebook, comprising class assignments of all practical topics must be prepared and duly signed by the teacher. The exercises are to be drawn in pencil with photocopied representations of source materials where necessary. All texts are to be handwritten. Open/ closed ended questionnaires should be used in the field survey for Unit 1.1. Focused group discussion outcomes should be written in a single page. [5 Marks]

2. Viva-voce based on the laboratory notebook. [10 Marks]

3. Practical Exercises: Internal assessment to be conducted on the basis of above three units. [15 Marks]

• End Semester Examination: 20 Marks

1. Written test: In the End Semester Examination, students have to answer the questions set from the above three units. [15 Marks]

2. Viva-voce based on laboratory notebook. [5 Marks]

✧ References

- Alvi, Z. (1994): A Textbook of Practical Geography, Vikas Publishing House Pvt. Ltd., New Delhi.
- Anson R. and Ormelling F.J., (1994): International Cartographic Association: Basic Cartographic Vol., Pregmen Press.
- Bygott, J. (1964): Introduction to Mapwork and Practical Geography, Harper Collins Distribution Services, London.
- Chouhan, P. (2013): Topographical Maps: Analysis and Interpretation, Readers Service, Kolkata.
- Garnett, A. (1955): The Geographical Interpretation of Topographical Maps, George G. Harrap & Co. Ltd., London.
- Gupta K.K. and Tyagi, V.C., (1992): Working with Map, Survey of India, DST, New Delhi.
- Haggett, P., Cliff, A.D. and Frey, A. (1977): Locational Analysis in Human Geography, Edward Arnold, London
- Ishtiaq, M. (1994): Practical Geography, Jawahar Publishers & Distributors, New Delhi.



- Khan, Md. Z.A. (1998): Text Book of Practical Geography, Concept Publishing Company, New Delhi.
- Liendsor, J.M. (1997): Techniques in Human Geography, Routledge.
- Mishra R.P. and Ramesh, A. (1989): Fundamentals of Cartography, Concept, New Delhi.
- Monkhouse, F.J. and Wilkinson, H.R. (1971). Maps and Diagrams: Their Compilation and Construction, Alphaneumera-Kolkata.
- Robinson, A.H., Morrison, J.L., Phillip, C.M., Kimerling, A.J., and Guptill, S.C. (1995). Elements of Cartography, 6th ed, Wiley.
- Saha, P.K. and Basu, P. (2009): Advanced Practical Geography, Books and Allied (P) Ltd., Kolkata.
- Sarkar, A. (2008): Practical Geography: A Systematic Approach, Orient BlackSwan, Kolkata.
- Singh, G. (1998): Map Work and Practical Geography, Vikas Publishing, New Delhi.
- Singh, L.R. (2005): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
- Singh, R.L. and Singh, P.B. (2009): Elements of Practical Geography, Kalyani Publishers, New Delhi.
- Sinha, M.M.P. and Bala, S. (2021): Advanced Cartography and Practical Geography, Rajesh Publications, New Delhi.
- Toyne, P. and Newby, P.T. (1971): Techniques in Human Geography, Macmillan Education, London.
- Yeates, M. (1968): An introduction to Quantitative Analysis in Human Geography, McGraw-Hill, New York.

WEBSITES:

- Census of India: <https://censusindia.gov.in/census.website/data/census-tables>
- Civil Registration System: <https://dc.crsorgi.gov.in/crs/>
- Directorate of Census Operations, West Bengal: <https://westbengal.census.gov.in/>
- Government of India Data Platform: <https://www.data.gov.in/>
- International Institute for Population Sciences: <https://www.iipsindia.ac.in/>
- Ministry of Statistics and Programme Implementation (GoI): <https://www.mospi.gov.in/>
- Socio-Economic Statistics India: <https://www.indiastat.com/>
- Sol, National Survey and Mapping Organization: <https://indiamaps.gov.in/login>



Programme: B.Sc.		Year: II		Semester: III	
Discipline: Geography					
Course Name: Climatology					
Course Code: BSCGEOMJ301					
Course Type: Major (Theoretical + Practical)		Course Details: MJC-3		L-T-P: 3 - 0 - 4	
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35
Course Objectives:					
<ul style="list-style-type: none"> ✧ To provide fundamental knowledge of the Earth's atmospheric system and climate patterns through data analysis and understanding natural processes. ✧ The course offers basic knowledge on relevant aspects of climatology, with particular emphasis on climatic elements diagrams and climatic classification. 					
Learning Outcome:					
<ul style="list-style-type: none"> ✧ Students shall be able to learn the fundamental concepts of atmospheric science, as well as understand the basic physical processes governing atmospheric dynamics. ✧ The students will definitely interpret and explain atmospheric phenomena, climate variability and change, and climate impacts on society and the environment. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ The obtained knowledge is vital to perform simple mathematical calculations related to atmospheric science and use different meteorological instruments for the acquisition of data related to various climatic variables. ✧ This knowledge will provide essential inputs in extracting climate data from open source archives and assisting to interpret synoptic weather maps. 					
BSCGEOMJ301 - Theory [50 Marks]					
Sub units	Topics to be covered				No. of Lectures
Unit I: Elements of the Atmosphere [15 Hours]					
1.1	Nature, composition and layering of the atmosphere; Basic concepts in atmospheric physics: heat flow and heat capacity				4
1.2	Insolation: controlling factors; Heat balance (terrestrial and latitudinal); Heat budget of the atmosphere				3
1.3	Temperature: horizontal and vertical distribution; Inversion of temperature: types, causes and consequences; Adiabatic temperature changes; Heat waves: causes and effects				5
1.4	Greenhouse effect; Formation, depletion, restoration, and significance of the ozone layer				3
Unit II: Atmospheric Phenomena, Climate Change and Climatic Classification [30 Hours]					



2.1	Circulation in the atmosphere: planetary wind system with special reference to tri-cellular model, jet stream and monsoons; Atmospheric disturbances: tropical and mid-latitude cyclones	10
2.2	Condensation: processes and forms; Mechanism of precipitation: Bergeron-Findeisen theory, collision and coalescence theory; Forms of precipitation	6
2.3	Origin, classification and modification of Air mass; Types of fronts, frontogenesis and frontolysis; Stability and instability	6
2.4	Classification of World Climate: schemes of Köppen (1936) and Thornthwaite (1948); Evidences and causes of climate change	8
BSCGEOMJ301 - Practical (Lab) [50 Marks]		
Sub units	Topics to be covered	Lab work hours
Unit I: Data Collection in Climatology [20 Hours]		
1.1	Activities of India Meteorological Department (IMD); Measurement of weather elements using analogue instruments: mean daily temperature, air pressure, relative humidity, and rainfall	16
1.2	Preparation of an inventory of sources of gridded climate data	4
Unit II: Cartographic Representation of Climatic Data and their Interpretation [20 Hours]		
2.1	Construction and interpretation of hythergraph and climograph (G. Taylor); Construction and interpretation of wind rose	12
2.2	Construction and interpretation of ombrothermic diagram and hyetograph	8
Unit III: Analysis of Climatic Data and Maps [20 Hours]		
3.1	Preparation of station model (Indian Context) and interpretation of synoptic chart (Indian Context)	8
3.2	Interpretation of a daily weather map of India: Monsoon	12

✧ Course Evaluation:

🕒 BSCGEOMJ301 - Theory

● **Continuous Assessment: 15 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]

- 1. Seminar presentations:** A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [15 Marks]
- 2. Class test:** There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [15 Marks]



- **End Semester Examination: 35 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer One questions carrying **10 marks** out of given **two** questions; Two questions carrying **5 marks** each out of given **four** questions; Five questions carrying **2 marks** each out of given **eight** questions; Five questions carrying **1 mark** each out of given **eight** questions.

⊙ BSCGEOMJ301 - Lab

- **Continuous Assessment: 30 Marks**

1. Practical records: An A3 or tabloid-size (11 inch x 15 inch) laboratory notebook, comprising class assignments of all practical topics must be prepared and duly signed by the teacher. India Meteorological Department data are to be used where applicable. The exercises are to be drawn in pencil with photocopied representations of source materials where necessary. All texts are to be handwritten. [5 Marks]

2. Viva-voce based on laboratory notebook. [10 Marks]

3. Practical Exercises: Internal assessment to be conducted on the basis of above three units. [15 Marks]

- **End Semester Examination: 20 Marks**

1. Practical Exercises: In the End Semester Examination, students have to answer the questions set from the above three units. [15 Marks]

2. Viva-voce based on laboratory notebook. [5 Marks]

✧ References

BOOKS:

Ackerman, S.A. and Knox, J.A. (2012): Meteorology: Understanding the Atmosphere, Jones & Bartlett Learning, London.

Ahrens, C.D. (2012): Essentials of Meteorology: An Invitation to the Atmosphere. 9th ed., Cengage Learning, Boston.

Ahrens, C.D., Jackson, P.L., Jackson, C.E.J. and Jackson, C.E.O. (2012): Meteorology Today: An Introduction to Weather, Climate and the Environment, Cengage Learning, Boston.

Atkinson, B.W. (Ed.) (1981): Dynamical Meteorology: An Introductory Selection, Methuen, London.

Barry, R.G. and Chorley R.J. (2009): Atmosphere Weather and Climate, 9th ed., Routledge.



- Basu, R. and Bhaduri, S. (Eds.) (2007): Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata.
- Bhutani, S. (2002), Our Atmosphere (Popular Science Series), Kalyani Publishers, New Delhi.
- Bradley, R.S. (2014): Paleoclimatology: Reconstructing Climates of the Quaternary, 3rd ed., Academic Press Inc.
- Byers, H.R. (1974): General Meteorology, 4th ed., McGraw-Hill Book Company, New York.
- Chandrasekar, A. (2022): Basics of Atmospheric Science, PHI Learning Pvt. Ltd., New Delhi.
- Critchfield, H.J. (2008): General Climatology, 4th ed., Pearson Education India.
- Das, P.K. (2018): The Monsoons, 12th ed., National Book Trust, New Delhi.
- Fitzroy, R. (1863): The Weather Book: A Manual of Practical Meteorology, Longman, Green, Longman, Roberts & Green, London.
- Gates, E.S. (1972): Meteorology and Climatology, 4th ed. revised, ohne Verlagsangabe.
- Houghton, J. (2002): The Physics of Atmospheres, 3rd ed., Cambridge University Press, Cambridge.
- Kendrew, W. (1949): Climatology, Clarendon Press, Oxford.
- Lal, D.S. (2021): Climatology, Sharda Pustak Bhawan, Prayagraj.
- Lutgens, F.K., Tarbuck, E.J. and Herman, R.L. (2019): The Atmosphere: An Introduction to Meteorology, 14th ed., Pearson, Hudson Street, NY.
- Malik, A. (2013): Causes of Climate Change, Rajat Publications, New Delhi.
- McIlveen, R. (2010): Fundamentals of Weather and Climate, 2nd ed., Oxford University Press, Oxford.
- Monkhouse, F.J. and Wilkinson, H.R. (1971): Maps and Diagrams: Their Compilation and Construction, 3rd ed. (2017 reprint), Alphaneumera-Kolkata.
- Oliver, J.E. and Hidore J.J. (2003): Climatology: An Atmospheric Science, Pearson Education India.
- Petterssen, S. (1941): Introduction to Meteorology, Mcgraw-Hill Book Company, Inc., New York.
- Rayner, J.N. (2000): Dynamic Climatology: Basis in Mathematics and Physics, Wiley-Blackwell.
- Rohli, R.V. and Vega, A.J. (2013): Climatology, 3rd ed., Jones and Bartlett Publishers.
- Saha, P. (2016): Modern Climatology, 1st ed., Allied Publishers Pvt Ltd., Kolkata.
- Saha, P.K. and Basu, P. (2013): Advanced Practical Geography, 3rd ed., Books and Allied (P) Ltd., Kolkata.
- Sarkar, A. (2008): Practical Geography: A Systematic Approach, Orient BlackSwan, Kolkata.
- Siddhartha, K. (2018): Climatology: Atmosphere Weather Climate, Kitab Mahal.
- Singh, Gopal (1998): Map Work and Practical Geography, Vikas Publishing, New Delhi.
- Singh, L.R. (2005): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.



Singh, R.L. and Singh, R.P.B. (1991): Elements of Practical Geography, Kalyani Pub., New Delhi.
 Singh, S. (2020): Climatology, Pravalika Publications, Allahabad.
 Terry, J.P. (2007): Tropical Cyclones: Climatology and Impacts in the South Pacific, Springer.
 Thompson, R.D. (1998). Atmospheric Processes and Systems, 1st ed., Routledge, London.
 Trewartha G.T. and Horne L.H., (1980): An Introduction to Climate, 5th ed., McGraw-Hill.
 Wallace, J.M. and Hobbs, P.V. (2006): Atmospheric Science: An Introductory Survey, 2nd ed., Elsevier.

WEBSITES:

- Climate Hazards Group InfraRed Precipitation with Station data: www.chc.ucsb.edu/data/chirps
 Climatological tables of observatories of India:
<https://www.imdpune.gov.in/library/public/Climatological%20Tables%201991-2020.pdf>
 Gauge-based APHRODITE Gridded Precipitation Dataset: www.chikyu.ac.jp/precip
 Greenhouse Gas Bulletin: wmo.int/publication-series/greenhouse-gas-bulletin
 India Meteorological Department: www.imd.gov.in
 Intergovernmental Panel on Climate Change: www.ipcc.ch
 MERRA-2-Gridded Reanalysis Dataset: <https://power.larc.nasa.gov/data-access-viewer/>
 Tropical Rainfall Measuring Mission: people.geog.ucsb.edu/~bodo/TRMM
 United Nations Climate Action: www.un.org/en/climatechange
 World Bank Climate Change Knowledge Portal: <https://climateknowledgeportal.worldbank.org>
 World Meteorological Organization: public.wmo.int/en

Programme: B.Sc.	Year: II		Semester: III		
Discipline: Geography					
Course Name: Cartography and Surveying					
Course Code: BSCGEOMJ302					
Course Type: Major (Practical)	Course Details: MJC-4		L-T-P: 0 - 0 - 10		
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	---	40	---

**Course Objectives:**

- ✧ This course is designed to provide the knowledge and skills for understanding the process of map making, and to acquaint students with new techniques used in map making.
- ✧ To impart knowledge on the various surveying instruments used in geography to students so that they can apply them to prepare plans and maps of the area surveyed.

Learning Outcome:

- ✧ Upon completing this course, the students will be able to apply the techniques and principles of map making and designing for map creation.
- ✧ Students will learn about the measurement of the earth's surface features on horizontal and vertical planes through the learning of different surveying and levelling operations.

Professional Skill Development:

- ✧ The acquired knowledge is beneficial for preparing a wide variety of maps using different datasets.
- ✧ This obtained knowledge will provide essential inputs in surveying skills, which will help the students get jobs in various industries, such as private surveying and engineering firms, land development, and real estate companies in the near future.

Sub units	Topics to be covered	Lab work hours
Unit I: Elements of Cartography [30 Hours]		
1.1	Maps: components and classification; Coordinate systems: polar and rectangular; Bearing: magnetic and true, whole-circle and reduced	6
1.2	Concept of generating globe; Grids: angular and linear measurement methods	5
1.3	Concepts of cartograms and thematic maps; Principal national agencies producing thematic maps in India: NATMO, GSI, NBSSLUP, NHO, NRSC/ Bhuvan	5
1.4	Cartograms: representation of data on map by proportional squares, pie diagrams with proportional circles, dots and spheres; Thematic maps: representation of data using choropleth, isopleth, chorochromatic maps	14
Unit II: Map Projection [40 Hours]		
2.1	Map projections: classification, properties, deformations and uses	5
2.2	Basic concepts: parallels and meridians, scale factor, developable surface, constant of a cone, orthodrome, loxodrome	5
2.3	Construction of projections: Polar Zenithal Case (Gnomonic and Stereographic), Conical Case (Simple Conic with one standard parallel and Bonne's)	20
2.4	Construction of projections: Cylindrical Case (Cylindrical Equal Area and Mercator's)	10

Unit III: Surveying and Mapping [80 Hours]



3.1	Surveying: definition, classification, and principles; Plan and map; Measurement and mapping of a plot by Chain survey	20
3.2	Concept of traverse, numerical problems related to traverse (calculation of exterior and interior angles), Bowditch correction for closed traverse; Mapping a closed traverse by Prismatic Compass survey	20
3.3	Profile line survey using Dumpy Level; Preparation of contour map of a small area by Prismatic Compass and levelling instruments	20
3.4	Determination of height of base accessible and inaccessible objects by Theodolite (same vertical plane method)	20

✧ Course Evaluation:

• Continuous Assessment: 60 Marks

1. Practical records: An A3 or tabloid-size (11 inch x 15 inch) laboratory notebook, comprising class assignments of all practical topics must be prepared and duly signed by the teacher. The exercises are to be drawn in pencil with photocopied representations of source materials where necessary. All texts are to be handwritten. [10 Marks]

2. Viva-voce based on laboratory notebook. [20 Marks]

3. Practical Exercises: Internal assessment to be conducted on the basis of Unit II and Unit III. Students have to answer the questions set from the above two units. [30 Marks]

• End Semester Examination: 40 Marks

1. Practical Exercises: In the End Semester Examination, students have to answer the questions set from the above three units. [30 Marks]

2. Viva-voce based on laboratory notebook. [10 Marks]

✧ References

BOOKS:

Alvi, Z. (1994): A Textbook of Practical Geography, Vikas Publishing House Pvt. Ltd., New Delhi.

Basak, N.N. (2017): Surveying & Levelling, 2nd ed., McGraw Hill Education.

Bygott, J. (1964): Introduction to Mapwork and Practical Geography, Harper Collins Distribution Services, London.

Elfic, M.H., Fryer, J.G., Brinkner, R.C. and Wolf, P.R. (1994): Elementary Surveying, 8th Edition, Harper Collins Publishers, London.



- Gupta, K.K. and Tyagi V.C. (1992): Working with Map, Survey of India, DST, New Delhi.
- Hussain, S.K. and Nagaraj, M.S. (1992): Text Book of Surveying, S. Chand & Co. Ltd., New Delhi.
- Ishtiaq, M. (1994): Practical Geography, Jawahar Publishers & Distributors, New Delhi.
- Kanetkar, R.P. and Kulkarni, S.V. (1988): Surveying and Levelling, Part-I, Vaidyarathi Griha Prakashani, Pune.
- Kellaway, G.P. (1979): Map Projections, 1st Indian Edition, B.I. Publication, Delhi.
- Khan, Md. Z.A. (1998): Text Book of Practical Geography, Concept Publishing Company, New Delhi.
- Kochher, C.L. (1993): A Text Book of Surveying, S.K. Katariya & Sons, Delhi.
- Mailing, D.H. (1973): Coordinate Systems and Map Projections, George Phillip & Sons, London.
- Mishra R.P. and Ramesh, A. (2002): Fundamentals of Cartography (Revised and Enlarged), 2nd ed., Concept Publishing Co., New Delhi.
- Monkhouse, F.J. and Wilkinson, H.R. (1971): Maps and Diagrams: Their Compilation and Construction, 3rd ed. (2017 reprint), Alphaneumera-Kolkata.
- Punmia, B.C. (1985): Surveying, Volume II, Standard Book House, Delhi.
- Raisz, E. (2007): Principles of Cartography, Surjeet Publication, Delhi.
- Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. and Guphill, S.C. (2009): Elements of Cartography, 6th ed., Wiley, New York.
- Saha, P.K. and Basu, P. (2013): Advanced Practical Geography, 3rd ed., Books and Allied (P) Ltd., Kolkata.
- Sarkar, A. (2008): Practical Geography: A Systematic Approach, Orient BlackSwan, Kolkata.
- Shepherd, F.A. (1983): Engineering Surveying, Edward Arnold, London.
- Singh, Gopal (1998): Map Work and Practical Geography, Vikas Publishing, New Delhi.
- Singh, L.R. (2005): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
- Singh, R.L. and Singh, R.P.B. (1991): Elements of Practical Geography, Kalyani Pub., New Delhi.
- Sinha, M.M.P. and Bala, S. (2021): Advanced Cartography and Practical Geography, Rajesh Publications, New Delhi.
- Steers J.A. (1965): An Introduction to the Study of Map Projections, University of London Press, London.
- Talukder, S. (2008): An Introduction to Map Projections, EBH Publishers (India), Guwahati.
- Venkatramaiah, C. (1996): A Textbook of Surveying, Universities Press/Orient Longman Ltd., Hyderabad.

WEBSITES:

Geological Survey of India: <https://www.gsi.gov.in/webcenter/portal/OCBIS>

Indian National Cartographic Association: <http://www.incaindia.org/>



- Indian Naval Hydrographic Department: <https://hydrobharat.gov.in/>
- International Cartographic Association: <https://icaci.org/>
- ISRO Bhuvan 2D Platform: <https://bhuvan.nrsc.gov.in/home/index.php>
- National Atlas and Thematic Mapping Organisation: <https://portal.natmo.gov.in/en/>
- National Bureau of Soil Survey and Land Use Planning: <https://nbsslup.icar.gov.in/>
- National Remote Sensing Centre: <https://www.nrsc.gov.in/>
- Sol Onlinemaps Portal: <https://onlinemaps.surveyofindia.gov.in/>
- Sol, National Survey and Mapping Organization: <https://indiamaps.gov.in/login>
- Survey of India (Sol): <https://surveyofindia.gov.in/>
- Survey of Villages Abadi & Mapping with Improvised Technology in Village Areas (SVAMITVA): <https://svamitva.nic.in/svamitva/>

Programme: B.Sc.	Year: II		Semester: III		
Discipline: Geography					
Course Name: Climate Change: Vulnerability and Adaptations					
Course Code: BSCGEOMN301					
Course Type: Minor (Theoretical)	Course Details: MNC-3		L-T-P: 4 - 1 - 0		
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		---	30	---	70
<p>Course Objectives:</p> <ul style="list-style-type: none"> ✧ To familiarize the students with the science of climate change and related aspects while keeping in view the vulnerability and human adaptation. ✧ This course is also oriented to deliver knowledge on the mitigation of climate impacts and to know the institutional role. ✧ The course offers the necessity to incorporate and consider the changing climate in various long-term planning and development activities. 					
<p>Learning Outcome:</p> <ul style="list-style-type: none"> ✧ Students will be able to assess climate change impacts, vulnerability and adaptation, as well as how societies in developed and developing nations can effectively adapt to climate change. ✧ The students will acquire insight for explaining and demonstrating knowledge of different measures and strategies of climate change mitigation used in various parts of the world. 					



Professional Skill Development:		
<p>✧ The obtained knowledge is vital to provide a foundation for collaborative interdisciplinary works with public agencies and NGOs.</p> <p>✧ Students will become competent in climate change impact evaluation through the application of scientific principles and methodologies.</p>		
Sub units	Topics to be covered	No. of Lectures
Unit I: Basics of Climate Change [30 Hours]		
1.1	Climate change with reference to the geological time scale	2
1.2	Factors of climate change; Theories of climate change	4
1.3	Evidences of climate change; Reconstruction of past climates	4
1.4	Understanding recent climatic change; Greenhouse gases (GHGs) and global warming; Global climatic assessment: IPCC reports	5
1.5	Physical risks of climate change: acute (droughts and floods) and chronic (accelerating loss of biodiversity)	3
1.6	Climate change and vulnerability: physical, economic and social vulnerabilities, and measured indices	5
1.7	Impact of climate change: agriculture and water; flora and fauna; human health and morbidity	5
1.8	Reducing vulnerability: climate change adaptation, climate resilience	2
Unit II: Climate Change: Adaptation and Mitigation [30 Hours]		
2.1	Global initiatives to climate change mitigation: Kyoto Protocol, carbon trading, clean development mechanism, UNFCCC and COPs	5
2.2	Methods for reducing GHG emissions: carbon footprint and carbon sequestration	5
2.3	Climate change mitigation framework: climate-smart agriculture	4
2.4	Climate change adaptive strategies with particular reference to South Asia	4
2.5	National Action Plan on Climate Change (NAPCC): missions, status and drawbacks	4
2.6	Increasing cyclonic intensity in Indian Sundarban of recent times	4
2.7	Glacial lake outburst floods in Himalayan region	2
2.8	G20 and Climate Change	2

✧ Course Evaluation:

- **Continuous Assessment: 30 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]



1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [30 Marks]
 2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [30 Marks]
- **End Semester Examination: 70 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer Two questions carrying **10 marks** out of given **three** questions; Five questions carrying **5 marks** each out of given **eight** questions; Ten questions carrying **2 marks** each out of given **fourteen** questions; Five questions carrying **1 mark** each out of given **eight** questions.

✧ References

BOOKS:

Anderson, D.E., Goudie, A.S. and Parker, A.G. (2013): Global Environments through the Quaternary: Exploring Environmental Change, 2nd ed., Oxford University Press.

Barry, R.G. and Chorley R.J. (2009): Atmosphere Weather and Climate, 9th ed., Routledge.

Bradley, R.S. (2014): Paleoclimatology: Reconstructing Climates of the Quaternary, 3rd ed., Academic Press Inc.

Burroughs, W.J. (2007): Climate Change: A Multidisciplinary Approach, 2nd ed., Cambridge University Press.

Dessler, A.E. and Parson, E.A. (2019): The Science and Politics of Global Climate Change: A Guide to the Debate, 3rd ed., Cambridge University Press.

Fleming, J.R. (2005): Historical Perspectives on Climate Change, Oxford University Press.

Hardy, J.T. (2003): Climate Change - Causes, Effects and Solutions, 1st ed., John Wiley & Sons.

Houghton, J. (2015): Global Warming: The Complete Briefing, 5th ed., Cambridge University Press.

Incropera, F.P. (2015): Climate Change: A Wicked Problem: Complexity and Uncertainty at the Intersection of Science, Economics, Politics, and Human Behavior, Cambridge University Press.

Malik, A. (2013): Causes of Climate Change, Rajat Publications, New Delhi.

Maslin, M. (2008): Global Warming: A Very Short Introduction, 2nd ed., OUP Oxford.

Maslin, M. (2021): Climate Change: A Very Short Introduction, 4th ed., OUP Oxford.

Mélières, M-A and Maréchal, C. (2015): Climate Change: Past, Present, and Future, Wiley-Blackwell.

National Research Council (2020): Climate Change Science: An Analysis of Some Key Questions, National Academies Press.



Organisation for Economic Co-operation and Development (OECD) (2008): Climate Change Mitigation: What Do we do? Organisation and Economic Co-operation and Development.

Roy Sen, S. and Singh, R.B (2002): Climate Variability Extreme Events and Agricultural Productivity in Mountain Regions, Oxford & IBH Publishing Company, New Delhi.

Singh, M., Singh, R.B. and Hassan, M.I. (Eds) (2014): Climate Change and Biodiversity: Proceedings of IGU Rohtak Conference, Vol. 1, Springer.

Singh, R.B., Mal, S. and Huggel, C. (Eds.) (2018): Climate Change, Extreme Events and Disaster Risk Reduction: Towards Sustainable Development Goals, Springer, Switzerland.

Terry, J.P. (2007): Tropical Cyclones: Climatology and Impacts in the South Pacific, Springer.

United Nations Environmental Programme (UNEP) (2007): Global Environment Outlook: GEO4: Environment for Development, United Nations.

Weart, S.R. (2008): The Discovery of Global Warming, 2nd ed., Harvard University Press.

WEBSITES:

Future Earth: <https://futureearth.org/>

Greenhouse Gas Bulletin: wmo.int/publication-series/greenhouse-gas-bulletin

Group of 20: <https://www.g20.org/>

India Meteorological Department: www.imd.gov.in

Intergovernmental Panel on Climate Change: www.ipcc.ch

International Geosphere-Biosphere Programme: <http://www.igbp.net/>

Ministry of Environment, Forest and Climate Change: <https://moef.gov.in/>

United Nations Climate Action: www.un.org/en/climatechange

United Nations Framework Convention on Climate Change: <https://unfccc.int/>

World Bank Climate Change Knowledge Portal: <https://climateknowledgeportal.worldbank.org>

World Meteorological Organization: public.wmo.int/en

Programme: UG	Year: II		Semester: III		
Discipline: Geography					
Course Name: Bharatavarsha - A Land of Rare Natural Endowments					
Course Code: MDC301					
Course Type: MD (Theoretical)	Course Details: MDC-3		L-T-P: 2 - 1 - 0		
Course Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		---	15	---	35

**Course Objectives:**

- ✧ To provide fundamental knowledge about history of ancient Bharatvarsha and its area, location and geographical background.
- ✧ The course offers basic knowledge on natural/ physical resources and their utilization.
- ✧ The course will provide knowledge about present prosperous India.

Learning Outcome:

After the completion of the course, the students will have the ability to:

- ✧ Understand the ancient Bharatvarsha and its frontiers and neighbouring countries.
- ✧ Understand the physical aspects of the country.
- ✧ Study the resource endowment and its spatial distribution and utilization.
- ✧ Understand the agricultural and industrial scenario of the country before and after the independence.
- ✧ Study the prosperity of the country in comparison to the rest of the world and the uniqueness of culture.

Professional Skill Development:

- ✧ The obtained knowledge will help the students in their future competitive examinations for jobs like CGL, PSC, UPSC etc.

Sub units	Topics to be covered	No. of Lectures
Unit I: Introducing Physical and Natural Environment of India [15 Hours]		
1.1	Bharatvarsha: Nomenclature; Meaning, concept and geographical area; Historical background	3
1.2	Spatial Features: Location, size and shape, geographical information, frontiers and neighbouring countries; Importance of geographical location	3
1.3	The land of India/ physical aspects: Physiographic characteristics; Drainage system; Seasonal rhythm and relationship with monsoon; Classification of soil and natural vegetation in India	5
1.4	Mineral and power resources: Distribution and utilization of iron ore, coal and petroleum; Non-conventional sources of energy: solar and wind	4
Unit II: Introducing Socio-Cultural Environment of India [15 Hours]		
2.1	Growth and distribution of population; Languages; Types of rural settlements; Trends of urbanization	5
2.2	Agro-ecological regions in India; Green revolution	3
2.3	Industrial development in India since independence; Impact of liberalization; Distribution and production of iron and steel, cotton textile and IT industries	5
2.4	Regional Cooperation: SAARC and BRICS	2

✧ Course Evaluation:

- **Continuous Assessment: 15 Marks**

1. An assignment on the given topic is to be prepared and submitted. The assignment must be handwritten on A4 page and not exceed 2000 words excluding references. [10 Marks]

**2. Viva-voce** based on assignment. [5 Marks]**• End Semester Examination: 35 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer One questions carrying **10 marks** out of given **two** questions; Two questions carrying **5 marks** each out of given **four** questions; Five questions carrying **2 marks** each out of given **eight** questions; Five questions carrying **1 mark** each out of given **eight** questions.

✧ References**BOOKS:**

Ahmad, E. (1976): Some Aspects of Indian Geography, Central Book Depot.

Bandyopadhyay, S., Kar, N.S., Das, S. and Sen, J. (2014): River system and water resources of West Bengal: A Review. In: Vaidyanadhan, R. (Ed) Rejuvenation of Surface Water Resources of India: Potential, Problems and Prospects, Geological Society of India Special Publication.

Chattopadhyay, A. (2020): Bharat o Paschimbanger Bhugol (Bengali), Nabodaya Publications, Kolkata.

Cunningham, A. (2024): The Ancient Geography of India, S.K. Enterprise.

Deshpande, C.D. (1992): India: A Regional Interpretation, ICSSR, New Delhi.

Douglas, L. Johnson., (2009): World Regional Geography, 10th ed., Pearson Education Inc, New Jersey.

Husain, M. (2017): Geography of India, 7th ed., McGraw Hill Education, New Delhi.

Johnson, B.L.C., ed. (2001): Geographical Dictionary of India. Vision Books, New Delhi.

K. Siddhartha (2001): India: The Physical Aspects, 3rd ed., Centre for Development of Environment and Resources, Kisalaya Publication Pvt. Ltd., New Delhi.

Khullar, D.R. (2023): India: A Comprehensive Geography, 6th revised ed., Kalyani Publishers, New Delhi.

Pal, S.K. (1998): Physical Geography of India, Orient Blackswan Private Limited.

Pathak, C.R. (2003): Spatial Structure and Processes of Development in India, Regional Science Assoc., Kolkata.

Saroha, J. and Singh, S. (2022): Geography of India, 3rd ed., Pearson Education.

Saxena, H.M., Saxena, R. and Saxena, P. (2024): Geography of India, Panchsheel Prakashan, Jaipur.

Sharma, T.C. (2013): Economic Geography of India. Rawat Publication, Jaipur.

Singh R.L. (1971): India: A Regional Geography, National Geographical Society of India.

Singh, G. (2010): A Geography of India, 9th ed., Atma Ram & Sons.



Singh, J. (2003): India: A Comprehensive Systematic Geography, 2nd ed., Radha Publications, New Delhi.

Spate, O.H.K. and Learmonth, A.T.A. (2018): India and Pakistan: A General and Regional Geography (Routledge Library Editions: British in India), 1st ed., Routledge.

Tirtha, R. (2002): Geography of India, Rawat Publication, Jaipur & New Delhi.

Tiwari, R.C. (2016): Geography of India, 11th ed., Pravalika Publications, Allahabad.

WEBSITES:

Chronological chart of the history of Bharatvarsh since its origination:

https://www.encyclopediaofauthenticinduisim.org/articles/53_chronological_chart.htm

Department of Water Resources, River Development and Ganga Rejuvenation: <https://jalshakti-dowr.gov.in/>

Indian Council of Agricultural Research (ICAR): <https://icar.org.in/>

Indian Culture Portal, Ministry of Culture, Government of India: <https://www.indianculture.gov.in/>

International Institute for Population Sciences (IIPS): <https://www.iipsindia.ac.in/>

Know India: National Portal of India: <https://knowindia.india.gov.in/>

Ministry of Housing and Urban Affairs: <https://mohua.gov.in/>

National Institute of Urban Affairs (NIUA): <https://niua.in/>

The Early Concept of Bharatvaesha, Vivekananda International Foundation:

<https://www.vifindia.org/sites/default/files/national-security-vol-4-issue-1-essay-Rchattopadhyay&ASarkar.pdf>



Programme: B.Sc.		Year: II		Semester: IV	
Discipline: Geography					
Course Name: Soil and Biogeography					
Course Code: BSCGEOMJ401					
Course Type: Major (Theoretical + Practical)		Course Details: MJC-3		L-T-P: 3 - 0 - 4	
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35
Course Objectives:					
<ul style="list-style-type: none"> ✧ To introduce different aspects of soil science, soil formation and development processes, and the classification and utility of the major soil groups, their erosion and relationships with land capability and crop suitability. ✧ The objective of this course is to make the students comprehend how the natural surroundings and human activities are responsible for the distribution of plants and animals. 					
Learning Outcome:					
<ul style="list-style-type: none"> ✧ Students shall be able to understand soil profile development, their physico-chemical characteristics and changes over time, measure and quantify information on soil properties and erosion, and land capability and crop suitability. ✧ The students will acquaint themselves with various dimensions of biogeography, the function and structure of ecosystem and mass cum energy flow through it, and the significance of biodiversity. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ Students are obtained the ability to recognize and sample different soils in the field, trained to imbibe fundamental knowledge on how to analyze soil properties, and learn skills for soil database generation and interpretation. ✧ This obtained knowledge will equip the students with tools for measuring, mapping, and analyzing the environment comprehensively. 					
BSCGEOMJ301 - Theory [50 Marks]					
Sub units	Topics to be covered				No. of Lectures
Unit I: Soil Geography [25 Hours]					
1.1	Soil as a component of biosphere; Pedogenic processes and development of soil profiles; Factors of soil formation; Man as an active agent of soil transformation				4
1.2	Characteristics and significance of soil properties: physical (Texture, structure, colour and moisture) and chemical (pH, organic matter and NPK); Soil minerals and nutrients; Soil pollution: causes and consequences				10
1.3	Concept of soil catena; Study of soil profiles: Podzol, Laterite, Chernozem; Characteristics of Saline and Alkaline soils				6



1.4	Principles of soil classification: Genetic and USDA; Concept of land capability and its classification	5
Unit II: Biogeography [20 Hours]		
2.1	Nature, scope, and contents of Biogeography; Concepts of biosphere, ecosystem, biome, ecotone, community and ecology; Ecological successions: stages and climax	4
2.2	Concepts of trophic structure, food chain and food web; Energy flow in ecosystems	4
2.3	Factors of plant ecology; Classification of world biomes (Whittaker)	5
2.4	Concept of biodiversity; Biodiversity: hotspots, loss and conservation; Wildlife conservation in India: tiger and elephant conservation	7
BSCGEOMJ301 - Practical (Lab) [50 Marks]		
Sub units	Topics to be covered	Lab work hours
Unit I: Laboratory Analysis of Physical Properties of Soil [15 Hours]		
1.1	Soil sampling techniques: surface and profile	7
1.2	Determination of soil texture by feel method; Textural classification of soil by ternary diagram	8
Unit II: Laboratory Analysis of Chemical Properties of Soil and Analyzing Soil Maps [25 Hours]		
2.1	Determination of Soil pH, organic carbon and nutrient concentration (NPK) of soil with the help of soil kit	10
2.2	Data extraction from Bhoomi Geoportal; Interpretation of Soil & Land Use Survey of India (SLUSI) and ICAR-NBSS & LUP maps and soil databases	15
Unit III: Biogeography [20 Hours]		
3.1	Measuring species diversity and dominance: Simpson and Shannon-Wiener index	10
3.2	Preparation of Participatory Biodiversity Register	10

✧ Course Evaluation:

⊙ BSCGEOMJ401 - Theory

- **Continuous Assessment: 15 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]

1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [15 Marks]



2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [15 Marks]

• **End Semester Examination: 35 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer One questions carrying **10 marks** out of given **two** questions; Two questions carrying **5 marks** each out of given **four** questions; Five questions carrying **2 marks** each out of given **eight** questions; Five questions carrying **1 mark** each out of given **eight** questions.

⊙ BSCGEOMJ401 - Lab

• **Continuous Assessment: 30 Marks**

1. Practical records: An A3 or tabloid-size (11 inch x 15 inch) laboratory notebook, comprising class assignments of all practical topics must be prepared and duly signed by the teacher. The exercises are to be drawn in pencil with photocopied representations of source materials where necessary. All texts are to be handwritten. [5 Marks]

2. Viva-voce based on laboratory notebook. [10 Marks]

3. Practical Exercises: Internal assessment to be conducted on the basis of above three units. [15 Marks]

• **End Semester Examination: 20 Marks**

1. Practical Exercises: In the End Semester Examination, students have to answer the questions set from the above three units. [15 Marks]

2. Viva-voce based on laboratory notebook. [5 Marks]

✧ References

BOOKS:

Birkeland, P.W. (1984): Soils and Geomorphology, Oxford University Press, Oxford.

Biswas, T.D. and Mukherjee, S.K. (2017): Textbook of Soil Science, 2nd ed., McGraw Hill Education.

Breibart, R. (1988): Soil Testing Procedures for Soil Survey: Part 2 - Laboratory Procedure Manual, FAO, UNDP.

Bunting, B.T. (1965): The Geography of Soil, Hutchison University Library, London.

Buol, S.W., Hole, F.D. and McCracken, R.J. (1989): Soil Genesis and Classification, 3rd ed., Iowa State University Press.



- Burt, R. (Ed.) (2004): Soil Survey Laboratory Methods Manual, Soil Survey Investigations Report No. 42. v 4.0, Natural Resources Conservation Service, United States Department of Agriculture.
- Chapman, J.L. and Reiss, M.J. (2003): Ecology: Principles and Applications, 2nd ed., Cambridge University Press.
- Cox, C.B., Moore, P.D. and Ladle, R. (2016): Biogeography: An Ecological and Evolutionary Approach, 9th ed., Wiley-Blackwell.
- Daji, J.A., Kadam, J.R. and Patil, N.D. (1996): A Textbook of Soil Science, Media Promoters and Publishers.
- Dash, M.C. and Dash, S.P. (2009): Fundamental of Ecology, 3rd ed., McGraw Hill Education, New Delhi.
- Dey, N.K. and Ghosh. P. (1993): India: A Study in Soil Geography, Sribhumi Publishing Company.
- Foth, H.D. (1991): Fundamentals of Soil Science, 8th ed., Wiley.
- Franzmeier, D.P., McFee, W.W., Gravel, J.G. and Kohnke, H. (2016): Soil Science Simplified, 5th ed., Waveland Press.
- Fullen, M.A. and Catt, J.A. (2004): Soil Management: Problems and Solutions, Hodder Arnold.
- Gerrard, A.J. (1992): Soil Geomorphology, Chapman & Hall, London.
- Gerrard, J. (2000): Fundamentals of Soils (Routledge Fundamentals of Physical Geography Series), Routledge, London.
- Huang, P.M., Li, Y. and Sumner, M.E. (2011): Handbook of Soil Sciences: Properties and Processes, CRC Press, New York.
- Huggett, R.J. (2004): Fundamentals of Biogeography (Routledge Fundamentals of Physical Geography), 2nd ed., Routledge, London:
- Joffe, J.S. (1949): The ABC of Soils, Pedology Publications, New Brunswick, New Jersey.
- Kormondy. E.J. (2017): Concepts of Ecology, Updated 4th ed., Pearson Education.
- Lomolino, M.V., Riddle, B.R. and Whittaker, R.J. (2016): Biogeography: Biological Diversity Across Space and Time, 5th ed., Oxford University Press.
- MacDonald, G. (2023): Biogeography: Introduction to Space, Time, and Life, 2nd ed., John Wiley & Sons.
- McKenzie, N.J., Grundy, M.J., Webster, R. and Ringrose-Voase, A.J. (2008): Guidelines for Surveying Soil and Land Resources (Australian Soil and Land Survey Handbooks Series Book 2), 2nd ed., CSIRO Publishing, Melbourne.
- Morgan, R.P.C. (2004): Soil Erosion and Conservation, 3rd ed., Wiley-Blackwell.
- Nayak, D.C., Sarkar, D. and Velayutham, M. (2001): Soil Series of West Bengal (Technical Bulletin), NBSS&LUP (ICAR), Govt. of India, Kolkata.
- Odum, E.P. (2017): Fundamentals of Ecology, 5th ed., Cengage India Private Limited.
- Panda, N. (2019): Principles of Soil and Water Analysis, New India Publishing Agency - Nipa, New Delhi.



- Plaster, E.J. (2013): Soil Science and Management, 6th ed., Cengage Learning, Boston.
- Rai, M.M. (2008): Principles of Soil Science, 4th ed., Macmillan India Ltd., Delhi.
- Rowell, D.L. (2016): Soil Science: Methods & Applications, Routledge.
- Sahai, V.N. (2016): Fundamentals of Soil, 5th ed., Kalyani Publishers.
- Sarkar, D. (2003): Fundamentals and Applications of Pedology, 1st ed., Kalyani Publishers, New Delhi.
- Schaetzl, R. and Thompson, M.L. (2015): Soils: Genesis and Geomorphology, 2nd ed., Cambridge University Press, New York.
- Sehgal, J. (2015): A Textbook of Pedology: Concepts and Applications, 3rd ed., Kalyani Publishers, New Delhi.
- Sharma, P.D. (2014): Ecology and Environment, 13th ed., Rastogi Publications, Meerut.
- Simmon, I.G.(1979): Biogeography: Natural and Cultural, Edward Arnold, London.
- Watts, D. (1971): Principles of Biogeography, McGraw Hill, New York.
- Xiao, M. (2009): Soil Testing Laboratory Manual, Bent Tree Press, USA.
- Singer, M.J. and Munns, D.N. (2005): Soils: An Introduction, 6th ed., Pearson.
- Stohlgren, T.J. (2006): Measuring Plant Diversity: Lessons from the Field, Oxford University Press.
- Weil, R.R. and Brady, N.C. (2022): The Nature and Properties of Soils, 15th ed., Pearson Education.
- White, R.E. (2005): Principles and Practice of Soil Science: The Soil as a Natural Resource, 4th ed., Wiley-Blackwell.
- Wild, A. (1993): Soils and the Environment: An Introduction, Cambridge University Press.

WEBSITES:

- BHOOMI GeoPortal: <http://www.bhoomigeoportal-nbsslup.in/>
- European Soil Data Centre (ESDAC): <https://esdac.jrc.ec.europa.eu/>
- Indian Biodiversity Information System: <https://www.indianbiodiversity.org/>
- National Atlas and Thematic Mapping Organisation: <https://portal.natmo.gov.in/en/>
- National Bureau of Soil Survey and Land Use Planning: <https://nbsslup.icar.gov.in/>
- Soil & Land Use Survey of India (SLUSI): <https://slusi.da.gov.in/>



Programme: B.Sc.		Year: II		Semester: IV	
Discipline: Geography					
Course Name: Remote Sensing, GIS and GNSS					
Course Code: BSCGEOMJ402					
Course Type: Major (Theoretical + Practical)		Course Details: MJC-6		L-T-P: 3 - 0 - 4	
Course Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35
Course Objectives:					
<ul style="list-style-type: none"> ✧ This course introduces the students to the basic concepts of remote sensing and imparts necessary skills in remote sensing analysis and image interpretation. So that, students acquire employable skills in remote sensing. ✧ To study the basics of digital image processing to solve real-world problems. ✧ To provide a firm conceptual and technical understanding of GIS and GNSS. 					
Learning Outcome:					
<ul style="list-style-type: none"> ✧ At the end of this course, it is expected that students will be able to learn fundamental principles and concepts of photogrammetry, remote sensing, and digital image processing. ✧ Students will be able to understand GIS data types and structures with processing and visualization techniques in GIS. ✧ Students will also be able to understand GNSS-based survey and mapping under variety of planning and management applications. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ This knowledge will provide students with a wide range of professional skills applicable to various fields. ✧ Students will acquire employable skills in remote sensing and GIS. 					
Sub units	Topics to be covered				No. of Lectures
BSCGEOMJ402 - Theory [50 Marks]					
Unit I: Photogrammetry and Remote Sensing [25 Hours]					
1.1	Concept, types and geometry of aerial photographs; Basic elements of aerial photo interpretation				5
1.2	Principles of Remote Sensing; Electro Magnetic Radiation and Electro Magnetic Spectrum, spectral reflectance curves; Platforms and geometry of orbits; Sensors and resolutions				8
1.3	Types of Satellite Remote Sensing; IRS and Landsat missions				6
1.4	Preparation of colour composites (TCC and SFCC); Concept of visual image interpretation and digital image interpretation of satellite imagery				6



Unit II: Geographic Information System (GIS) and Global Navigation Satellite System (GNSS) [20 Hours]		
2.1	Basics of GIS: Definition, components, development and applications; GIS data structures types: spatial and non-spatial, raster and vector	6
2.2	Principles of preparing attribute tables, data manipulation and query; Principles and significance of buffer preparation; Principles and significance overlay analysis	4
2.3	Geodesy and Coordinate Systems; Basics of GNSS: Principle, components and applications; Global/ Regional Satellite constellations, GNSS signals	5
2.4	Sources of error in a GNSS system; GNSS receiver types and positioning concepts	5
BSCGEOMJ402 - Practical (Lab) [50 Marks]		
Unit I: Photogrammetry and Remote Sensing [25 Hours]		
1.1	Determination of scale of aerial photographs; Determination of height of objects from aerial photographs using parallax bar under a mirror stereoscope; Identification and mapping of physical and cultural features from aerial photograph using mirror stereoscope	15
1.2	Georeferencing of scanned maps and satellite images; Mosaicking and layering of images and maps of different dates and scales; Creating region of interest (subsetting/ clipping)	10
Unit II: Remote Sensing and GIS [25 Hours]		
2.1	Preparation of reflectance libraries of LULC features across different image bands; Supervised image classification, class editing and post-classification analysis	15
2.2	Digitization of features and administrative boundaries; Data attachment, overlay and preparation of annotated thematic maps	10
Unit III: GNSS [10 Hours]		
3.1	Waypoint collection from GNSS receivers, exporting to GIS database and plotting	5
3.2	Mapping exercise with importing GPS data in Google Earth	5

✧ Course Evaluation:

☉ BSCGEOMJ401 - Theory

● Continuous Assessment: 15 Marks*

*[average of the obtained marks of two are to be made to calculate the final marks]

1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [15 Marks]



2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [15 Marks]

• **End Semester Examination: 35 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer One questions carrying **10 marks** out of given **two** questions; Two questions carrying **5 marks** each out of given **four** questions; Five questions carrying **2 marks** each out of given **eight** questions; Five questions carrying **1 mark** each out of given **eight** questions.

⊙ **BSCGEOMJ401 - Lab**

• **Continuous Assessment: 30 Marks**

1. Practical records: An A3 or tabloid-size (11 inch x 15 inch) laboratory notebook, comprising class assignments of all practical topics must be prepared and duly signed by the teacher. The exercises on scanned maps, satellite images and GPS data are to be represented from **QGIS/ Garmin BaseCamp/ Microsoft Excel** software as applicable. Methods and interpretations are to be handwritten. [5 Marks]

2. Viva-voce based on laboratory notebook. [10 Marks]

3. Practical Exercises: Internal assessment to be conducted on the basis of above three units. [15 Marks]

• **End Semester Examination: 20 Marks**

1. Practical Exercises: In the End Semester Examination, students have to answer the questions set from the above three units. [15 Marks]

2. Viva-voce based on laboratory notebook. [5 Marks]

✧ References

BOOKS:

Agarwal, G.C. (1974): Photogrammetric Surveys, their Planning, Execution and Costing, Survey of India Technical Publication, No. 7401.

Bhatta, B. (2021): Global Navigation Satellite Systems: New Technologies and Applications, 2nd ed., CRC Press.

Bhatta, B. (2021): Remote Sensing and GIS, 3rd ed., Oxford University Press.

Bolstad, P. (2019): GIS Fundamentals: A First Text on Geographic Information Systems, 6th ed., XanEdu Publishing.



- Brewer, C.A. (2015): *Designing Better Maps: A Guide for GIS Users*, 2nd ed., ESRI Press.
- Burrough, P.A., McDonnell, R.A. and Lloyd, C.D. (2016): *Principles of Geographical Information Systems*, 3rd ed., International 3rd ed., Oxford University Press.
- Campbell, J.B. and Wynne, R.H. (2011): *Introduction to Remote Sensing*, 5th ed., The Guilford Press, New York.
- Chaisman, N. (2002): *Exploring Geographic Information Systems*, 2nd ed., John Wiley and Sons, Inc., New York.
- Chang, K-T. (2020): *Introduction to Geographic Information Systems*, 9th ed., McGraw Hill Education (India) Private Limited.
- Curran, P.J. (2020): *Principles of Remote Sensing*, Rawat Publications, Jaipur.
- Fazal, S. (2008): *GIS Basics*, New Age International (P) Limited, Publishers, New Delhi.
- Ganguly, M. (2024): *Adunik Remote Sensing, G.I.S Ebong G.N.S.S. - Tattya O Proyog Padhati (Bengali Version)*, Nabodaya Publications, Kolkata.
- Harvey, F. (2015): *A Primer of GIS: Fundamental Geographic and Cartographic Concepts*, The Guilford Press.
- Heywood, I., Cornelius, S. and Carver, S. (2011): *Introduction to Geographical Information Systems*, 4th ed., Pearson.
- Jensen, J.R. (2013): *Remote Sensing of the Environment: An Earth Resource Perspective*, 2nd ed., Pearson Education India.
- Jensen, J.R. (2017): *Introductory Digital Image Processing: A Remote Sensing Perspective*, 4th ed., Pearson Education.
- Joseph, G. and Jeganathan, C. (2018): *Fundamentals of Remote Sensing*, 3rd ed., Universities Press.
- Lillesand, T.M., Kiefer, R.W. and Chipman, J.W. (2022): *Remote Sensing and Image Interpretation (An Indian Adaptation)*, 7th edition, Wiley India Pvt Ltd.
- Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2015): *Geographic Information Science and Systems*, 4th ed., John Wiley & Sons, New York.
- Nag, P. and Kudrat, M. (1998): *Digital Remote Sensing*, Concept Publishing Company Private Limited.
- Nag, P. and Sengupta, S. (2008): *Introduction to Geographical Information System*, Concept Publishing Company.
- Panda, B.C. (2008): *Remote Sensing: Principles and Applications*, Viva Books Private Limited, New Delhi.
- Pandey, S. and Tripathi, S. (2020): *Basic Concept of Remote Sensing, GPS and GIS*, Sankalp Publication.
- Rahman, A. and Fazal, S. (2017): *Global Positioning System: Concept, Technique and Application*, New Age International Pvt Ltd.
- Rajan, M.S. (2012): *Space Today*, National Book Trust, New Delhi.



Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi.

Reddy, M.A. (2012): Textbook of Remote Sensing and Geographical Information Systems, 4th ed., BS Publications.

Rees, W.G. (2012): Physical Principles of Remote Sensing, 3rd ed., Cambridge University Press.

Sabins, F.F. and Ellis, J.M. (2020): Remote Sensing: Principles, Interpretation, and Applications, 4th ed., Waveland Press, Inc., Illinois.

Sahu, K.C. (2007): Textbook of Remote Sensing and Geographical Information Systems, Atlantic Publishers, New Delhi

Samanta, S. (2023): A Text Book of Remote Sensing, GIS and GNSS, Notion Press.

Wolf, P.R. (2013): Elements of Photogrammetry, Indian Edition, McGraw Hill Education.

WEBSITES:

Alaska Satellite Facility - Distributed Active Archive Center: <https://search.asf.alaska.edu/#/>

BaseCamp Software: <https://www.garmin.com/en-IN/software/basecamp/>

Campbell, J. and Shin, M. (2011): **Essentials of Geographic Information Systems**, Saylor Foundation:

<https://open.umn.edu/opentextbooks/textbooks/67>

Centre for Space Science and Technology Education in Asia and the Pacific: <https://cssteapun.org/>

Copernicus Data Space Ecosystem: <https://dataspace.copernicus.eu/>

Geospatial World: <https://www.geospatialworld.net/>

Indian Institute of Remote Sensing: <https://www.iirs.gov.in/>

Indian Space Research Organisation: <https://www.isro.gov.in/>

International Society for Photogrammetry and Remote Sensing: www.isprs.org

ISRO Bhuvan 2D and 3D Platforms:

<https://bhuvan-app1.nrsc.gov.in/bhuvan2d/bhuvan/bhuvan2d.php>

<https://bhuvan-app1.nrsc.gov.in/globe/3d.php>

Magazine: Coordinates: <https://mycoordinates.org/>

Magazine: GIS World: <https://gisworld.co.in/>

Magazine: GPS World: <https://www.gpsworld.com/>

NASA Earthdata: <https://search.earthdata.nasa.gov/search/>

National Remote Sensing Centre Bhoonidhi: <https://bhoonidhi.nrsc.gov.in/bhoonidhi/home.html>

National Remote Sensing Centre: www.nrsc.gov.in

QGIS: <https://www.qgis.org/>

Space Applications Centre: <https://www.sac.gov.in/Vyom/>

USGS EarthExplorer: <https://earthexplorer.usgs.gov/>



Programme: B.Sc.		Year: II		Semester: IV			
Discipline: Geography							
Course Name: Geospatial Science and Technology							
Course Code: BSCHGEOMN401							
Course Type: Minor (Theoretical)		Course Details: MNC-4		L-T-P: 4 - 1 - 0			
Course Credit: 5		Full Marks: 100		CA Marks		ESE Marks	
				Practical	Theoretical	Practical	Theoretical
		---	30	---	70		
<p>Course Objectives:</p> <ul style="list-style-type: none"> ✧ To familiarize the students with the detailed concept and understanding of geospatial science and the importance of major geospatial policies of India while keeping in view the growth of the geospatial industry. ✧ This course introduces the students to the basic concepts of remote sensing and imparts necessary skills in remote sensing analysis and image interpretation. So that, students acquire employable skills in remote sensing. ✧ The course offers information on how to solve spatial decision problems using geospatial technology, as well as the limitations and pitfalls of using these technologies. 							
<p>Learning Outcome:</p> <ul style="list-style-type: none"> ✧ At the end of this course, it is expected that students will be able to learn fundamental concepts of geospatial science and mapping. ✧ Students will be able to acquire knowledge on GIS data structures with interpolation, modelling and functions. ✧ Students will also be able to understand GNSS-based survey and mapping as well as the application of geospatial technology for specific purposes. 							
<p>Professional Skill Development:</p> <ul style="list-style-type: none"> ✧ This knowledge will provide students with a wide range of professional skills applicable to various fields. ✧ Students will acquire employable skills in geospatial technology. 							
Sub units	Topics to be covered				No. of Lectures		
Unit I: Introduction to Geospatial Science and Mapping [30 Hours]							
1.1	Geospatial Science: Definition, scope and historical development; Geospatial mapping: Datum surface and coordinate systems, transformation				5		
1.2	Geodesy: Definition, shape and size of the Earth, geoid and reference ellipsoid				3		
1.3	National Map Policy 2005; Role of National Mapping Organisations: Survey of India, NATMO and NRSC				4		
1.4	Concept of data and information; Types of data: Spatial and non-spatial; Types, characteristics and sources of spatial data; Quality and reliability issues of geospatial data				5		
1.5	Primary geospatial data acquisition techniques: Raster data capture (Earth imaging satellite capturing and UAV data); Vector data capture (field surveying techniques, crowdsourcing)				5		



1.6	New Geospatial Data Guidelines 2021	2
1.7	Concept of Geospatial software and types (Open source and commercial software); Major functions of geospatial software available in the market	3
1.8	Geospatial industry: Concept and types; Role of geospatial industry in service provision and in the daily life aspects	3
Unit II: Geospatial Technology [30 Hours]		
2.1	History and evolution of photogrammetry and remote sensing (RS); Principles of RS; Platforms, geometry of orbits; Types of RS satellites and sensors; Sensor resolutions and their applications; Types of RS; Band Combination, FCCs and SFCC	9
2.2	Pre-processing of satellite data (geometric and radiometric corrections); Image enhancement techniques (spectral and spatial); Image classification (supervised and unsupervised)	6
2.3	Basics of GIS: Definition, components, development and applications	2
2.4	GIS variables: points, lines, polygon; Advantage and limitation of GIS	2
2.5	Spatial data structures in GIS: raster and vector; DBMS	3
2.6	Principle, components and applications of GNSS; GNSS signals	3
2.7	Trends in geospatial technology: Development of web-based spatial platforms with reference to Bhuvan and Google Earth Engine	2
2.8	Applications of geospatial technology in climate change studies and disaster risk reduction (DRR)	3

◇ Course Evaluation:

- **Continuous Assessment: 30 Marks***

*[average of the obtained marks of two are to be made to calculate the final marks]

1. Seminar presentations: A powerpoint presentation to be conducted for internal assessment on the notified portions/ topics. [30 Marks]

2. Class test: There shall be test (s) of knowledge and understanding through written test on the notified portions/ topics (s). [30 Marks]

- **End Semester Examination: 70 Marks**

The end semester examination shall be conducted based on written test.

Question Pattern: Students have to answer Two questions carrying **10 marks** out of given **three** questions; Five questions carrying **5 marks** each out of given **eight** questions; Ten questions carrying **2 marks** each out of given **fourteen** questions; Five questions carrying **1 mark** each out of given **eight** questions.



✧ References

BOOKS:

Agarwal, G.C. (1974): Photogrammetric Surveys, their Planning, Execution and Costing, Survey of India Technical Publication, No. 7401.

Bhatta, B. (2021): Global Navigation Satellite Systems: New Technologies and Applications, 2nd ed., CRC Press.

Bhatta, B. (2021): Remote Sensing and GIS, 3rd ed., Oxford University Press.

Bolstad, P. (2019): GIS Fundamentals: A First Text on Geographic Information Systems, 6th ed., XanEdu Publishing.

Brewer, C.A. (2015): Designing Better Maps: A Guide for GIS Users, 2nd ed., ESRI Press.

Burrough, P.A., McDonnell, R.A. and Lloyd, C.D. (2016): Principles of Geographical Information Systems, 3rd ed., International 3rd ed., Oxford University Press.

Campbell, J.B. and Wynne, R.H. (2011): Introduction to Remote Sensing, 5th ed., The Guilford Press, New York.

Chaisman, N. (2002): Exploring Geographic Information Systems, 2nd ed., John Wiley and Sons, Inc., New York.

Chang, K-T. (2020): Introduction to Geographic Information Systems, 9th ed., McGraw Hill Education (India) Private Limited.

Curran, P.J. (2020): Principles of Remote Sensing, Rawat Publications, Jaipur.

Fazal, S. (2008): GIS Basics, New Age International (P) Limited, Publishers, New Delhi.

Ganguly, M. (2024): Adunik Remote Sensing, G.I.S Ebong G.N.S.S. - Tattya O Proyog Padhati (Bengali Version), Nabodaya Publications, Kolkata.

Harvey, F. (2015): A Primer of GIS: Fundamental Geographic and Cartographic Concepts, The Guilford Press.

Heywood, I., Cornelius, S. and Carver, S. (2011): Introduction to Geographical Information Systems, 4th ed., Pearson.

Jensen, J.R. (2013): Remote Sensing of the Environment: An Earth Resource Perspective, 2nd ed., Pearson Education India.

Jensen, J.R. (2017): Introductory Digital Image Processing: A Remote Sensing Perspective, 4th ed., Pearson Education.

Joseph, G. and Jeganathan, C. (2018): Fundamentals of Remote Sensing, 3rd ed., Universities Press.

Lillesand, T.M., Kiefer, R.W. and Chipman, J.W. (2022): Remote Sensing and Image Interpretation (An Indian Adaptation), 7th edition, Wiley India Pvt Ltd.

Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2015): Geographic Information Science and Systems, 4th ed., John Wiley & Sons, New York.



- Nag, P. (2016): Indian Geospatial Infrastructure, Bharati Prakashan, Varanasi.
- Nag, P. and Kudrat, M. (1998): Digital Remote Sensing, Concept Publishing Company Private Limited.
- Nag, P. and Sengupta, S. (2008): Introduction to Geographical Information System, Concept Publishing Company.
- Panda, B.C. (2008): Remote Sensing: Principles and Applications, Viva Books Private Limited, New Delhi.
- Pandey, S. and Tripathi, S. (2020): Basic Concept of Remote Sensing, GPS and GIS, Sankalp Publication.
- Rahman, A. and Fazal, S. (2017): Global Positioning System: Concept, Technique and Application, New Age International Pvt Ltd.
- Rajan, M.S. (2012): Space Today, National Book Trust, New Delhi.
- Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi.
- Reddy, M.A. (2012): Textbook of Remote Sensing and Geographical Information Systems, 4th ed., BS Publications.
- Rees, W.G. (2012): Physical Principles of Remote Sensing, 3rd ed., Cambridge University Press.
- Sabins, F.F. and Ellis, J.M. (2020): Remote Sensing: Principles, Interpretation, and Applications, 4th ed., Waveland Press, Inc., Illinois.
- Sahu, K.C. (2007): Textbook of Remote Sensing and Geographical Information Systems, Atlantic Publishers, New Delhi
- Samanta, S. (2023): A Text Book of Remote Sensing, GIS and GNSS, Notion Press.
- Wolf, P.R. (2013): Elements of Photogrammetry, Indian Edition, McGraw Hill Education.

WEBSITES:

- Centre for Space Science and Technology Education in Asia and the Pacific: <https://cssteapun.org/>
- Campbell, J. and Shin, M. (2011): **Essentials of Geographic Information Systems**, Saylor Foundation: <https://open.umn.edu/opentextbooks/textbooks/67>
- Geospatial World: <https://www.geospatialworld.net/>
- GISGeography: <https://gisgeography.com/>
- Indian Institute of Remote Sensing: <https://www.iirs.gov.in/>
- Indian Space Research Organisation: <https://www.isro.gov.in/>
- International Society for Photogrammetry and Remote Sensing: www.isprs.org
- Magazine:** Coordinates: <https://mycoordinates.org/>
- Magazine:** GIS World: <https://gisworld.co.in/>
- Magazine:** GPS World: <https://www.gpsworld.com/>
- National Remote Sensing Centre: www.nrsc.gov.in



Programme: B.Sc.		Year: II		Semester: IV	
Discipline: Geography					
Course Name: Computer Applications in Geography					
Course Code: BSCGEOSE401					
Course Type: SEC (Practical)		Course Details: SEC-3		L-T-P: 0 - 0 - 6	
Course Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	---	20	---
Course Objectives:					
<ul style="list-style-type: none"> ✧ This course is an initiative to impart knowledge on the basics of computer and computer applications. ✧ To develop ability and skills in writing, editing, and presentation for representation of geographical information; data storing, formatting, and preparing graphs; developing internet surfing skills. 					
Learning Outcome:					
Upon successful completion of this course, students will be able to:					
<ul style="list-style-type: none"> ✧ Get working knowledge of computer hardware and software. ✧ Develop writing, editing, and presentation skills for the representation of geographical information. ✧ Develop ability and skills in data management and graphical representation. ✧ Acquire internet surfing skills and enhance the ability to gain knowledge from the digital world. ✧ Know about sources and uses of online educational resources and e-learning methods. 					
Professional Skill Development:					
<ul style="list-style-type: none"> ✧ This course has the great potential to advance the learner's career. The acquired knowledge is highly effective in developing data analysis skills, observation skills, communications skills in particular and digital skills in general. ✧ The knowledge obtained from this course will help the students to find employment opportunities. 					
Sub units	Topics to be covered				Lab work hours
Unit I: Computer Basics [20 Hours]					
1.1	Computer components: Hardware and software: CPU, Input and Output devices; System software and application software				10
1.2	Common computer languages; Numbering systems				10
Unit II: Computer Application [40 Hours]					
2.1	Understanding word processing: Introduction and working with Microsoft Word, basic commands, formatting text and documents, sorting and tables, working with graphics; Microsoft PowerPoint: Making a small presentation using Microsoft PowerPoint				15
2.2	Spreadsheets: Basics of spreadsheet; Manipulation of cells; Formulas and functions; Data storing and formatting in spreadsheet; Printing of spreadsheet; Preparation of annotated diagrams: Bar, Pie, Line Graph and Doughnut Chart; Heat map creation in MS Excel				25

**Unit III: Internet Surfing [30 Hours]**

3.1	Concept of internet; Application of internet; World Wide Web; Sending email and password security; Storing and retrieving of data/ documents using online data storage facilities	10
3.2	Preparation of online questionnaire/ online survey through google forms; Comprehensive browsing and listing of useful geographical sites; E-learning through e-content and open online courses: e-PG Pathshala, digital library, SWAYAM-MOOCs	20

✧ Course Evaluation:**• Continuous Assessment: 30 Marks**

1. Practical records: An A3 or tabloid-size (11 inch x 15 inch) laboratory notebook, comprising class assignments of all practical topics must be prepared and duly signed by the teacher. Methods and interpretations are to be represented as computer prints. [5 Marks]

2. Viva-voce based on laboratory notebook. [10 Marks]

3. Practical Exercises: Internal assessment to be conducted on the basis of above three units. [15 Marks]

• End Semester Examination: 20 Marks

1. Practical Exercises: In the End Semester Examination, students have to answer the questions set from the above three units. [15 Marks]

2. Viva-voce based on laboratory notebook. [5 Marks]

✧ References**BOOKS:**

Balagurusamy, E. (2009): Fundamentals of Computers, Tata McGraw-Hill Education Pvt. Ltd.

Bartee, T.C. (1977): Digital Computer Fundamentals, McGraw Hill.

Blissmer, R. (1996): Working with MS Word, Houghton Mifflin Co.

Chauhan, S., Saxena, A. and Gupta, K. (2006): Fundamentals of Computer, Laxmi Publications.

Flake, L.J., McClintock, C.E. and Turner, S. (1989): Fundamental of Computer Education, Wordsworth Pub. Co.

Leach, D.P., Malvino, A.P. and Saha, G. (2011): Digital Principles and Applications, 7th ed., Tata McGraw Hill Education Private Limited, New Delhi.

Leon, A. and Leon, M. (2009): Introduction to Computers, Vikas Publishing.

Leon, A. and Leon, M. (2012): Internet for Everyone, Second Edition, Vikas Publishing House.



Maguire, D.J. (1989): Computers in Geography, Longman, London.

Mano, M.M. and Kime, C. (2014): Logic and Computer Design Fundamentals, Fourth Edition, Pearson Education Limited.

Mather, P.M. (1991): Computer Applications in Geography, Wiley, New York.

Miller M. (2007): Absolute Beginner's Guide to Computer Basics, Fourth Edition, QUE.

Rajaraman, V. (2003): Fundamentals of Computers, Prentice Hall India Learning Private Limited.

Rajaraman, V. (2009): Computer Primer, 2nd Edition, Prentice Hall India Learning Private Limited.

Sarkar, A. and Gupta, S.K. (2002): Elements of Computer Science, S Chand and Company, New Delhi.

Sinha, P.K. and Sinha, P. (2008): Foundations of Computing, 3rd ed., BPB Publication.

WEBSITES:

e-PG Pathshala: <https://epgp.inflibnet.ac.in/>

MOOCS - NPTEL: <https://nptel.ac.in/>

MOOCS - SWAYAM: <https://swayam.gov.in/>

National Digital Library of India: <https://ndl.iitkgp.ac.in/>