DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

FACULTY OF GEO-SCIENCES

Curriculum for Bachelor of Science (Honours)
Session: 2021-2022

Examination year

B. Sc. (Honours) Part I 2022
B. Sc. (Honours) Part II 2023
B. Sc. (Honours) Part III 2024
B. Sc. (Honours) Part IV 2025

Geography and Environmental Studies
UNIVERSITY OF RAJSHAHI

UNIVERSITY OF RAJSHAHI

RAJSHAHI 6205, BANGLADESH

www.ru.ac.bd

PART A

1. **Name of the University:**
   University of Rajshahi, Rajshahi 6205, Bangladesh
2. **Vision of the University:**
   To pursue enlightenment and creativity for producing world-class human resources to cater for the needs of changing time.
3. **Mission of the University:**
   1. To ensure a world-class curriculum with talented academicians and conducive academic and research environment for generation and dissemination of knowledge.
   2. To maintain international standards in education with focus on both knowledge and skills, and humanitarian and ethical values to meet the needs of the society and state.
   3 To develop strategic partnerships with leading national and international universities, and organizations for academic as well as research collaborations.
4. **Name of the Faculty:**
   Faculty of Geo-Sciences
5. **Name of the Department:**
   Department of Geography and Environmental Studies
6. **Title of the Academic Program:**
   Bachelor of Science in Geography and Environmental Studies
7. **Vision of the Department:**
   To be a centre of academic excellence in Geography and Environment through quality teaching-learning, professional development, innovative and cutting-edge research, use of modern geo-spatial techniques, and community engagement.
8. **Mission of the Department**
   - to **provide** quality education and training in the fields of geography and environment with interactive teaching and learning strategies.
   - to **equip** students with intellectual and technical skills in order to meet the challenges associated with the continuing evolution of geographic & environmental sciences and to develop the carrier based on requirements of the society.
   - to **conduct** disciplinary and integrated research for contributing new innovations that spans local to global scales, with an emphasis on a geospatial perspective of our changing planet and its sustainability.
   - to **apply** geographic science to societal and environmental issues for the development of the nation and the global community.
   - to **create/establish** platform for local, national, global community for sharing and disseminating knowledge and skills through quality publication, conference, seminar/symposium, and building international collaboration and partnership.
9. **Objectives of the Department:**
   - to **provide** professional graduates in the field of geography and environmental studies considering requirements of contemporary job markets.
   - to **publish** in leading professional journals to contribute the theoretical development and application regarding geography and environmental studies addressing the various issues.
   - to **disseminate** recent knowledge about geography and environmental studies to ensure effective applications of statistics in real life practices.
   - to **deliver** adequate, relevant and timely assessment about geospatial phenomena to facilitate research, planning and decision-making process for the government and the community for achieving Sustainable Development Goals (SDGs) of Bangladesh.

B. Sc. Honours in Geography and Environmental Studies

Examination year

B. Sc. (Honours) Part I 2022
B. Sc. (Honours) Part II 2023
B. Sc. (Honours) Part III 2024
B. Sc. (Honours) Part IV 2025

Name of the Program:
B.Sc. Honours in Geography and Environmental Studies

Vision:
This program is designed to produce skilled and competent graduates equipped with necessary knowledge about geography and environmental studies that can be meet the needs of the national and global requirements.

Program Educational Objectives (PEOs)

PEO1	Graduates will demonstrate/possess technical competency, employable skill and effective leadership in the fields of geography and environment.
PEO2	Graduates will demonstrate commitment to address 21st century challenges, sustainable development and betterment of the community.
PEO3	Graduates will show/demonstrate the ability to think critically, to analyze problems, and to make sound and intelligent decision.
PEO4	Graduates will pursue lifelong learning in generating innovative geo-environmental solutions using up-to-date educational experience, cutting-edge research and complex problem-solving skills.

Program Learning Outcomes (PLOs)

PLO1	Able to understand/acquire knowledge about the philosophy, methods, and scientific knowledge in the field of geography and environment.
PLO2	Able to apply/use knowledge and skill on systems, theories, models and techniques about the different aspects of human and physical geography as well as various environmental issues.
PLO3	Able to identify, analyze, formulate, and solve various issues related to spatio-temporal phenomena of the Earth and environment.
PLO4	Able to synthesize geographic and environmental knowledge and apply innovative research strategies to solve problems in resource management/conservation, climate and environmental change, disaster forecast and management, spatial planning, population dynamics, and sustainable development within the community, region, and world.
PLO5	Able to think critically, logically and analytically to make sound and intelligent decisions in solving challenging geospatial concerns.
PLO6	Able to communicate effectively as well as accurately and to present technical information/research outcomes/findings in oral and written format.
PLO7	Able to develop skill, leadership quality, attitudes, and flexibility to work individually and collaboratively as part of a team.
PLO8	Able to become lifelong learner to seek new knowledge and continuously develop information management skills that are needed to succeed in a rapidly changing world.
PLO9	Able to be professional, confident and ethical in carrying out tasks and responsibilities.
PLO10	Able to respond and act on contemporary global issues.

Mapping of PEOs and PLOs

PEOs	PLOs									
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
PEO1	√	√			√	√	√			
PEO2	√			√		√		√	√	√
PEO3	√	√	√	√						
PEO4							√	√	√	√

Ordinance:

The B.Sc. Honours Course in Geography and Environmental Studies shall spread over 4 (four) academic years and the total marks is 4000 (40 units, 160 credits) conforming to the university Rules and Regulations. Theory courses comprise of major, minor and non-credit courses. Major courses carry 100 marks each and will be of four credit hours. The minor courses carry 75 marks each and will be of three credit hours. Year wise distribution of marks and credits including practical and viva voce are shown in the following Tables.

Curriculum Plan

Year	Theory						English			Practical		
	Major			Minor			(Non-Credit)					
	Unit	Marks	Credit	Unit	Marks	Credit	Unit	Marks	Credit	Unit	Marks	Credit
1st	4.0	400	16	3.0	300	12	0.5	50	N.C.	1.5	150	6
2nd	4.0	400	16	3.0	300	12	-	-	-	1.5	150	6
3rd	7.0	700	28	-	-	-	-	-	-	2.5	250	10
4th	7.0	700	28	-	-	-	-	-	-	2.5	250	10
Total	22.0	2200	88	6.0	600	24	-	-	-	8.0	800	32

Year	Viva voice			Class Assessment[1]			Total		
	Unit	Marks	Credit	Unit	Marks	Credit	Unit	Marks	Credit
1st	0.5	50	2	0.5	50	2	9.5	950	38
2nd	0.5	50	2	0.5	50	2	9.5	950	38
3rd	0.5	50	2	0.5	50	2	10.5	1050	42
4th	0.5	50	2	0.5	50	2	10.5	1050	42
Total	2.0	200	8	2.0	200	8	40	4000	160

[1] **Details of class assessment for each year with mark distributions:** 10 marks for class attendance, 10 marks for laboratory and field attendance, 15 marks for tutorial test, and 15 marks for terminal test.

Award of Degree:

The degree of Bachelor of Science with Honours in Geography and Environmental Studies shall be awarded on the basis of CGPA obtained by a candidate in B.Sc. Honours Part-l, Part-II, Part-III and Part-IV examinations. In order to qualify for the B.Sc. Honours degree a candidate must have to obtain within 6 (six) academic years from the date of admission. The required GPA, Credit Points and Class Attendance for class promotion, improvement, and degree award are provided in the following Tables:

Required GPA & Credit Point (CP) for Class Promotion				**Grade Improvement/ Course Improvement**
	Part-I	Part-II	Part-III	a. Number of Course Maximum 2 including F/I (if any) in Part-I, Part-II and Part-III Examination. b. Grade Improvement of CGPA less than 2.75 at the end of Part-IV examination in the following year /next available batch.
GPA	2.00	2.25	2.50	
GP Practical	2.00	2.00	2.00	
CP	30	30	34	

Award of Degree	**Result Improvement**	**Pass Degree**
CGPA 2.50 CP 144 (90% of Total CP). GP-2.00 in Practical Examination of Part I, Part II, Part III and Part IV.	a. Number of Course Maximum 4 (four) in Part-IV Examination. b. GP less than 2.75 c. Must be within 6 (six) academic years.	CGPA 2.50 CP 128 (80% of total CP).

Distribution of Marks for Class Attendance:

Percentage of Class Attendance	**Marks**
90% and above	10
80% and above	9
70% and above	8
60% and above	7
Less than 60%	0

Publication of Result: The overall result of a successful candidate covering all examinations of four years shall be declared on the basis of CGPA. The transcript in English shall show the course number, course title, credit, grade and grade point of individual courses, GPA of each year, CGPA and the corresponding LG for the overall result.

PART B: Detailed Course Outline
Curriculum Plan for B.Sc. Honours Part-I
Examination: 2022

Course No.	Title of the Course	Unit	Full Marks	Credit
Major Courses				
GES 101	Introduction to Geography and Earth System Science	1.0	100	4
GES 102	Introduction to Human Geography	1.0	100	4
GES 103	Introduction to Physical Geography	1.0	100	4
GES 104	Climatology	1.0	100	4
Minor Courses				
GES 105	Statistics in Geography	0.75	75	3
GES 106	Principles of Cartography and Geo-Visualization	0.75	75	3
GES 107	Computer Techniques in Geography	0.75	75	3
GES 108	Biogeography	0.75	75	3
GES 109	English for Geographer (Non-Credit)	0.5	50	Non-Credit

PRACTICAL EXAMINATION

[Practical Examination shall be 18 hours (six hours per day)] [2]

A.	Basic Cartographic Techniques and Tools for Mapping	1.5	150	6
B.	Preparation of map scales, map construction, transformation and reproduction			
C.	Analyses and interpretation of Relief/map features			
D.	Biogeography			
E:	Field work of historical aspects: Field visit to historical interest, sketching, mapping, description of places, and assessing tourism potentiality.			
Viva-voce		0.5	50	2
Class Assessments: Attendance, Field Attendance, Tutorial and Terminal		0.5	50	2
Total Credit		**9.5**	**950**	**38**

[2] **Details of practical examination marks**: 105 marks for practical examination, 15 marks for record of practical works, and 30 marks for field work report. **Total 150 Marks**.

Curriculum Plan for B.Sc Honours Part-II
Examination: 2023

Course No.	Title of the Course	Unit	Full Marks	Credit
	Major Courses			
GES 201	Geographical Concepts and Methodology	1.0	100	4
GES 202	World Regional Geography	1.0	100	4
GES 203	Fundamentals of Economic Geography	1.0	100	4
GES 204	Geomorphology and Oceanography	1.0	100	4
	Minor Courses			
GES 205	Meteorology and Weather Forecasting	0.75	75	3
GES 206	Principles of Geographic Information Systems	0.75	75	3
GES 207	Quantitative Techniques in Geography	0.75	75	3
GES 208	Historical Geography of Bangladesh	0.75	75	3

PRACTICAL EXAMINATIONS
[Practical Examination shall be 18 hours (six hours per day)] [3]

Part-A	Map Projections	1.5	150	6
Part-B	Surveying I: Chain and Tape, Plane Table, Prismatic Compass			
Part-C	Basic Operations of GIS and Preparation of Thematic Maps using GIS Software			
Part-D	Fieldwork of Physical Aspects: Landscape and physical resource sketching and mapping, description of landscape process, and assessment of resource potentiality.			
Viva-voce		0.5	50	2
Class Assessments: Attendance, Field Attendance, Tutorial and Terminal		0.5	50	2
	Total Credit	**9.5**	**950**	**38**

[3] **Details of practical examination marks**: 105 marks for practical examination, 15 marks for record of practical works, and 30 marks for field work report. **Total 150 Marks**.

Curriculum Plan for B.Sc. Honours Part-III

Examination: 2024

Course No.	Title of the Course	Unit	Full Marks	Credit
GES 301	Environmental Geography	1.0	100	4
GES 302	Urban and Transport Geography	1.0	100	4
GES 303	Agriculture and Soil Geography	1.0	100	4
GES 304	Geography of Bangladesh	1.0	100	4
GES 305	Advance Economic Geography	0.75	75	3
GES 306	Climate Change and Disaster Management	0.75	75	3
GES 307	Research Methodology and Project Monitoring	0.75	75	3
GES 308	Principles of Photogrammetry and Remote Sensing	0.75	75	3

PRACTICAL EXAMINATIONS

[Practical Examination shall be 24 hours (6 hours per day)] [4]

Part-A	Surveying II: Surveying, GPS, Total Station, and UAV	2.5	250	10
Part-B	Aerial Photographs Interpretation and Remote Sensing Data Analysis			
Part-C	Study of Geological Maps and Identification of Rocks & Minerals			
Part-D	Study of Weather Maps			
Part-E	Field Work of Human Aspects: Socio-economic survey of a region through field observations, questionnaire survey, in-depth interview and FGD			
Viva-voce		0.5	50	2
Class Assessments: Attendance, Field Attendance, Tutorial and Terminal		0.5	50	2
	Total Credit	**10.5**	**1050**	**42**

[4] **Details of practical examination marks:** 180 marks for practical examination, 20 marks for record of practical works, and 50 marks for field work report. **Total 250 Marks.**

Curriculum Plan for B.Sc Honours Part-IV

Examination: 2025

Course No.	Title of the Course	Unit	Full Marks	Credit
GES 401	Fundamentals of Resource Management	1.0	100	4
GES 402	Population and Settlement Geography	1.0	100	4
GES 403	Fluvial Morphology and River Management	1.0	100	4
GES 404	Research Project	1.0	100	4
GES 405	Political and Cultural Geography	0.75	75	3
GES 406	Tourism Geography	0.75	75	3
GES 407	Spatial Analysis	0.75	75	3
GES 408	South Asia [Excluding Bangladesh]	0.75	75	3

PRACTICAL EXAMINATIONS

[Practical Examination shall be 24 hours (6 hours per day)] [5]

Part-A	Morphometric Analysis	2.5	250	10
Part-B	Spatial Analysis and Mapping			
Part-C	Environmental Analysis			
Part-D	Field Techniques in Geography			
Part-E	Analyzing Demographic and Settlement Data			
Part-F	Field Work of Environmental Aspects: Eco-environmental Survey - collection and processing of field samples, EIA, and presentation.			
Viva-voce		0.5	50	2
Class Assessments: Attendance, Field Attendance, Tutorial and Terminal		0.5	50	2
Total Credit		**10.5**	**1050**	**42**

[5] **Details of practical examination marks:** 180 marks for practical examination, 20 marks for record of practical works, and 50 marks for field work report. **Total 250 Marks**

Curriculum Plan for B.Sc. Honours Part-I

Examination: 2022

Course No.	Title of the Course	Unit	Full Marks	Credit
Major Courses				
GES 101	Introduction to Geography and Earth System Science	1.0	100	4
GES 102	Introduction to Human Geography	1.0	100	4
GES 103	Introduction to Physical Geography	1.0	100	4
GES 104	Climatology	1.0	100	4
Minor Courses				
GES 105	Statistics in Geography	0.75	75	3
GES 106	Principles of Cartography and Geo-Visualization	0.75	75	3
GES 107	Computer Techniques in Geography	0.75	75	3
GES 108	Biogeography	0.75	75	3
GES 109	English for Geographer (Non-Credit)	0.5	50	Non-Credit

PRACTICAL EXAMINATION

[Practical Examination shall be 18 hours (six hours per day)] [2]

A.	Basic Cartographic Techniques and Tools for Mapping	1.5	150	6
B.	Preparation of map scales, map construction, transformation and reproduction			
C.	Analyses and interpretation of Relief/map features			
D.	Biogeography			
E:	Field work of historical aspects: Field visit to historical interest, sketching, mapping, description of places, and assessing tourism potentiality.			
Viva-voce		0.5	50	2
Class Assessments: Attendance, Field Attendance, Tutorial and Terminal		0.5	50	2
Total Credit		**9.5**	**950**	**38**

[2] **Details of practical examination marks**: 105 marks for practical examination, 15 marks for record of practical works, and 30 marks for field work report. **Total 150 Marks**.

Course Title: Introduction to Geography and Earth System Science

Course Code: GES 101, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course provides the basic concept of geography and earth system science with the definition, meaning, nature and scope. The content of the course is also described the astronomical aspects of the Earth. After completion of this course students will learn about the universe, galaxy, solar system and the earth along with the understanding of latitude, longitude and global timing.

Course Outcomes (COs):
CO1: Able to understand the introduction of geography and earth system science, and their relations giving emphasis on astronomical knowledge.
CO2: Able to describe the creation of Universe, formation of galaxy, Solar System and differences between Earth and other planets in the Solar System.
CO3: Able to explain earth's co-ordination system, global calendar system and its application in the real life.

COs	Course Contents	TLS	AS
CO1	Geography and Earth System Science: Meaning, fundamental concepts, scope, nature and branches. The relationship between geography and astronomy.	Lecture , Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Universe: Big-Bang theory, creation of primary elements, formation of galaxy, and stars.		
CO2	Solar System: Planets and Satellites, Sun, Earth and Moon.		
CO2	Earth System: Form and shape of the Earth including oblate and spheroid curvature of the earth. Common centre of gravity. Polar axis and equatorial axis.		
CO1 & CO3	Earth's Circumference and Area: Longitude and Latitude determination. Prime meridian. Length of latitudes and longitudes. Great circle. Rhumb line.		
CO1 & CO3	Rotation and Revolution: Illumination of the globe. Circle of illumination. Almanac and analema. Length of day and night, and altitude of the sun. Solstices and equinoxes. Twilight - types, determination.		
CO3	Time: Longitude and time. Local and standard time, division of the earth according to standard time. Standard time of USA, India and Bangladesh. International Date Line. Calendar-Astronomical, Jewish, Mohammedan, Roman, Julian, Gregorian and World.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Adhikari, S. (2011). *Fundamentals of Geographical Thought*. Chaitanya Publishing House, Allahabad, India
Berry, B. J. L. (1973). *A Paradigm for Modern Geography*, In R. J. Chorley (ed.), *Directions in Geography*. London, Methuen,
Broek, J. O. M. (1965) *Geography, its scope and spirit*.
Merrill, Columbus, Ohio. Branley et.al., (1975). *Astronomy.* Thomas Y. Crowell & Co., New York
pp. 3-22.
Strahler, A. H., and Strahler, A. N. (2006). *Introducing physical geography*.
Wiley, J.; Arny, T., and Schneider, S. E. (1994). *Explorations: an introduction to astronomy*.Mosby.

Course Title: Introduction to Human Geography

Course Code: GES 102, **Credit:** 4.0, **Full Marks:** 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course is designed to study the spatial structures and processes of human organizations, activities, and cultural aspects. It particularly examines spatial and temporal patterns of human-nature relationships, environmental changes, cultural diversities and economic development of the world. Several other issues such as the application of human geographic perspectives, approaches, concepts, theories, tools and techniques will also be discussed in this course.

Course Outcomes (COs):

CO1: Able to define the major concepts and approaches in human geography including location, space, scale, region, diffusion, spatial interaction, economic and cultural landscapes.

CO2: Able to understand the present world which is demographically, ecologically, economically, and politically interconnected, interdependent, and overwhelmingly changing.

CO3: Able to explain/solve problems geographically using maps and geospatial techniques, interpreting cultural landscapes, and applying human geographic concepts.

COs	Course Contents	TLS	AS
CO1	Perspectives of Human Geography: Nature and perspective of human geography, major geographical concepts, approaches, tools and techniques.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Population and Settlement: Population size and distribution, demographic transitions, human migration and development, population dynamics, types and patterns of rural settlements, environmental issues in rural settlements, urbanization and cities, and urban sustainability.		
CO2 & CO3	Cultural Aspects: Concepts of culture, cultural differences and regional patterns, and cultural diffusion. Racial, linguistic, and ethnic diversities. Gender, religions and minorities. Cultural landscapes and cultural identity. Cultural differences in rural and urban settings.		
CO2 & CO3	Economy and Development: Economy and economic activities, economic development of land, vegetation, surface and groundwater, energy, minerals, biotic and marine resources. Theories of development, trade and world economy. The green revolution, eco-tourism and development. Sustainable Development Goals (SDGs).		
CO2 & CO3	Political Issues: Territory, space and society. The concept of the nation-state. Geopolitical traditions and globalization.		
CO2 & CO3	Man and Environment: Fundamentals of human-environment geography, contemporary perspectives and thematic issues in human- geography. Ecology and ecosystem, man- environment relationships, global environmental changes, environmental hazards and disasters.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Aitken, S. and Valentine, G. (Eds.) (2006), Approaches to human geography. Sage Publications, London.
Blunden, J. (1979). Fundamentals of Human Geography. London: Harper & Row.
de Blij, H.J. and Alexander B. (2003). Human geography: Culture, Society, and Space.. 7th ed.New York: John

Wiley.
Fouberg, E. H.; Murphy, A. B. and de Blij, H. J. (2009). Human geography: People, place and culture. John Wiley and Sons Inc.
Gregory, D.; Johnston, R.; Pratt, G.; Watts, M. and Whatmore, S. (2011). The Dictionary of human geography. Wiley-Blackwell.
Haggett, P.; Cliff, A. D. and Frey, A. (1977). Locational analysis in human geography., Edward Arnold.
Hartshorn, A T, and Alexander, J.W. (1988). Economic geography. New Delhi: Prentice-Hall
Knox, P. L., and Sallie A. M. (2003). Places and regions in global context: Human geography.
Kuby, M.; Harner J. and Patricia G. (2004). Human geography in action. 3rd ed. New York: John Wiley, 2004.
Norton, W. (1998). Human geography. UK: Oxford University Press.
Pitzl, G. R. (2004). Encyclopedia of human geography. Greenwood Publishing, Westport.
Rubenstein, James M. (2002). The cultural landscape: An introduction to human geography. 7th ed. Upper Saddle River, N.J.: Prentice-Hall.
Upper Saddle River, N.J.: W.H. Freeman.

Course Title: Introduction to Physical Geography

Course Code: GES 103 **Credit:** 4.0, **Full Marks:** 100

Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:

This course is designed to study physical geography as a foundation of the earth's physical environment. In this course, major emphasis will be given on earth's evolution through its geological history, origin of the earth, exogenetic-endogenetic process and geological properties of the earth including formation and characteristics of rocks and minerals. The geomorphological processes that modify the earth's surface and influence the environment and the earth's hydrological system are also included in this course.

Course Outcomes (COs):

CO1: Able to describe the fundamental concepts of physical geography.
CO2: Able to demonstrate/explain the origin, structure, endogenetic and exogenetic processes and formation of the earth.
CO3: Able to categorize the broader concept of earth system and apply critical thinking skills in advanced study.

COs	Course Contents	TLS	AS
CO1	Introduction to Physical Geography: Definition, development, significance and scope. Major branches and connection with other physical sciences.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Dynamic Earth: Origin, internal structure, movement, continental drift theory and plate tectonics.		
CO1 & CO2	Scales and Dimensions in Physical Geography: Geological history, earth's external formation, and the geological time scale.		
CO2 & CO3	Spheres of the Earth and its Interaction: Lithosphere, hydrosphere and biosphere, and their role in structuring environment.		
CO2 & CO3	Rocks and Minerals: Definition, characteristics, compositions and classification of rocks and minerals.		
CO2 & CO3	Morphological System: Earth's first level configuration, seismology, and isostacy.		
CO2 & CO3	Systems Approach in Physical Geography: Morphologic, cascading, process response, control systems, open, closed and isolated systems, and positive and negative feedback in systems and ecosystems.		
CO2 & CO3	Diastrophism: Orogenic and epiorogenic movement.		
CO2 & CO3	Endogenetic Processes: Faults and folds, cleavage and unconformities and major structural features. Landforms produced by volcanic activities and earthquake. Exogenetic Processes: Agents of earth's sculpture- rivers, glaciers, winds and waves.		
CO2 & CO3	Hydrosphere: Hydrological cycle, surface and subsurface water and aquifers.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Cunningham, W.P. and Cunningham, M.A. (2007). Principles of Environmental Science. McGraw Hill, USA.
Gabler, R. E., Petersen, J. F.; Trapasso, L. M. and Sack, D. (2009). Physical geography. Brooks/Cole, USA.
Miller, E.W. (1985). Physical geography. Columbus Press, USA. Park, C. (2008). The Environment, Taylor & Francis Inc, USA.
R.J. Foster (2009). Physical Geography. Brooks/Cole, USA.
Singh S. (2008). Environmental Geography. Prayag Pustak Bhawan, India. Singh S. (2002). Physical Geography. Prayag Pustak Bhawan, India.
Smithson, P.; Addison, K. and Atkinson, K. (2002). Fundamentals of the physical environment Routledge, London.
Strahler, A. H. and Strahler, A.N., (1992). Modern Physical Geography. John Wiley & Sons, Singapore.

Course Title: Climatology

Course Code: GES 104, **Credit**: 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course will incorporate a general treatment of the fundamentals of the climate which are necessary for the clear understanding of climatology. It introduces the basic concepts of weather and climate, climatic zones of the world, atmosphere, atmospheric motions, stability and moisture. Furthermore, the course also highlights the characteristics and formation of tropical cyclone, tornados and thunderstorm.

Course Outcomes (COs):
CO1: Able to understand/discuss the basic concept of atmosphere, elements and factors of climate, atmospheric motions and the extreme weather events.

CO2: Able to classify the climatic zones of the world

CO3: Able to analyze/distinguish stages of atmospheric moisture, climatic zones and the extreme weather phenomenon.

COs	Course Contents	TLS	AS
CO1	Background: Definition of climatology, scope and subject matter.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Atmosphere: Composition and structure of atmosphere.		
CO1	Factors and Elements of Climate: Solar radiation and distribution of insolation, temperature, inversion of temperature, pressure belts and winds.		
CO1	Atmospheric Motions: Laws of horizontal movement.		
CO1	Air: Air divergence and convergence, atmospheric stability, adiabatic process, air mass and air fronts.		
CO1 & CO3	Atmospheric Moisture: Humidity, evaporation and evapo-transpiration, condensation, cloud, rainfall, fog, dew and frost.		
CO2	Classification: Koppen and Thornwatte's classification of climate.		
CO2	Types of Climates: Equatorial, monsoon, Mediterranean, desert and polar climate.		
CO1 & CO3	Extreme Weather Phenomenon: Tropical cyclone, tornado and thunderstorm.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Ahmed, R., (1997). *Abhaoa O Jalbauy Vignan*. Department of Geography and Environmental Studies, RU: Rajshahi.

Barry, R. G. and Chorley, R. J., (1978). *Atmosphere, weather and climate*. Methuen: London and New York.

Lal, D. S., (2000). *Climatology*. Chatanya Publishing House: Allahabad.

Singh, D. S., (2007). *Climatology*. Prayag Pustak Bhawan: Allahabad.

Trewartha, G. T., (1968).. *An introduction to climate*. Mcgraw-Hill Book Company, Inc., New York: London.

Course Title: Statistics in Geography

Course Code: GES 105**, Credit:** 3.0, **Full Marks:** 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

This course is design to provide an overall understanding about several aspects of quantitative technique that are necessary for geographical and environmental data analysis. Although spatial and non-spatial data, measurement of data, statistical analysis and presentation of geographical data are going to be discussed as an integral part of this course, major focus will be given on the application of various statistical techniques e.g. summarization, frequency distribution, central tendency, dispersion, correlation and regression.

Course Outcomes (COs)

CO1: Able to describe/define the nature, concept and precise statements of geographical data, data measurement and scaling techniques.
CO2: Able to understand the concept of population, sample and sampling techniques.
CO3: Able to compute/calculate central tendency, dispersion, skewness, kurtosis, moments, correlation and regression.
CO4: Able to use/apply different statistical analysis including skewness, kurtosis, correlation and regression.

COs	Course Contents	TLS	AS
CO1	Definition, nature and application of quantitative techniques. Data nature, sources, classification and analysis of geographical data. Data measurement and scaling techniques.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	Concept of population, sample and sampling, types of sampling in geographical and environmental research.		
CO2	Concept of survey, population survey and sample survey, basic principles and steps involved in a sample survey, and various methods of data collection.		
CO3	Summarization of data, frequency distribution, frequency table and graphical presentation of quantitative and qualitative data.		
CO3	The normal distribution curve and its characteristics.		
CO3	Measures of central tendency: Mean, median and mode. Measures of dispersion: Definition, importance, measures of dispersion, variance, and coefficients.		
CO3 & CO4	Concepts, properties and measurement of Skewness, Kurtosis, and moments		
CO3 & CO4	Definition and types of correlation Karl Pearson's coefficient of correlations, rank correlation, spearman's rank correlation coefficient, and significance test.		
CO3 & CO4	Definition and uses of linear regression, least square regression, regression coefficients, and fitting of regression lines.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Freund, J. E. (1967). *Modern Elementary Statistics*. Prentice-Hall, Inc., Englewood Cliffs,N.J.

Gregory, S. (1978). *Statistical Methods and the Geographers*. Methuen, New York, USA.

Gupta, S. C. and Kapoor, V. K. (2007). *Fundamentals of Mathematical Statistics*.

Hammond, R and McCullagh, P. (1978). *Quantitative Techniques in Geography: An Introduction*. Oxford University Press.

Johnston, R.J. (1984). *Multivariate Statistical Analysis in Geography: a primer on the general linear model*. Longman, London.

Mahmood, A. (1977). *Statistical Methods in Geographical Studies*. Rajesh Publications, India.

Mian, Md. Ali and Miyan M. Alimullah (2011). *An Introduction to Statistics*. Dhaka: Ideal Books.

Savage, L. J. (1982). *The Foundations of Statistics*. Dover publication, New York.

Schmidt, M. J. (1975). *Understanding and Using Statistics: Basic concepts.* DC heath and company, Lexington, Massachusetts/ Torronto/ London.

Weatherburn, C. E. (1968). *A First Course in Mathematical Statistics*. Cambridge University Press, Australia.

Course Title: Principles of Cartography and Geo-Visualization

Course Code: GES 106**, Credit:** 3.0, **Full Marks:** 75

Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

This is a basic course for learning the background knowledge about cartography and geo- visualization. In general, this course will discuss about the development of cartography, techniques used and the recent use of computerized system in cartography and geo-visualization. However, emphasis will be given basic cartographic aspects such as shape, size, maps scales, coordinate systems, graticules, and map projections. Additionally, cartographic expressions, map design, techniques of map drawing, symbolization, lettering and generalization technique will be discussed.

Course Outcomes (COs):

CO1: Able to define the fundamental concepts and basic principles of cartography and geo-visualization.

C02: Able to understand/explain/discuss the theory of cartographic expressions, new automated mapping technique, shape and size of the Earth, map, projection and coordinate system.

CO3: Able to use/apply/explain different techniques of data presentation and techniques of visualization of geographic features especially map drawing, symbolization, lettering, and map design.

C04: Able to classify/distinguish different type of maps, projections, map generalization and symbolization techniques.

COs	Course Contents	TLS	AS
CO1 & CO2	Cartography, its historical development and the new automated mapping technique.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Basic cartographic principles: shape, size, maps scales, coordinate systems, graticules and directions.		
CO2 CO3 & CO4	Classification of maps and projection, introduction to commonly used maps in Bangladesh.		
CO2 & CO3	Map design: Technique of cartographic expressions for map design. Map design consideration and map design process.		
CO3	Techniques of map drawing, symbolization and lettering.		
CO3 & CO4	Technique of map generalization and mapping spatial variations of point, line and areal features.		
CO2	Thematic cartography and data representation. Elements of map.		
CO2 & CO3	Techniques of landscaping visualization.		
CO3	Computer assisted cartography and Geo-visualization of geographic features.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Bugayevskiy, L.M. and Snyder, J.P. (1995). *Map Projections: A Reference Manual,* CRC Press.
Campbell, J., (1991). *Introductory Cartography*. William C Brown Pub; 2nd edition
Chicago : University of Chicago Press
Crane, N. (2002). *Mercator : The Man who mapped the Planet*. London
Harley, J. B. (John Brian); Woodward, D (1987-2003). *The History of cartography*.
Jones, C. (1977). *Geographical Information Systems and Computer Cartography.* Prentice Hall.
Kraak, M. J. and Ormeling, F. (2003). *Cartography : visualization of geospatial data*. New York : Pearson Education.
Lawrence G.R.P. (1971). *Cartographic Methods*. London: Methuen.
Monkhouse, F.J. and Wilkinson, H. R., (1971). *Maps and Diagrams*. Methuen and Co., London.
Raisz, E. (1948). *General Cartography*. New York, McGraw-Hill Book Co.
Robinson, A.H.(1915-2004). *Elements of Cartography*. New York: John Wiley, 6th ed.
Singh, R.L.(1979). *Elements of Practical Geography*. Kalyani Publishers.

Course Title: Computer Techniques in Geography

Course Code: GES: 107**, Credit**: 3.0**, Full Marks:** 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

The purpose of this course is to offer the fundamental concepts and disciplinary traditions of computer techniques that are used in geography. It focuses the basic knowledge of computers, number systems and codes, data structure and database management. Additionally, this course discusses the basic computer software and programming languages that are useful in geographical and environmental study.

Course Outcomes (COs):

CO1: Able to describe/define the basic function of computer.
CO2: Able to understand the application of software and basic statement of programing language that are particularly used in spatial analysis.
CO3: Able to prepare/explain database using geographical and environmental data.

COs	Course Contents	TLS	AS
CO1	Computer fundamentals: Definition, historical development of computer, processing units of a computer, basic functions, application of computer techniques in geography.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Number systems and codes: Decimal and binary. Conversion between the number systems. Number and ASCII codes.		
CO2	Software: Classification, operating systems, application software both general and geographical data analysis.		
CO3	Data: Structure, common data elements, concept of database in geographical study, database management system, database normalization, and entity relationship model.		
CO2	Fundamentals of computer programing languages: Definition types, and statements that are used in geographical studies.		

References:

Mather, P. M. (1991). Computer Applications in Geography. Chichester: John Wiley & Sons.
McGuire, D.J. (1989).: Computers in Geography. New York: Longan Scientific and Technical.
Parker, Charles S. (1988). Computer and their applications.

Course Title: Biogeography

Course Code. GEO 108, **Credit:** 3.0, **Full Marks:** 75

Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

This course is designed to teach biogeography elaborately based on its two branches: plant geography and zoogeography. In this course focus will be given on the subject-matter, scope and elements of plant geography and zoogeography. Environmental habitat factors of flora and fauna, classification and spatial distribution of plant, plant adaptation, association and succession, zoogeographical realms, regions, transition and characteristics of fauna will also be taught. It will also include types, geographical distribution and importance of flora and fauna of Bangladesh.

Course Outcomes (COs):

CO1: Able to identify the elementary aspects of biogeography including plant geography and zoogeography.

CO2: Able to understand the geographical aspects of plant and animal kingdoms including geographical habitat pattern, spatio-temporal distribution, and conservation of flora and fauna.

CO3: Able to explain the flora and fauna of Bangladesh including types, spatial distribution, importance and conservation.

CO4: Able to assess the problem related to the environment, habitat, biotic components and biodiversity.

COs	Course Contents	TLS	AS
CO1	Introduction to Biogeography: Definition and branches. Concept, scope, elements of plant geography and zoogeography.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	Plant response to environmental habitat factors: Climatic, edaphic, physiographic and biotic factors.		
CO2	Plant classification and distribution.		
CO2	Plant succession, adaptation and association.		
CO2	Animal kingdom, spatio-temporal distribution of animal and animal habitat.		
CO2	Zoogeographical realms and regions. Physical and faunal characteristics.		
CO2	Faunal transition and transitional fauna.		
CO2	Insular fauna, major types and characteristics.		
CO3	Classification, distribution and importance of flora of Bangladesh.		
CO3	Bio-ecological regions, spatial distribution of fauna of Bangladesh. Extinct and endanger fauna, causes and conservation.		
CO4	Biodiversity preservation and conservation.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Dansereau, P. M. (1957). *Biogeography: An Ecological Perspective*. Ronald Press

Huggett. R. (1998). *Fundamentals of Biogeography.* Routledge. London.

Darlington, P. (1957). *Zoogeography*. *The Geographical Distributions of Animals*.

Kormondy. E.J. (1996). *Concepts of Ecology.* 4thE edition Prentice-Hall.

Robinson, H. (1972). *Aspect Geographies-Biogeography.* London: Macdonald & Evans Ltd.

Tiwari, S. K. (1985). *Zoogeography of India and South East Asia*. Delhi: CBS Publishers.

Course Title: English (Non-credit)

Course Code: GEO 109**, Credit:** 2.0, **Full Marks:** 50
Number of Classes: Approximately 16 (45 minutes class duration)

Course Description:

This course is designed to understand, develop and practice the four skills in English language – listening, speaking, reading and writing. It offers basic knowledge in English grammar, such as word form and functions, suffixes, prefixes, synonyms, antonyms, change of word forms, tenses, Parts of speech and their conversion, subject-predicate, clause, type of sentences, infinitives, participles and gerunds. This course also introduces the techniques of writing note/summary and paragraphs.

Course Outcomes (COs):

CO1: Able to understand basic English grammar.
CO2: Able to use English language for reading and writing effectively.

COs	Course Contents	TLS	AS
CO1	Vocabulary: Understand word form and functions from dictionary, suffixes, prefixes, synonyms, antonyms, and change of word forms in sentences. Basic grammar and sentence structure: Tenses, Parts of speech and their conversion, subject-predicate, clause, type of sentences, infinitives, participles and gerunds. Comprehension and translation: From English to Bengali and Bengali to English.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/ exam), Terminal, Final examination
CO2	Reading: Identification of writer's views/claims and information. Writing: Completing sentences and combining sentences, generating ideas, short-answer questions, notes/summary, and paragraphs. It is expected that the students are able to describe information about geographical data, graphs, charts, tables and diagrams and present the description in their own words.		
	Speaking: Assessment of student's speaking skill in English. Various methods will be used to understand students' ability in speaking English and to develop their speaking proficiency in English		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Amanullah, S. M. (Year) *Mastering English Language Skills.*
Cambridge Preparation Materials for IELTS (Cambridge University Press)
Mark Ibbotson, Cambridge English for Engineering Student's Book with Audio CDs (2) (Cambridge Professional English)
Michael A. Pyle and Mary E. Munoz. (1983).
Cliffs TOEFL Prep Guide, Cliffs Notes; 4th edition.
Myall, E. G. (Year). *English A Comprehensive Grammar of Current English*
Nell Ann Pickett, N. A. (Year). Technical English: Writing, Reading and Speaking. (8th Edition)
Pearson, B.A. (Year). *Fundamentals of English Grammar*
Schrampfer A. (Year). *Basic English Grammar.*
Taylor, S. (Year). *Model Business Letters, E-mails and Other Business Documents.*
Zakir Hussain (1998) A passage to English Language. Rohel publications, Dhaka.

Course Title: FIRST YEAR PRACTICALS

Course No.: GES 110, **Credit:** 6.0, **Unit:** 1.5 **Full Marks:** 150

Number of classes: 24 approximately (90 minutes duration)

Course Description:

The course contains generally map-based lab activities and a field trip to familiarize with real world situation as a preparation for extensive field activities. The map work includes basic cartographic activities such as knowing different types of maps and their features, construction and transformation maps, map design, understanding scales and their use in map enlargement and reduction, representation of relief features, and free-hand landscape sketching. At the end of this course, a field work will be conducted on a place of historical interest for sketching, mapping, and assessing tourism potentiality.

Course Outcomes (COs):

CO1: Able to define the fundamental concepts and basic principles of maps and map making techniques.
C02: Able to acquire knowledge about basic cartographic techniques and tools such as map scales; construction, transformation and reproduction of map; interpretation of relief features and mapping of bio-geographical features.
CO3: Able to design/construct map scale, landscape sketching, relief profiles, and different type of thematic maps.
CO4: Able to be skilled for map design, preparation, reproduction, reduction and enlargement of map.
CO5: Able to organize field work for collection of data about the places of historical interest for sketching, mapping and preparing report to assess tourism potentiality.

Course Contents:

Part-A: Basic Cartographic Techniques and Tools for Mapping

a. Getting familiar with cartographic drawing equipment and materials.
b. Lettering techniques and practices, map composition, map design, selection fonts, and colors.
c. Preparation of base map using GIS software.
d. Free hand landscape sketching

Part-B Mapping: Preparation of Map Scales, Map Construction, Transformation, and Reproduction

a. Construction of map scale (simple, comparative, and diagonal).
b. Transformation of map scale and measurement of area
c. Drawing of thematic maps. Qualitative, quantitative, chorochromatic, and choreographic maps.
d. Techniques of statistical mapping. Qualitative and quantitative distribution maps, dot maps, graduated symbol maps, circle ratio maps, square, cubes, spheres, and other point symbol maps, gradient maps, flow maps.
e. Map reproduction

Part-C: Analyses and Interpretation of Relief and Map Features

f. Getting familiar with topographic maps, cadastral maps, aerial photographs of both from Bangladesh and from other countries.
g. Making cross-profiles from contour lines in maps and identify various physical features, Interpolation techniques and creating isopleths from spot values.
h. Vertical exaggeration of scales and inter-visibility study

Part-D: Biogeography Mapping

i. Drawing zoo geographical regions of the world.
j. Plant group bio-diversity of habitat.
k. Measuring daily photo-time and seasonal changes

Part-E: Field Work of Historical Aspects

Field visits of places of historical interest, sketching, mapping, description of places, and assessment of tourism potentiality.

Curriculum Plan for B.Sc Honours

Part-II Examination: 2023

Course No.	Title of the Course	Unit	Full Marks	Credit
	Major Courses			
GES 201	Geographical Concepts and Methodology	1.0	100	4
GES 202	World Regional Geography	1.0	100	4
GES 203	Fundamentals of Economic Geography	1.0	100	4
GES 204	Geomorphology and Oceanography	1.0	100	4
	Minor Courses			
GES 205	Meteorology and Weather Forecasting	0.75	75	3
GES 206	Principles of Geographic Information Systems	0.75	75	3
GES 207	Quantitative Techniques in Geography	0.75	75	3
GES 208	Historical Geography of Bangladesh	0.75	75	3
PRACTICAL EXAMINATIONS [Practical Examination shall be 18 hours (six hours per day)]				
Part-A	Map Projections	1.5	150	6
Part-B	Surveying I: Chain and Tape, Plane Table, Prismatic Compass			
Part-C	Basic Operations of GIS and Preparation of Thematic Map using GIS Software.			
Part-D	Fieldwork of Physical Aspects: Landscape and physical resource sketching and mapping, description of landscape process and assessment of resource potentiality.			
	Viva-voce	0.5	50	2
	Class Assessments: Attendance, Field Attendance, Tutorial and Terminal	0.5	50	2
	Total Credit	**9.5**	**950**	**38**

Course Title: Geographical Concepts and Methodology

Course Code: GES 201, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45-minute class duration)

Course Description:

This course attempts to explain the definitional concepts and nature of Geography as an earth science. It describes the contemporary Geography and the development of ancient geographical knowledge including the age of Greek, Roman and Muslim classical periods. This course also includes major school of thoughts and approaches to study Geography. It also discusses the most influential geographical explorations such as discovery of America' and 'gateway from Europe to Asia through ocean'. Besides, the course states the characteristics of theories, laws and models with reference to Geography and analyze Geography's position to the society and the state.

Course Outcomes (COs):

CO1: Able to state the fundamental concepts and nature of Geography.
CO2: Able to understand different stages of development of Geography with references to ancient ages.
CO3: Able to explain major school of thoughts and approaches used in Geography.
CO4: Able to analyze the status of Geography with reference to modern world.

COs	Course Contents	TLS	AS
CO1	Definition of Geography.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	Geography as a science. Geography as an environmental Science. Geography as a social science.		
CO2	Nature and trend in contemporary Geography.		
CO2	Scope and subject matters of contemporary Geography.		
CO2	Brief history of the development of geographical knowledge and concepts.		
CO3	Geographical knowledge of Greek, Roman and Muslim classical period.		
CO3	Dark age of Europe and age of exploration.		
CO2 & CO3	Major school of thoughts and geographical personalities.		
CO2 & CO3	Major approaches in Geography.		
CO2 & CO3	Theories, laws and models in Geography and its relevance to environmental studies.		
CO2 & CO3	The status of Geography today and its relevance to environmental studies.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Adhikari, S. 2011. Fundamentals of Geographical Thought. Chaitanya Publishing House, Allahabad, India
Ahmad, N. 1947. Muslim Contributions in Geography, Lahore. (Bangla Translation by Nazrul Islam and Jamal Khan, Bangla Academy, Dhaka. First edition 1994)
Baker, L.N.L. 1963. The History of Geography, New York. Barnes & Noble.

Course Title: World Regional Geography

Course Code: GES 202, **Credit:** 4.0, **Full Marks**: 100

Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:

The course is designed to introduce both the human and physical features of the world, and to understand the world by analyzing regional similarities and disparities. Especial emphasis is given to the interrelations and diversities among regions on different human and physical attributes such as populations and urbanization, culture, languages, economy, physiography, climate, soil, and flora and fauna. The course also provides an overall understanding about the recent trend of regionalization and globalization that shape the diversities of the world.

Course Outcomes (COs):

CO1: Able to understand the human and physical processes that shape the world regions.

CO2: Able be explain the processes of regionalization and globalization which are conducive to generate socioeconomic, cultural and political diversities in the world.

CO3: Able to demonstrate the relations among local, national and global contexts.

CO4: Able to analyze the regional differences and harmonies and sketch the regional maps to present human and physical features of theworld.

COs	Course Contents	TLS	AS
CO1 & CO 2	World regional geography: Definition, concepts and approaches.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	Region: The concept of region in geographic analysis, types of region, purposes and objectives of regionalization, and methods of delineating region.		
CO2 CO3 & CO4	Physical processes that shape the world regions: Geologic processes and landforms, and patterns of climate and vegetation. Soil regions, distribution of mineral resources, and the world's oceans.		
CO2 CO3 & CO4	Human process that shape the world: Revolutions that have changed the earth, and the geography of development. The geography of population - world urbanization, culture, race and religions.		
CO3 & CO4	Regional development: Concept and politics of regional development, political and economic regionalization, and globalization.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

de Blij; Harm J.; Muller, P. O. and Nijman, J. (2014). *Geography: Realms, regions, and concepts*. USA: Wiley. Development Publishing House, Dhaka.

Finlayson, C. (2019). *World regional geography*. Open Textbook Library.

http://caitiefinlayson.com/WRGTextbook.pdf

Hobbs, J. J. (2009). *World regional geography*. Australia: Brooks/Cole.

Hobbs, J. J. (2017). *Fundamentals of world regional geography*. Cengage Learning, USA. Hossain, D. (2010). *Globalization and new regionalism in South Asia: Issues ad dynamics*. A H

Mauro, F. D.; Dees, S. and McKibbin, W. J. (Eds.) (2008). *Globalization, regionalism and economic interdependence*. Cambridge University Press, Cambridge.

Rowntree, L.; Lewis, M.; Price, M. and Wyckoff, W. (2014). *Globalization and diversity: geography of a changing world.* Pearson Prentice Hall, Glenview, IL.

Course Title: Fundamentals of Economic Geography

Course Code: GES 203, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course provides an introduction about the field of economic geography. It addresses the processes that drive the spatial patterns of economic activities at the global, regional and national scales. This course also will describe the distribution of resources like agricultural, forest, industrial, marine and minerals over the space, resources based economic activities and their relationship with national and international trade, the E-economy and alternative economics.

Course Outcomes (COs):
CO1: Able to understand/discuss elementary concepts of economic geography.
CO2: Able to describe/explain spatial patterns of economic activities at different scales.
CO3: Able to illustrate the major economic blocks, distribution of resources and international trade.
CO4: Able to analyze pattern of world and regional economic growth and development.

COs	Course Contents	TLS	AS
CO1	Definition, scope and methodology of economic geography. Nature of changes in economic geography, globalization and its impact.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Fundamental concepts about space, location, interaction, distribution, processes, patterns, production, consumption and exchange.		
CO2	Nature, characteristics and classification of economic activities. Gathering, hunting, fishing, mining, and agriculture - nomadic herding/livestock ranching. Forest - types and production. Marine resources - major fishing areas, production and trade.		
CO2	Mineral resources of the world: Distribution, production and trade of minerals - iron ore, manganese, copper, mica, gold. coal, petroleum, hydroelectricity and atomic energy.		
CO2 & CO3	Growth and development of manufacturing industry, major industrial and manufacturing regions of the world. Major economic blocks of the World (SAARC, ASEAN, BIMSTEC, EU, NAFTA, etc.)		
CO2 & CO3	Basic principles and characteristics of transportation, means of transportation and their relative merits and demerits. International trade and trade routes.		
CO4	Economic development and economic growth, determinants and measurement of economic development, and obstacles to economic development. Theoretical approach of economic development (e.g. Marx, Rostow). Concept and development of E-economy.		

TLS: Teaching- learning Strategy **AS: Assessment Strategy**

References:

Ahmad, N. (1976). *A New Economic Geography of Bangladesh*. Vikas, New Delhi.
Alexander, J. W. (1964). *Economic Geography.* R. G. College.
Chisholm, M. 1970. *Geography and Economics*, G. Bell.
Estall, R.C. and Buchanan (1968). *Industrial Activity and Economic Geography.* Hutchinson.
Hartshorn, T.A. and Alexander J.W. (1988). *Economic Geography*. Prentice-Hall, New Delhi.
Harvey, J. (1989). *Mastering Economics*. Macmillan Edu. London.
Hurst, N. E. (1992). *A Geography of Economic Behaviour*. Routledge, London.
Loyed, P. E. and Dicken, P. *Location in Space: A theoretical Approach to Economic Geography*. USA.
Pounds, N. (1981). *Economic Geography.* John Murvay.
Rashid, H. E. (2005). *Economic Geography of Bangladesh*. University Press. Dhaka.
Sokol, M. (2011). *Economic Geography*. University of London.

Course Title: Geomorphology and Oceanography

Course Code: GES 204, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:

This course is designed to provide an insight of geomorphology and oceanography. On the geomorphology side, basic concepts of geomorphology, geomorphic and climatic processes, gravitational transfer, concept of erosion cycle, and agents of gradational processes and associated land forms are the main points of discussion. However, oceanography part will focus on the oceanographic processes, ocean resources, ocean weather and climate, description of major surface and deep currents in the ocean, and ocean transportation system.

Course Outcomes (COs):

CO1: Able to define and state various features of geomorphology and oceanography.

CO2: Able to understand and discuss key concepts of geomorphology and oceanography especially geomorphic processes, gravitational transfer, concept of erosion cycle, gradational processes, ocean bathymetry and nomenclature, motion of the ocean and ocean climate.

CO3: Able to examine associated landforms as a result of gradational processes CO4. Able to categorize and assess the ocean resources and maritime boundary.

COs	Course Contents	TLS	AS
CO1 & CO2	Geomorphology: Definition, concept scope, development and recent trends.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	Geomorphic processes: Exogenitic and endogentic processes. Eperogenic, gradation- degradation and aggradation processes- erosion, transportation and deposition.		
CO2	Gravitational transfer: Mass movement and slope movement.		
CO2	Concept of erosion cycle: Interrupted cycle of erosion and change in base level.		
CO1	Agents of gradational processes and associated land forms:		
CO2 & CO3	River, its pattern, drainage system, landform characteristics, rejuvenation and profile of equilibrium. Glaciers, its types, landform characteristics and periglacial landforms. Action of wind and landform characteristics. Coastal process and landforms.		
CO2	Climatic and geomorphic processes: Morphogenetic and morpho-climatic regions.		
CO1 & CO2	Definition, distribution of world land and water bodies. Ocean zonation.		
CO2	Ocean: Nomenclature, ocean relief, elementary knowledge about the origin of oceans and ocean water. Composition of ocean water and bottom topography.		
CO1 & CO2	Waves and currents: Cause and effects, type, distribution and characteristics. Currents of the Pacific and the Atlantic. Tide: Origin of tidal waves. Spring and neap tides and classification. Coral reefs: Origin, classification, and characteristics of different types of coral reefs.		

COs	Course Contents	TLS	AS
CO4	Ocean water as a resource: Territorial and international water, fish resources, fishing grounds and fishing industries, flora and fauna, mineral resource especially petroleum and natural gas.		
CO2	Ocean climate and transportation systems.		
CO2 & CO4	Oceanographic characteristics of the Bay of Bengal. UNCLOS, blue economy and maritime boundary of Bangladesh.		

TLS: Teaching- learning Strategy **AS: Assessment Strategy**

References:

Doxbury and Doxbury (2004). *Introduction to World Ocean*. New York; Wiley

Gross, M.G. (1987). *Oceanography: A view of the Earth*. New Jersy: Prentice Hall, USA King, C.A.M (1962). *Oceanography for Geographers*. London: Edwin Arnold Publishers Ltd.

Hugget, R.J. (2007). *Fundamentals of Geomorphology*. London: Routledge.

Sharma, R.C. and Vatal, M. (1980). *Oceanography for Geographers*. India: Chaitanya Publishing House, Allahabad

Singh S. (2008). *Oceanography*. India: Prayag Pustak Bhawan

Thornbury, W.D. (2007). *Principles of Geomorphology*. New York: John Wiley & Sons.

Turbuck, E.J. (2000). *Earth Science*. New Jersey: Prentice Hall.

Course Title: Meteorology and Weather Forecasting

Course Code: GES 205, **Credit:** 2.0, **Full Marks**: 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:
This course is designed to provide an understanding about the dynamic processes within the Earth's atmosphere and their role for producing different weather scenarios. Study of boundary layer, atmospheric pressure, cloud formation and storms in relation to meteorology and weather forecasting are emphasized in this course. This course will also explore topics such as relationship between geography and weather phenomenon, factors creating tornadoes and cyclones, as well as global weather patterns such as El NiÑo.

Course Outcomes (COs):
CO1: Able to list/describe the basic elements of weather and its observation system.
CO2: Able discuss the pattern of local and global atmospheric circulations.
CO3: Able to investigate whether situation using modern techniques.
CO4: Able to analyze the weather variables to produce weather forecast.

COs	Course Contents	TLS	AS
CO1	Atmosphere: Definition, composition, and vertical structure.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/ exam), Terminal, Final examination
CO1	Weather observation system. Surface and upper air instruments for atmospheric measurements. Synoptic meteorology and weather map analysis.		
CO2	Physical meteorology and atmospheric dynamics: Forces that generate wind, global atmospheric circulation pattern, and physics of cloud and precipitation.		
CO2	Marine meteorology: Ocean-atmosphere interactions, observing and modeling weather conditions in marine environment. Tropical cyclone meteorology in the Bay of Bengal		
CO3	Satellite meteorology: Principles of meteorological remote sensing, weather satellite orbits and payloads, characteristics of satellite image used in meteorology, and observation of various weather systems.		
CO3	Radar meteorology: Working principles of Radar meteorology, Doppler effect, and measurement of meteorological parameters.		
CO4	Atmospheric modeling and weather forecasting: Techniques used for weather prediction, and forecasting accuracy assessment. Weather forecasting at Bangladesh Meteorological Department.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

Ahmed, R. (1997). *Abhaoa O Jalbauy Vignan*. Department of Geography and Environmental Studies, RU: Rajshahi.

Barry, R. G., and Chorley, R. J. (1978). *Atmosphere, weather and climate.* Methuen: London and New York.

Roy, C. (2016). *An Informed System Development Approach to Tropical Cyclone Track and Intensity Forecasting*. Linköping University Press.

Ahrens, C. D. (2011). *Essentials of Meteorology: An Invitation to the Atmosphere.* Cengage Learning, India.

Inness, P. and Dorling, S. (2013). *Operational Weather Forecasting*. John Wiley & Sons, UK.

Kelkar, R. R. (2007). *Satellite meteorology*. BS Publications.

Vasquez, T. (2002). *Weather Forecasting Handbook*. Weather Graphics Technologies.

Course Title: Principles of Geographic Information Systems (GIS)

Course Code: GES 206, **Credit:** 3.0, **Full Marks:** 75

Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

The purpose of this course is to provide an overview about the Geographic Information Systems (GIS) and its application on different geographic and environmental aspects. Although, the fundamentals of GIS will be discussed in this course, however, main focused will be placed on the nature of geographic information, data models and structures, geographic data input, data manipulation, data storage system and visualization techniques. Additionally, spatial analysis, modeling techniques, error analysis, and the use and architecture of GIS software will also be discussed in this course. Nevertheless, this course will highlight essential proficiency needed for industry-standard GIS usage for analyzing spatial data and producing cartographic output as well.

Course Outcomes (COs):

CO1: Able to state the fundamental concepts of GIS, data, date structure, and other related issues in GIS.

CO2: Able to understand/discuss historical development and various components of GIS, concepts and theories of GIS, geospatial data and conversion, data sources and metadata management, and modelling techniques in GIS.

CO3: Able to explain/apply/geospatial data, GIS software, and different kind of modelling and visualization techniques of GIS for conducting basic GIS analyses for solving various kind of issues related to geography and environment.

CO4: Able to analyze outcomes obtained from different kind of modelling and visualization technique for understanding the role of GIS in the wider decision making/management process.

COs	Course Contents	TLS	AS
CO1	Introduction to geographic information systems: Definition, concept, components, subsystems, management perspective and entities of GIS.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	History and development of GIS: History, current issues and trends. Applications of GIS.		
CO2 & CO3	GIS data structure and data models: Topology, DBMS, vector and raster models, attribute data model-hierarchical, network and relational models.		
CO2 & CO3	Data acquisition techniques: Primary and secondary data in GIS, available data sources in national and international levels.		
CO2	Database creation: Georeferencing, data input and editing, integration with non-spatial data, data conversion, data quality and errors.		
CO2 CO3 & CO4	Vector data model and vector data analysis. Raster data model and raster data analysis.		
CO3	Models and modelling in GIS. Data representation and visualization.		
CO2 & CO3	GIS software: structure of GIS software, open sources and commercial software.		
CO2 & CO3	Future of GIS: Mobile-GIS, WebGIS, virtual reality and augmented reality.		

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References:

Burrough P. A. and McDonnell R. A. (2000). *Principles of Geographical Information Systems–Spatial Information Systems and Geostatistics.* Oxford University Press.

Chang K.T. (2009). *Introduction to Geographic Information Systems.* McGraw-Hill.

Davis, B.E. (1996). *GIS: A Visual Approach*. Onword Press, USA

Course Title: Quantitative Techniques in Geography

Course Code: GES 207, **Credit:** 3.0, **Full Marks**: 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:
The course provides essential knowledge on statistical techniques intending to analyze spatial and temporal data in relation to various geographical and environmental issues. Several components of statistical techniques and their applications for processing and analyzing geographical data will be addressed. The major emphasis is placed on the concepts, definitions and techniques of statistical analysis, probability distribution, descriptive and inferential statistics, bivariate measures of association, the analysis of variance, and correlation and multiple regression.

Course Outcomes (COs)
CO1: Able to identify/define the key concepts in spatial statistical analysis, geographical space, and spatial data.
CO2: Able to understand common univariate statistics and indices for measuring the location, specialization, and concentration of activities across space.
CO3: Able to explain standard regression methods and principles and methods for hypothesis testing of geographical data analysis.
CO4: Able to evaluate obtained results from different statistical analyses and hypothesis testing.

COs	Course Contents	TLS	AS
CO1 & CO2	Measures of Spatial Distribution: Types of spatial data - point distribution, line distribution-networks, discrete areal distribution (choropleth), and continuous areal distribution (isopleth). Concept of spatial randomness, the nearest neighbor index. Index number and analysis of time series.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/ exam), Terminal, Final examination
CO1 & CO2	Samples and Estimates: Populations and samples - sampling frame, sample size, sampling types, types of sampling used in the geographical research. Population parameters, sample statistics, sampling distribution, and standard error.		
CO1 & CO2	Probability distribution: Concept of probability, the law of addition and multiplication, and sample space. Normal, binomial and Poisson distributions. Properties of the normal curve, Z-scores, and calculation of probability.		
CO2 CO3 & CO4	Revealing relationships: Theory for covariance, correlation and regressions. Test of significance, robustness, heteroscedasticity and outliers' detection. Principal component analysis and factor analysis.		
CO3 & CO4	Hypothesis testing: The χ^2-test, binomial test, t-test, the Mann-Whitney U-test, the Wilcoxon test. Type I and Type II error. The analysis of variance.		

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References:

Gupta, S. C. (2014). Fundamental of Statistics. India: Himalaya Publishing House.

Hammond, R. and Patrick M. S. (1978). Quantitative techniques in Geography: An Introduction. UK: Oxford University Press.

Healy, J. F. (2009). Statistics: A tool for social research. Australia: Wadsworth Cengage Learning.

Larry O'Brien (1992). Introducing Quantitative Geography: Measurement, Methods and Generalized Models. London: Routledge.

Mian, M. A. and Miyan M. A. (2011). *An introduction to Statistics*. Dhaka: Ideal Books.

Course Title: Historical Geography of Bangladesh

Course Code: GES 208, **Credit:** 3.0, **Full Marks**: 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:
This course is designed to focus the historical background of Bangladesh. The main purpose of this course is to provide an overview of historical knowledge of ancient, mediaeval and recent through the geographical point of view. Liberation of Bangladesh, Speech of 7th March and declaration of independence, army crackdown of 25th March, Mujibnagar government, different forces, sectors and final victory will also be highlighted in this course.

Course Outcomes (COs):
CO1: Able to state the historical background of Bangladesh.
CO2: Able to discuss/review the different historical events of Bangladesh.
CO3: Able to examine/explain the causes and consequences of liberation war.

COs	Course Contents	TLS	AS
CO1	Introduction: Definition of historical geography, scope, source materials, origin and early settlement of Bengal.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/ exam), Terminal, Final examination
CO1 & CO2	Mughal Bengal: Bhuyan's of Bengal, Bengal under Suja and Shaista Khan, reforms by Murshid Kuli Khan, European merchants in Bengal, Shiraj-Ud-Daulah and the Battle of Plassey.		
CO1 & CO2	Bengal under the British: Dual government, permanent settlement, sepoy mutiny, partition of Bengal. Farazi, Titumir and other movements in Bengal.		
CO1 & CO2	Partition of subcontinent: Bengal pact, Simon commission, undivided Bengal (1937-1947), Lahore resolution, two nation's theory, and Crips and Cabinet Mission.		
CO1 & CO2	East Pakistan: Language movement, united front, reforms of Ayub Khan, six points demand, inter wings disparity, mass uprising in 1969, and election of 1970.		
CO1 & CO3	Liberation of Bangladesh: Speech of 7th March and declaration of independence, army crackdown of 25th March, Mujibnagar government, different forces, sectors and final victory.		

TLS: Teaching- learning Strategy **AS: Assessment Strategy**

References:

Ahmad, K. (1975). *A Socio-Political History of Bengal*. Dhaka: DU Library.
Ahmed, S. (2004). *Bangladesh-Past and Present*. Paragon Publishers; Dhaka. Asiatic Society of Bangladesh; Second Edition.
Jahan, R. (Year) (i) Pakistan: Failure in National Integration (ii) Bangladesh: Promise and Performance Jadunath Sarkar (Ed.), *The History of Bengal*, Vol. II
Karim, A. (1977). *Banglar Itihas: Sultani Amal:* (History of Bengal During Sultanate Period); Bangla Academy; Dhaka; (in Bengali).
Muhammad Abdur Rahim, The Muslim Society and Politics in Bengal (1757-1947)
Muhit M. A. (Year). *Emergence of Bangladesh*
Niharranjan (1978). *History of Bengali People.* Orient Longman: Hyderabad; 1994
R.C. Majumdar (Ed.) (Year). *The History of Bengal*. Vol. I
Rahman, M. (2003). *Bangladesher Itihas.* Samay Prakashan,
Ray, A.l C. (1968). *History of Bengal: (Mughal Period 1526-1765)*. Nababharat Publishers; Calcutta. Ray, Sirajul Islam (Ed.) (Year). *History of Bangladesh 1704-1971*. Vols. I & II

Course Title: SECOND YEAR PRACTICAL

Course No.: GES 209 **Credit:** 6.0, **Unit:** 1.5 **Full Marks:** 150
Number of Classes: 24 approximately (90 minutes class duration)

Course Description:

The course introduces basic concept of map projection; chain and tape, plane table and prismatic compass surveying; GIS lab exercise; and field work- landscape and physical resource mapping. Additionally, it offers hands-on training on map projections, different kinds of surveying, and use of GIS software for the preparation of thematic map. Technique of landscape and physical resource mapping (i.e. sketching and mapping of landscape, description of landscape mapping, assessment of resource potentiality) will also be taught in this course.

Course Outcomes (COs):

CO1: Able to understand map projection; chain and tape, plane table and prismatic compass surveying; GIS lab exercise; and field work.
CO2: Able to acquire knowledge about map projection, different surveying techniques, and GIS mapping technique.
CO3: Able to design/sketch map based on surveyed data using chain and tape, plane table and prismatic compass surveying instruments.
CO4: Able to be skilled for thematic map preparation using different types of GIS software.
CO5: Able to organize field work for collection of data about the landscape and physical resource for sketching and mapping of landscape, description of landscape mapping, and assessment of resource potentiality.

Course Contents:

Part-A: Map Projections

- **a.** Concepts of projection, deformation in map projections, criteria for selecting map projections.
- **b.** Major criteria for the construction of projections, latitude, longitude, central meridian, standard parallel, scale of projection.
- **c.** Mathematical and graphical methods of preparing projections.
- **d.** Conical group of projections.
- **e.** Cylindrical group of projections.
- **f.** Zenithal group of projections.

Part-B: Surveying I: Chain and Tape, Plane Table, Prismatic Compass-

a. Concepts of surveying.
b. Chain and Tape surveying.
c. Plane Table surveying.
d. Prismatic Compass surveying.

Part-C: Basic Operations of GIS and Preparation of Thematic Maps using GIS Software

a. Exercise 1: Introduction to GIS software-ArcGIS, IDRISI and ENVI
b. Exercise 2: Creation of spatial data layer and editing-geo-referencing, digitizing, editing, topology creation and analysis.
c. Exercise 3: Input non-spatial (attribute) data, editing and integration with spatial data.
d. Exercise 4: Spatial query, buffering, Boolean operations.
e. Exercise 5: Preparation of different kinds of thematic maps.

Part-D: Fieldwork of Physical Aspects: Landscape and physical resource sketching and mapping, description of landscape process, and assessment of resource potentiality.

Curriculum Plan for B.Sc Honours

Part-III Examination: 2024

Course No.	Title of the Course	Unit	Full Marks	Credit
GES 301	Environmental Geography	1.0	100	4
GES 302	Urban and Transport Geography	1.0	100	4
GES 303	Agriculture and Soil Geography	1.0	100	4
GES 304	Geography of Bangladesh	1.0	100	4
GES 305	Advance Economic Geography	0.75	75	3
GES 306	Climate Change, Hazards and Disaster Management	0.75	75	3
GES 307	Research Methodology	0.75	75	3
GES 308	Principles of Photogrammetry and Remote Sensing	0.75	75	3
PRACTICAL EXAMINATIONS [Practical Examination shall be 24 hours (6 hours per day)]				
Part-A	Surveying II: Theodolite Surveying, GPS, Total Station	2.5	250	10
Part-B	Aerial Photographs and Remote Sensing Data Analysis			
Part-C	Study of Geological Maps and Identification of Rocks & Minerals			
Part-D	Study of Weather Maps			
Part-E	Field Work of Human Aspects: Socio-economic survey of a region through questionnaire survey and FGD			
	Viva-voce	0.5	50	2
	Class Assessments: Attendance, Field Attendance, Tutorial and Terminal	0.5	50	2
	Total Credit	**10.5**	**1050**	**42**

Course Title: Environmental Geography

Course Code: GES 301, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course is broadly designed to teach the environment, ecology and ecosystem by means of geographical approach. Energy flow, heat balance and the biogeochemical cycles of the ecosystem which are very important in the balance of abiotic and biotic environment will also teach in this course. World distribution of biomes and their characteristics, environmental degradation, and some important environmental problems in recent time are also included in this course to enrich the knowledge of the students in this area. Moreover, this course will introduce the concept, laws, agreements, protocols and policies for protection, planning and management of environment.

Course Outcomes (COs):
CO1: Able to state/describe fundamental concepts of environmental geography, scope and its relationship with other branches of geography.
CO2: Able to understand/explain the ecology, ecosystem, interaction between biotic and abiotic components, process of energy flow in ecosystem and biogeochemical cycles.
CO3: Able to identify/investigate environmental degradation and problems such as greenhouse effects, global warming, loss of biodiversity, soil degradation, air and water pollutions, deforestation with respect to global, regional and local contexts.
CO4: Able to evaluate the legal policy of environmental protection, planning and management.

COs	Course Contents	TLS	AS
CO1	Fundamentals of environmental geography: Definition, concept, scope, relationship with other branches.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Environment: Structure, types, components, and man- environment relationship.		
CO2	Ecology and ecosystem: Concept and principles, types, hierarchy of ecology, level of organization of ecology, structure, components and functions of ecosystem, productivity and stability of ecosystem and biosphere.		
CO2	Energy flow in ecosystem: Sources of energy, flow of energy, laws of thermodynamics, heat balance, biotic and abiotic factors, trophic level, food chain, food web, and energy pyramid.		
CO2	Biogeochemical cycle: Gaseous cycle - carbon, nitrogen and oxygen, and sedimentary cycle - phosphorus.		
CO3	Biomes: Meaning, factors affecting biomes, types of biome - desert, grassland, forest, and tundra.		
CO4	Environmental degradation and problems: global, regional and local issues. Green house effects, global warming, loss of biodiversity, air and water pollutions, deforestation and climate change impacts. Agriculture-based water and soil pollution: Modernization of agriculture, change in agricultural inputs - inorganic and organic fertilizers, and underground water for irrigation. Soil contamination, soil suitability and pollution analysis.		
CO3 & CO4	Environment protection, planning and management: Concepts, agreements/protocols, agendas, laws, polices and international program.		

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References

Castree, N.; Demeritt, D.; Liverman, D. and Rhoads, B. (2009). *A Companion to Environmental Geography*. Blackwell Publishing Ltd, UK
Chandna R. C. (2002). *Environmental Geography*. Kalyani, Ludhiana.
Miller G. T. (2004). *Environmental Science: Working with the Earth.* Thomson Brooks Cole, Singapore
Singh S. (1997). *Environmental Geography.* Prayag Pustak Bhawan. Allahabad.

Course Title: Urban and Transport Geography

Course Code: GES 302, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course provides an introduction to urban and transport geography. It explores the distinctive contributions of urban geography in analyzing contemporary urbanization and urban life. The course outlines the origin and evolution of cities, the determinants, processes and impacts of urbanization, urban development models and theories, urban environment, and urban transport system. Drawing on the issues of urbanization in the developing countries, the course also includes major concerns in urbanization and urban environment, urban disaster, and urban governance.

Course Outcomes (COs):
CO1: Able to state various features of urban and transport geography, theories and models of urban development and land use planning for transportation.
CO2: Able to understand key concepts of urban and transport geography.
CO3: Able to examine different urban structures in the developing countries, urban-rural migration, and environmental problems related to urbanization and transportation.
CO4: Able to evaluate/assess models and theories, planning and policy related to urban development and transportation.

COs	Course Contents	TLS	AS
CO1 & CO2	Urban geography: Definition, scope, development and relationship with other disciplines. Approaches and importance of studying urban geography.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	Origin and evolution of cities: Early, medieval and modern cities. Recent urbanization trends.		
CO1 & CO4	Models and theories of urban development: Central place theory, rank-size rule and primate city. Urban land use, economic base of cities, ecological footprint, sustainable city and megacities.		
CO2	Determinants and impacts of urbanization: Urban population, poverty and deprivation, urban informality. Urban livability and disaster.		
CO3	Urbanization in the developing countries: Urbanization in third world - internal structure, rural-urban migration, urban economy and employment, housing, environmental problems and health.		
CO4	Urban planning and policy: Urban policy and regeneration, urban sustainability and the future of the city.		
CO1 & CO2	Transport geography: Definition, scope and importance of transport geography.		
CO2 & CO3	Transport: Nature and modes of transport, transportation and environment. Urban transportation: Urban form and transportation. Urban travel patterns, major transport problems and solutions. Mass transport system, transport planning and policy.		
CO4	Transportation in Bangladesh: Growth and development of transport, importance of transport, problems and solutions of transportation in Bangladesh.		

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References:

Carter, H. (1995). *The Study of Urban Geography*. London: Edward Arnold.

Elahi, K. M. and Rumi, S. R. A (Eds.) (2005). *Nagar Bhugol: Shamprotik Dhara* (in Bangla). Dhaka: Delta Books.

Hall, T. (2006). *Urban Geography*. London: Routledge.

Hoyle, B. S. and Knowles, R. (Eds.) (1998). *Modern Transport Geography*. Chichester: John Wiley and Sons.

Johnson, J. H. (1972). *Urban Geography: An Introductory Analysis*. Oxford: Pergamon Press.

Knox,P. and Pinch, S. (2010). *Urban Social Geography*. England: Pearson.

Latham, A.; McCormack, D.; McNamara, K. and McNeil, D. (2009). *Key Concepts in Urban Geography*. Los Angeles: Sage.

Mitlin, D. and Satterthwaite, D. (Eds.) (2004). *Empowering squatter citizen: local government, civil society and urban poverty reduction*. London: Earthscan.

Pacione, M. (2009). *Urban Geography: A Global Perspective*. London: Routledge.

Course Title: Agriculture and Soil Geography

Course Code: GES 303, **Credit:** 4.0, **Full Marks**: 100

Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:

This course is designed to provide an opportunity for understanding the origin, development, system and determinants of agriculture of the world. Various theories and models will be explained. Particular attention will be given to agriculture of Bangladesh. Additionally, an elaborate explanation about different issues of soil geography will be discussed. Focus has also been given on the formation, composition, properties, types and profile of soils.

Course Outcomes (COs):

CO1: Able to understand the concept, origin, development and determinants of agriculture.
CO2: Able to discuss the system, types and regionalization of agriculture.
CO3: Able to explain the theories and models in agricultural geography.
CO4: Able to examine present scenario of agriculture in Bangladesh including modernization.
CO5: Able to discuss the formation, properties and classification of soil.

COs	Course Contents	TLS	AS
CO1	Introduction: Definition, scope, subject matter and approaches.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Origin, growth and development of agriculture.		
CO1 & CO2	Physical and non-physical determinants of agriculture. Agricultural systems of the world.		
CO2	Agricultural regionalization, crop diversification, crop combination and cropping intensity.		
CO3	Agricultural location theories and models with special reference to J.H. von Thünen, Sinclair, and O. Jonasson.		
CO4	Agricultural land resources of Bangladesh, land management and land tenure system of Bangladesh.		
CO4	Land use, major cropping pattern and production, and adoption of new agricultural technology in Bangladesh.		
CO5	Definition, forming factors and formation process of soil. Soil composition and profile development. Physical properties of soil. Generalized classification of soil - zonal, azonal and intra-zonal soil.		

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References:

Amin, S. M. (2004). *Modern Soil Science*. Mowla Brothers: Dhaka.

Brammer, H. (1996). *The Geography of the Soils of Bangladesh*. University Press Limited: Dhaka.

Husain, M. (2006). *Systematic Agricultural Geography*. Rawat publication: Jaipur and New Delhi.

Sikder, Z. I. (2004). *Krishi Arthaniti (Agricultural Economics*), Confidence Prakasani: Dhaka.

Singh, J. & Dhillon, S. (2000). *Agricultural Geography*, Tata McGraw-Hill publishing company: New Delhi.

Tarrant, J. R. (1974). *Agricultural Geography*. John Wiley & Sons: New York.

Course Title: Geography of Bangladesh

Course Code: GES 304, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course incorporates a general treatment about the geography of Bangladesh which is necessary for providing a clear understanding of physical and human scenarios of the country. Geo-environmental setting, natural resources, and major issues regarding physical and human environment are included as an integral part of this course. The course also focuses on the historical background, human resource, settlement, and major economic activities.

Course Outcomes (COs):
CO1: Able to describe physical settings of Bangladesh.
CO2: Able to discuss environmental problems of the country.
CO3: Able to examine socio-cultural aspects and economic sectors of the country.
CO4: Able to explain foreign relationships with other countries.
CO5: Able to analyze contemporary issues.

COs	Course Contents	TLS	AS
CO1	General introduction: Locational characteristics and importance, evolution of boundary and frontiers.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Geo-environmental settings: Geological and tectonic aspects, relief and physiographic structure, river systems and wetlands, climate and climatic hazard, soil classification and agro-ecological zone.		
CO1	Natural resources: Land, water, minerals, fuel and energy, livestock, fisheries and forests.		
CO2	Major issues of physical environment: Environmental pollution (i.e. soil, water & air), impact of climate change, and major development (engineering) projects. Hydro- metrological hazards - riverbank erosion, flood and tectonic hazard.		
CO3	Historical background: People, race, languages and religion. Human Resources - characteristics and constraints of development. Human development index and comparison with neighboring countries		
CO3	Population and Settlement: Population distribution and density, and population dynamics. Settlements pattern and urbanization.		
CO3	Major economic activities: Primary (agriculture, fisheries etc), secondary (industrial & manufacturing etc), tertiary (trade, and transport) and services.		
CO4	Foreign policy: Foreign policy of Bangladesh and relationships with other countries.		
CO5	Contemporary problems and issues: Population pressure, poverty, food security, blue economy, water dispute and regional cooperation. Development contribution of Government and NGOs. Urbanization, regional inequality and regional development.		

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References:

Ahmad, N. (1976). *New Economic Geography of Bangladesh.* Vikas Publishing House.

Brammer, H. (2012). *Physical Geography of Bangladesh*. The University Press Ltd.

Gain, P.; Moral, S.; Raj, P. and Sircar, L. (2002). *Bangladesh environment: facing the 21st century*. Society for Environment and Human Development.

Rashid, H. (1978) *Geography of Bangladesh*. Westview Press.

Course Title: Advanced Economic Geography

Course Code: GES 305**, Credit:** 3.0, **Full Marks:** 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:
This course is designed to provide details knowledge on economic system, theoretical perspective of economic geographic models, and theories and laws especially various classical models and theories related to agricultural, industrial location and urban structure. Diffusion of innovation and movement, as well as interaction among the activities in the light of development of economic landscape, and core-periphery economic activities also included in this course.

Course Outcomes (COs):
CO1: Able to state theories and models related to different types of economic activities.
CO2: Able to explain theoretical perspective of economic geographic models, and theories and laws
CO3: Able to examine classical theories and models in economic geography.
CO4: Able to analyze interaction between economic activities and space.

COs	Course Contents	TLS	AS
CO1	Economic geography: Concepts of space, place and scale.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	System Concept in Economic Geography: economic system, theories and models in economic geography, the concept of 'system' and systems in economic geography, and factors of production.		
CO2 CO3 & CO4	Spatial organization of agriculture: Modification of von Thünen, comparison with Sinclair, E.M. Hoover, Garrison and Marble, and O. Jonasson.		
CO2 CO3 & CO4	Spatial Organization of Industries: Industrial location theories of Weber's, Tord Palander, Edgar Hoover, August Lösch, Isard's, and Smith's space cost curve.		
CO2 CO3 & CO4	Central Place System: Spatial organization of land uses within urban centres, central place hierarchy, theoretical extension of the Christaller model by August Lösch, theories of Ernest W. Burgess, Homer Hoyt, Chauncy D. Harris and Edward L. Ullman.		
CO4	Movement and Interaction in the Economic Landscape: People, objects and information. Movement and diffusion models, transport system, the location of transportation routes and networks, their form and structure, and transportation costs.		

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References:

দত্ত, কুন্তলা লাহিড়ী (১৯৯৫) ভূগোল চিন্তার বিকাশ। কলিকাতা, ওয়ার্ল্ড প্রেস।

Chorley, R. J. and Haggett, P. (1967). *Models in geography*. London: Methuen & Ca., Ltda. Cooper, E. H. (1968). *Introduction to economic geography*. London: University Tutorial Press Ltd.

Haggett, P. (1991). *Geography-A modern synthesis*. Ulmer.

Harvey, D. (1969). *Explanation in geography*. London: Arnold

Lloyd, P. E. and Dicken, P. (1972). *Location in space: a theoretical approach to economic geography*. New York: Harper & Row.

Murphy, R. E. (1966). *The American city: an urban geography*. New York: McGraw-Hill.

Smith, D.M. (1970). *Industrial Location.* London: Wiley International.

Course Title: Climate Change and Disaster Management

Course Code: GES 306, **Credit:** 3.0, **Full Marks**: 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:
This course is designed to provide a deeper understanding about climate change, hazard and disaster along with various associated issues. Global warming will be particularly addressed as a threat induced by climate change. It will give an insight into climate change adaptation strategies and contemporary research for combating climate change. In this course, existing novel strategies are discussed for adopting and managing irregular patterns, reoccurrence, and destructiveness of natural hazard and disaster in a changing climatic scenario. Various disaster management approaches will also be discussed thoroughly in this course.

Course Outcomes (COs):

CO1: Able to describe climate change, global warming, and various associated issues.
CO2: Able to compare among various climate change adaptation strategies.
CO3: Able to investigate climate change, hazards, disasters and their impacts.
CO4: Able to explain the analyze climate change models as well as theoretical framework and phases of disaster management.

COs	Course Contents	TLS	AS
CO1	Climate Change: Meaning, science, significance, indicators, links with hazards and disasters.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO3 & CO4	Effects of climate change on: Agriculture, water resources, human health, and ecology.		
CO1 & CO3	Greenhouse effect and global warming: Causes, threats, predictions, and controlling measures. Ozone layer depletion.		
CO4	Climate change modeling: Construction, variables used, results, and testing of models.		
CO2	Climate change mitigation and adaptation: Potentials, constraints, strategies, adaptive capacity, and roles of GOs and NGOs. Institutional arrangement of climate change research.		
CO3	Hazards and disasters: Definitions, distinctions, types, characteristics, and impacts. Relevant terms: vulnerability, risk, coping strategy, adaptation, and resilience.		
CO4	Theoretical framework of disaster management: Pressure and release model (PAR) and place-based model.		
CO4	Disaster management cycle: Views, preparedness, response, recovery, relief and rehabilitation, and mitigation.		

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References

Baba, A.; Tayfur, G.; Gündüz, O.; Howard, K. W. F.; Friedel, M. J. and Chambel, A. (2011). *Climate Change and its Effects on Water Resources Issues of National and Global Security*. Springer.

Bicknell, J.; Dodman, D.; and Satterthwaite, D. (2009). *Adapting Cities to Climate Change: Understanding and addressing the development challenges*. Earthscan.

Bose. C. B. (2014). *Disaster Management in 21st Century*. Rajat Publications, New Delhi.

Desonie, D. (2008). *Climate Causes and Effects of Climate Change.* Chelsea House Publishers, New York.

Hardy. J. T. (2003). *Climate Change Causes, Effects, and Solutions*. John Wiley & Sons, England.
McMichael, A. J.; Campbell-Lendrum, D. H.; Corvalán, C. F.; Ebi, K. L.; Githeko, A. K.; Scheraga, J. D. and Woodward, A. (2003). *Climate change and human health Risks and Responses*. WHO.
Mendelsohn, R. and Dinar, A. (2009).*Climate Change and Agriculture an Economic Analysis of Global Impacts, Adaptation and Distributional Effects.* World Bank.
Murthy, R. K. (2012). *Disaster Management*. Wisdom Press, New Delhi.
Neelin, J. D. (2011). *Climate Change and Climate Modeling.* Cambridge University Press.
Paul, B. K. (2011). *Environmental hazards and disasters: contexts, perspectives and management.* John Wiley & Sons.
Shrivastava, A. K. (2009). *Global Warming*, A P H Publishing Corporation, New Delhi.
Surampalli, R. Y.; Zhang, T. C.; Ojha, C. S. P.; Gurjar, B.; Tyagi, R. D. and Kao, C. M. (2013). Climate *Change Modeling, Mitigation, and Adaptation*. ASCE.
Treidel, H.; Martin-Bordes, J. L. and Gurdak, J. J. (2011). *Climate Change Effects on Groundwater Resources A Global Synthesis of Findings and Recommendations.* CRC Press.

Course Title: Research Methodology and Project Monitoring

Course Code: GES 307, **Credit:** 3.0, **Full Marks**: 75

Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

The course introduces the language of research, ethical principles and challenges related to the research process within quantitative, qualitative and mixed-method approaches. It is mainly designed to fulfill the several objectives including i) understand the concepts and types of geographical research, ii) be familiar with the ideas, makers, and thinkers of geography, iii) be knowledgeable about literature review, find research gaps and conceptualize research problems, and iv) learn the methods of data collection, analysis, project/paper writing and presentation.

Course Outcomes (COs):

CO1: Able to understand the research practices and contextualize theories concerning contemporary geographical research.

CO2: Able to achieve hands-on practices about literature review to figure out research gap(s) and design a conceptual framework.

CO3: Able to plan/design a scholarly research project in the field of geography and environment.

COs	Course Contents	TLS	AS
CO1	Nature of geographical research: Definition and concept of geographical research, the 'science' in geographical research, and general principles of geographical inquiry.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Ethics in geographical research: Ethical principles, ethics and the issues of protection of the participants and researchers. Ethics and the organizations.		
CO2	Research process and strategies: Elements of the research process, theory and research, deductive and inductive theory, epistemological and ontological considerations, quantitative and qualitative research, and mixed-method approach.		
CO2	Research designs: Experimental design, cross-sectional design, longitudinal design(s), case study design and comparative design. Reliability and validity.		
CO2	Literature review: Reviewing the existing literature, finding research gap(s), referencing, and plagiarism.		
CO2	Research methods: Ethnography and participant observations, interview, questionnaire survey, focus group discussion, and content analysis.		
CO2	Data analysis: Quantitative data analysis, qualitative data analysis, breaking down and combining quantitative and qualitative data.		
CO2 & CO3	Planning and monitoring of a research project: Thinking about the research area, managing time and resources, formulating suitable research questions and objectives, writing a research proposal, preparing/conducting fieldwork for data collection, analyzing data, and presenting the results.		
CO3	Research writing**:** Writing a research plan, research report, presentation of quantitative and qualitative data, final statement, editing, and proofreading processes.		

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References:

Blaikie, N. (2000). *Designing social research: the logic of anticipation*. Cambridge: Polity Press. Bryman, A. (2012). *Social research methods*. New York: Oxford University Press.

Clifford, N.; Cope, M.; Gillespie, T. and French, S. (Eds.) (2016). *Key methods in geography*. UK: Sage.

Flowerdew, R. and Martin, D. (Eds.) (2005). *Methods in human geography: A guide for students doing a research project* Pearson Education Ltd., UK.

Gomez, B. and Jones, J. P. (Eds.) (2010). *Research methods in geography: A critical introduction.* UK: Wiley-Blackwell.

Montello, D. and Sutton, P. (2013). *An introduction to scientific research methods in geography and environmental studies*. USA: Sage.

Walter, M. (2010). *Social research methods*. Oxford: Oxford University Press.

Course Title: Principles of Photogrammetry and Remote Sensing

Course Code: GES 308, **Credit:** 3.0, **Full Marks**: 75

Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

This is an introductory course in order to provide the basics of remote sensing and aerial photography as well as their applications in both academic disciplines and professional industries. Besides, fundamental concepts of remote sensing and aerial photography, primary emphasis will be placed on image acquisition and platforms, image characteristics identification, image processing, and data set manipulations. However, a detailed discussion regarding the different types of image classification techniques is also included in this course since learning the process of transforming satellite data into information classes through classification technique is an essential necessity for remote sensing scientist.

Course Outcomes (COs):

CO1: Able to describe the elementary aspects of photogrammetry and remote sensing.

CO2: Able to understand/discuss the processing steps of aerial photo and remotely sensed data using a variety of manual and automated techniques.

CO3: Able to assess image acquisition and platforms, image characteristics identification, image processing, and data set manipulations and to the strengths and weaknesses of remote sensing instruments.

CO4: Able to apply knowledge and critical thinking skills to solve a real-world problem with appropriate remote sensing data and processing methods.

COs	Course Contents	TLS	AS
CO1	Fundamentals of photogrammetry and remote sensing: Definition, basic principles and history.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Aerial photography: Photographic system, types, and geometric characteristics, Visual image interpretation and elements of visual image interpretation.		
CO1 & CO2	Basics of remote sensing: Remote sensing process, electromagnetic radiation, energy interaction with atmosphere and earth surface, properties of satellite imagery, types of remote sensing-optical, thermal, microwave, LiDAR and hyper-spectral remote sensing.		
CO1 & CO2	Sensors: definition, characteristics, types, sensor resolutions. Satellite and orbits: type and uses. Platforms used in remote sensing.		
CO1 & CO2	Digital image: Concept of digital image, image resolution, single and multiple spectral bands, image display, methods of storing multiband image.		
CO1 CO2 & CO3	Satellite image interpretation and feature extraction: image rectification, atmospheric and radiometric corrections, image enhancement, image classification techniques, accuracy assessment and change detection.		
CO3	Space research organizations and satellite remote sensing programmes. Space research organization and satellite in Bangladesh.		

COs	Course Contents	TLS	AS
CO2 & CO3	Band ratios and vegetation indices, and applications of vegetation indices.		
CO1 & CO2	Global Positioning System (GPS) and other Global Navigation Satellite Systems.		
CO4	Different kind of Applications of aerial photo and remote sensing to solve real-world problems.		

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References:

Campbell J. B. (2007). *Introduction to Remote Sensing*. Guildford Press.

Jensen J. R. (2004). *Introductory Digital Image Processing: A Remote Sensing Perspective*. Prentice Hall

Lillesand T. M.; Kiefer R. W. and Chipman J. W. (2004). *Remote Sensing and Image Interpretation*. Wiley. (Wiley Student Edition).

Wolf P. R. and Dewitt B. A. (2000). *Elements of Photogrammetry: With Applications in GIS*. McGraw- Hill.

Course Title: THIRD YEAR PRACTICAL

Course No.: GES 309, **Credit:** 10.0, **Unit:** 2.5, **Full Marks:** 250
Number of Classes: 40 approximately (90 minutes duration)

Description:
The course introduces background and technical knowledge about Levelling and Theodolite survey, Global Positioning System (GPS), Total station, aerial photographs and remote sensing, study of geological maps & identification of rocks and minerals, study of weather map, and socio-economic survey of a region through questionnaire survey and Focus Group Discussion (FGD). Intensive hands-on training will be provided on surveying, remote sensing, and study of weather map, geological maps, and identification of rocks and minerals. Besides, technique of socio-economic survey of a selected region through questionnaire survey and FGD will be covered in this course.

Course Outcomes (COs):

CO1: Able to acquire knowledge about levelling and Theodolite survey, GPS, Total station, aerial photographs and remote sensing, geological maps, weather map and rocks and minerals.

CO2: Able to be skilled for identifying rocks and minerals, studying of geological and weather maps, and analysis of aerial photographs and satellite image.

CO3: Able to conduct field work for socio-economic survey of a selected region through questionnaire survey and FGD.

Course Contents:

Part-A: Surveying II: Surveying, GPS, Total Station and UAV

a. **Surveying:** Level and Levelling Survey – Sea-level, Bench-Mark, Levelling survey procedure, use, plotting on field book, difficulties of the survey, Longitudinal and Sectional profile. Theodolite survey -Survey procedure, use, plotting on field book, difficulties of the survey and sheet drawing on surveying.
b. **GPS:** Overview and terminology; components of GPS system; GPS signal characteristics; GPS data and data plotting; sources of error; and applications of GPS.
c. **Total Station:** Introduction to co-ordinates; setting up and using the instrument; angle measurement theory; slope and horizontal distance calculation; known station, back sights, orientation, free-station; final field exercise measuring points with the Total Station.
d. Mapping and surveying with UAV.

Part-B: Interpretation of Aerial Photographs and Analysis of Remote Sensing Data

a. Interpretation of aerial photographs
b. Area measurements
c. Download and understanding of digital image, Geo-referencing of digital image
d. Histogram analyses, image enhancement and resampling
e. Spectral signature development
f. Image Classification: Un-supervised and Supervised
g. Ground truth verification and accuracy assessment
h. Change detection

Part-C: Study of Geological Maps & Identification of Rocks and Minerals

Part-D: Study of Weather Map

a. Analyses of weather maps
b. Making weather reports
c. Preparing various graphs and charts from weather data
d. Preparing various graphs and charts from climate data
e. Analyses of climate and weather data

Part-E: Field Work of Human Aspects: Socio-economic survey of a region through field observations, questionnaire survey, in-depth interview and FGD.

Curriculum Plan for B.Sc Honours Part-IV Examination: 2025

Course No.	Title of the Course	Unit	Full Marks	Credit
GES 401	Fundamentals of Resource Management	1.0	100	4.0
GES 402	Population and Settlement Geography	1.0	100	4.0
GES 403	Fluvial Morphology and River Management	1.0	100	4.0
GES 404	Research Project	1.0	100	4.0
GES 405	Political and Cultural Geography	0.75	75	3.0
GES 406	Tourism Geography	0.75	75	3.0
GES 407	Spatial Analysis	0.75	75	3.0
GES 408	South Asia [Excluding Bangladesh]	0.75	75	3.0

PRACTICAL EXAMINATIONS [Practical Examination shall be 24 hours (6 hours per day)]				
Part-A	Morphometric Analysis	2.5	250	10
Part-B	Spatial Analysis and Mapping			
Part-C	Environmental Analysis			
Part-D	Field Techniques in Geography			
Part-E	Analyzing demographic and settlement data			
Part-F	Field Work of Environmental Aspects: Eco-environmental Survey - collection and processing of field samples, EIA, and presentation.			
	Viva-voce	0.5	50	2
	Class Assessments: Attendance, Field Attendance, Tutorial and Terminal	0.5	50	2
	Total Credit	**10.5**	**1050**	**4**2

Course Title: Fundamentals of Resource Management

Course Code: GES 401, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:

The aim of the course is to provide an understanding about environmental, socio-economic and policy perspectives of resource management. It also gives an insight into the paradigms of conservation and sustainable development of resource use and planning. Additionally, an important goal of this course is to familiarize with traditional and ecosystem approach planning tools for natural resource management.

Course Outcomes (COs):

CO1: Able to describe different types of resources and their characteristics.
CO2: Able to explain resource appraisal and management.
CO3: Able to examine/assess different types of resource planning and conservation polices.
CO4: Able to investigate potential use and policy formulation regarding resources management.

COs	Course Contents	TLS	AS
CO1	Fundamentals of resource and its management: Definition and concepts, scope and approaches. The evolution of the field of resource management. Resource allocation and resource ecosystem.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/ exam), Terminal, Final examination
CO1	Resource Classification: Nature of resources, marine resources, natural resources, renewable and non-renewable resources.		
CO2	Resource appraisal, Forecasting and Monitoring: Methods and techniques, and population-resource nexus.		
CO2	Sustainability and carrying capacities: Concepts of sustainability, carrying capacity, perception, attitude and adjustment in resource management.		
CO3	Resource conservation: Meaning, strategies and techniques, important resources and their conservation strategies with particular reference to Bangladesh.		
CO3	Resource planning and management: Concept, approaches and models.		
CO4	Perspectives on the future resources: Salient trends, social order, institutional reforms, policy making, international order and co- operation.		

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References:

Husain, M. (1994). *Resource Geography*. New Delhi: Anmol Publication Pvt. Ltd.
Mitchell, B. (1979). *Geography and resource analysis*. New York: Longman Group Limited. Mitchell, B. (2002). *Resource & environmental management*. Harlow: Pearson Education Limited.
Omara-Ojungu, P. H. (1992). *Resource management in developing countries*. Longman Scientific and Technical.
Zimmerman, E. W. (1951). *World Resources and Industries: A Functional Appraisal of Availability of Agricultural and Industrial Resources*. Harper.

Course Title: Population and Settlement Geography

Course Code: GES 402, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:

This course provides an overview of the field of population and settlement geography. Several components about population, including i) dynamics, ii) distribution, iii) structure and composition, iv) growth and v) estimates and policies will discuss in this course thoroughly. Additionally, this course will highlight different aspects of human settlement as well as the settlement system, theories, and morphology of human settlement. Besides, the problem of settlements will also be addressed in this course with particular reference to Bangladesh.

Course Outcomes (COs):

CO1: Able to state the key aspects of population and settlement geography.
CO2: Able to understand factors and components of population distribution and dynamics, human settlement systems and patterns, and population and settlement geography theories with the particular focus on spatial variation.
CO3: Able to explain the trend of population dynamics and population growth.
CO4: Able to analyze population data and morphology of settlement.
CO5: Able to assess population and resources, population policies, and settlement problems.

COs	Course Contents	TLS	AS
CO1 & CO2	Population Geography: Definition, scope and methodology. Population structure and composition. Sources of population data.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO3	Population growth: Forces, trends, and theories. Population dynamics: fertility, mortality and migration.		
CO4	Population distribution and density. Measures of spatial variations and determinants of spatial variations.		
CO5	Population and resources. Population estimates. Population policies.		
CO1 & CO2	Settlement Geography: Definitions, scope and methods of settlement geography.		
CO1 & CO2	Human settlement: Number, sizes, classification and morphology.		
CO2 & CO3 CO4	Settlement system: Process and forms of settlement system, regions of settlement dimensions and deformations, dynamic systems. Theories of settlement: Fundamental theories, nature, and settlement goals. Human spatial needs, forces shaping settlements, structure and forms, texture and density.		
CO2 CO4 & CO5	Morphology of human settlement: Static and dynamic. Selected problems of settlements: Land use pattern. Problems of settlement - population, housing, health, education, transportation and communication, environment and ecology. Settlement problems in third World countries with particular reference to Bangladesh.		

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References:

Clarke, J. I. (1966). *Population Geography*. London: Pergamon Press.

Newbold, K. B. (2010). *Population Geography: Tools and Issues*. London: Rowman & Littlefied Publisher.

Raj, H. (1988). *Fundamentals of Demography.* Delhi: Surjeet Publications.

Course Title: Hydrology and Fluvial Morphology

Course Code: GES 403, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
The course provides different aspects of hydrology including precipitation, evaporation, interception, infiltration, run off etc. It also highlights subsurface water, Soil moisture, water storage in soil, zonation of ground water and water table. The origins and evolution of river, channel pattern, characteristics, channel processes are also included in this course with a particular attention to drainage basin. The course also focuses on concepts, causes, types, and consequences of fluvial disaster of Bangladesh and its mitigation strategies. A detailed impression on fluvial disaster management is also included in the course.

Course Outcomes (COs):

CO1: Able to describe various parameters about hydrology and fluvial morphology
CO2: Able to comprehend concept about surface and subsurface water, origin and evolution of river, channel forms, and processes and patterns.
CO3: Able to demonstrate knowledge about zonation of ground water, and formation of landforms by ground water movement, factors affecting hydrological response of a basin, drainage pattern, orders of stream channels.
CO4: Able to examine fluvial disaster consequences and fluvial disaster management scenario.

COs	Course Contents	TLS	AS
CO1 CO2 & CO3	Hydrology: Definition, scope and properties of water. World water balance and distribution. Hydrological cycle: Precipitation, evaporation, interception, infiltration, and run off. Characteristics and importance. Subsurface water: Types and factors, Soil moisture, water storage in soil, zonation of ground water, water table, ground water movement and formation of landforms.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Fluvial morphology: Definition, concept and importance. Origin and evolution of river, rill, gullies and stream flow.		
CO4	Channel pattern: Stream channel pattern and characteristics. Types of river, and river discharge measurements - velocity, flow, and hydrograph. Channel form and process: Energy and force, erosion, transportation and deposition characteristics. Landforms, floodplain and delta formation. Drainage basin: Factors affecting hydrological response of a basin, drainage pattern, orders of stream channels, bifurcation ratio and stream ordering laws.		
CO1 CO3 & CO4	Fluvial disaster: Concepts, causes and types. Fluvial disasters in Bangladesh-consequences and mitigation. Fluvial disaster management: Floodplain and water resource management in Bangladesh, and river management policies and problems in Bangladesh.		

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References:

Anderson, R. S. and Anderson S. P. (2010). *Geomorphology the mechanics and chemistry of landscapes*. Cambridge University press: UK

Brierley, G. J. and Fryirs, K. A. (2013). *Geomorphology and River Management*. Blackwell: USA and UK.

Brutsaert, W. (2005). *Hydrology: an introduction*. Cambridge University Press.
Charlton, Ro. (2008). *Fundamentals of fluvial geomorphology*. Routledge: London and New York.
Davie, T. and Quinn, N.W. (2019).. *Fundamentals of hydrology*. Routledge.
Fairbridge, R. W. (1968). *The encyclopedia of geomorphology*. New York.
ICWFM (2007). *International conference on water and flood management*. Institute of Water and flood management, BUET: Dhaka, Bangladesh: Vol.1
Miller, J.P.; Wolman, M. G. and Leopold, L.B. (1964). *Fluvial processes in geomorphology*. W. H Freeman and Company: San Francisco.
Ward, R.C. (1967). *Principles of Hydrology*. McGraw-Hill Book Company (UK) Limited: England.

Course Title: Research Project

Course Code: GES 404, **Credit:** 4.0, **Full Marks**: 100

Number of Classes: No requirement for formal class but all supervisors are requested to provide necessary feedbacks to their project students

Course description:

The course will provide a plenty of opportunities to understand the research processes and practices in the discipline of geography and environmental studies. It will help to obtain an in-depth knowledge and understanding about a selected topic of research and provide substantial training on writing a thesis/article and presenting of research findings. The course does not include any formal lectures, however, two presentations as well as written research report are needed for this course. All students are required to select their own research topics related to geography and environment issues depending upon their research interests after consulting with their academic supervisors.

Course Outcomes (COs):

CO1: Able to demonstrate the knowledge and skills gained throughout the program and apply them to a specific research question.
CO2: Able to formulate a research proposal justifying the methodology and research gaps through a critical literature review.
CO3: Able to design and implement suitable methods of sampling for data collections.
CO4: Able to plan and conduct fieldworks independently.
CO5: Able to analyze and present the empirical data using sophisticated statistical and cartographic techniques.
CO6: Able to construct an appropriately formatted scientific research dissertation and article,
CO7: Make a contribution to the geographical literature, and
CO8: Able to present and defend the research findings.

COs	Course Contents	TLS	AS
CO1 CO2 CO3 & CO4	Basic knowledge about the research outline. Determination of research topic. Writing a research proposal.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO5	Data collection. Data analysis. Result and outcome analysis.		
CO6 & CO8	Proposal presentation. Final research presentation.		
CO7	Final research report submission.		

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References:

Blaikie, N. (2000). *Designing social research: the logic of anticipation*. Cambridge: Polity Press. Bryman, A. (2012). *Social research methods*. New York: Oxford University Press.

Clifford, N.; Cope, M.; Gillespie, T. and French, S. (Eds.) (2016). *Key methods in geography*. UK: Sage.

Flowerdew, R. and Martin, D. (Eds.) (2005). *Methods in human geography: A guide for students doing a research project*. Pearson Education Ltd., UK.

Gomez, B. and Jones, J. P. (Eds.) (2010). *Research methods in geography: A critical introduction.* UK: Wiley-Blackwell.

Montello, D. and Sutton, P. (2013). *An introduction to scientific research methods in geography and environmental studies*. USA: Sage.

Course Title: Political and Cultural Geography

Course Code: GES 405, **Credit:** 4.0, **Full Marks**: 100
Number of Classes: Approximately 32 (45 minutes class duration)

Course Description:
This course is designed to provide a deep insight of political and cultural issues from geographical point of view. On the political side, elements and structure of state, international relations, international organizations, and Bangladesh in international politics are the main points of discussion, while cultural side focuses on the role of culture in shaping places, regions, and landscapes. In addition, evolution of civilization, influence of preceding cultures on contemporary culture, and culture of ethnic minorities of Bangladesh will also be discussed.

Course Outcomes (COs):
CO1: Able to state various features of political and cultural geography.
CO2: Able to understand ancient cultures, early civilizations, culture of ethnic minorities as well as discuss the elements and structure of state, relation between countries, international organizations and political situation of Bangladesh.
CO3: Able to examine the relation among countries and the political situation of Bangladesh before and after independence.
CO4: Able to evaluate the foreign policy of Bangladesh and activities of different international organizations.

COs	Course Contents	TLS	AS
CO1	Political and cultural geography: Definition, meaning, scope, and significance.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO2	Human evolution.		
CO2	Ancient culture: Paleolithic, Mesolithic, and Neolithic.		
CO2	Early Civilizations: Egyptian, Mesopotamian, Indus valley, and Greek.		
CO2	Culture of ethnical minorities of Bangladesh: Chakma, Marma, and Santal.		
CO2	Elements and structure of state.		
CO2 CO3 & CO4	Relationships between countries: Interactive relationships between power and place, and the construction, contestation and reconfiguration of political spaces.		
CO2 & CO3	Political ecology: Theoretical and conceptual frameworks and post structural political ecology and social capital.		
CO4	International organizations and grouping of states.		
CO3 & CO4	Bangladesh: Political situation before and after independence, relationships with other countries, and foreign policy.		

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References:

Agnew, J. (2003). *A Companion to Political Geography*. Blackwell Publishers Ltd, USA
Blacksell, M. (2006). *Political Geography*. Routledge, New York.
Cresswell, T.; Anderson, K.; Domosh, M.; Pile, S. and Thrift, N. (2003). *Handbook of Cultural Geography.*
Duncan, J.; Johnson, N. and Schein, R. (2004). *A Companion to Cultural Geography*. Blackwell Publishing Ltd.
Gallaher, C. Dahlman, C. T.; Gilmartin, M.; Mountz, A. and Shirlow, P. (2009). *Key concepts in political geography*. Sage.
Short, J. R. (1993). *An Introduction to Political Geography*. Routledge, London.

Course Title: Tourism Geography

Course Code: GES 406, **Credit:** 3.0, **Full Marks**: 75

Number of Classes: Approximately 24 (45 minutes class duration)

Course description:

This course provides an understanding about the relationship between tourism and geography, and the national and international prospects of tourism in the new millennium. The origin and destination of tourists along with demand, factors, and determinants of national and international tourisms are included in the course. It will also introduce the importance of resources for tourism, prospects of ecotourism, and planning and governance of tourism. Particularly, the course will help to acquire knowledge on the roles of the geographers and the geographical perspective for sustainable planning of tourism in Bangladesh as well as in the world.

Course Outcomes (COs):

CO1: Able to understand the key concepts and methods in tourism geography.
CO2: Able to examine the economic and environmental impacts of tourism industries in the world.
CO3: Able to analyze different perspectives of tourism and apply the principles of eco-tourism to develop a sustainable tourism policy.

COs	Course Contents	TLS	AS
CO1	Introduction to Tourism Geography: Definition, concept and approaches. Forms of tourism. The emergence of national and global tourism. The birth of modern tourism, international patterns of travel and tourism.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Socioeconomic and Environmental Relations and Demands: The local economic landscape of tourism, socio-cultural relations and experiences in tourism. The demand of tourism, factors and determinants of tourism. Tourism-sustainability, environmental change, and climate. Blue tourism.		
CO3	Planning of Tourism: Tourism and recreation planning and governance.		
CO1 & CO3	Ecotourism in Bangladesh: Concept and principles of eco-tourism, problems and prospects for sustainability of eco-tourism, ecotourism and community development in Bangladesh.		

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References:

Boniface, B. G. and Cooper, C. (2005). *Worldwide Destinations: The Geography of Travel and Tourism*. Amsterdam, Elsevier.

Hall, C. M. and Page, S. J. (2002). *The geography of tourism and recreation: Environment, place and space*. NY: Routledge.

Lew, A. A.; Hall, C. M. and Williams, A. M. (2004). *A companion to tourism*. UK: Blackwell Publishing Ltd.

Timothy, D. J. and Nyaupane, G. P. (2009). *Cultural Heritage and Tourism in the Developing World: A Regional Perspective*. London: Routledge.

Williams, S. (1998). *Tourism Geography*. Ney York: Routledge.

Williams, S. and Lew. A. A. (2015). *Tourism Geography: Critical understandings of place, space and experience.* London: Routledge.

Wilson, J. (2012). *The Routledge Handbook of Tourism Geographies*. London: Routledge.

Course Title: Spatial Analysis

Course Code: GES 407, **Credit:** 3.0, **Full Marks**: 75

Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:

This course is designed to develop a comprehensive and systematic understanding of spatial analysis methods using both GIS and remote sensing techniques. It provides knowledge and skills that are needed to investigate the spatial patterns and changes resulting from natural and anthropogenic processes operating on or near the Earth's surface. Besides the fundamental concept of spatial planning and its scope, major focus will be given on different types of spatial data analyzing methods and the analytical tools such as Multi-Criteria Evaluation (MCE), shortest path analysis, least cost path analysis, and watershed analysis for finding the best solution for any planning or decision-making process related to geography and environment.

Course Outcomes (COs):

CO1: Able to define the fundamental concepts of planning, spatial planning and other background knowledge related to GIS and remote sensing that are necessary for spatial planning.

CO2: Able to understand/discuss spatial data, spatial analysis tools including buffering, overlay, data interpolation, spatial autocorrelation, line-of-sight, viewshed and watershed.

CO3: Able to explain/apply different techniques and models of spatial analysis including buffering, overlay, data interpolation, spatial querying, spatial autocorrelation, decision support systems.

CO4: Able to analyze/compare outcomes from different spatial analysis models or decision support systems for spatial planning.

CO5: Able to evaluate/simulate the results obtained using different spatial analysis models or decision support systems for finding the best solution for any decision making process using spatial data.

COs	Course Contents	TLS	AS
CO1 & CO2	Concept of spatial planning, importance and its linkage/interaction with land use, urban, regional, transport, environmental planning and other related issues.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1 & CO2	Spatial data structure, spatial analysis, significance of spatial analysis, review of methods/tools for performing spatial analysis.		
CO1 & CO2	Spatial data interpolation, interpolation methods and their advantages and disadvantages. Interpolation of climate, environmental and topographic data.		
CO2 CO3 & CO4	Spatial decision support system for finding the best solution in different spatial planning problems. Multi Criteria Evaluation (MCE), shortest path analysis, least cost path analysis, and watershed analysis. Network analysis		
CO2 & CO3	Spatial autocorrelation, methods for investigating spatial autocorrelation (including global and local measures), and spatial statistical analysis.		
CO2 & CO3	Spatial presentation and the analysis of Digital Elevation Model (DEM). 3-D analysis: draping, extrusion, line-of-sight, viewshed, skylines, volumetric analysis and animation.		
CO3 & CO4	Spatial model building: Static model, individual and aggregate models and cellular model.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:

de Smith; Michael J.; Michael F.; Goodchild and Paul A. L. (2006-2011). *Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools*. 3rd Edition, UK

Fotheringham, A.S.; Brundson, C.; and M. Charlton (2003). *Geograph-ically Weighted Regression*. John Wiley & Sons.

Haining, R. (1990). *Spatial Data Analysis in the Social and Environmental Sciences*. Cambridge: Cambridge University Press.

O'Sullivan; David; and David J. U. (2010). *Geographic Information Analysis*. 2nd Edition. New York, John iley & Sons.

Course Title: South Asia Excluding Bangladesh

Course Code: GES 408, **Credit:** 3.0, **Full Marks**: 75
Number of Classes: Approximately 24 (45 minutes class duration)

Course Description:
This course is an elaborate outline of a selected region of South Asia including India, Pakistan, Nepal, Sri Lanka, Bhutan, the Maldives and Afghanistan. Bangladesh is excluded because it is already taught in two individual courses of 4 credits each. Focus will be on general regional aspects of (i) the region as a whole and (ii) each country separately to cover important geographical issues those are generally covered under systematic and regional approaches.

Course Outcomes (COs):
CO1: Able to identify geomorphologic and physical aspects of the region as a whole and all the countries in the region that prepares the functional base of the temporal transformations.
CO2: Able to understand a relation between the geographical characteristics of the region and functional phenomena that shapes the social, economic and cultural aspects.
CO3: Able to apply focus on the social, cultural and economic anomalies resulted from temporal processes.
CO4: Able to analyze environmental problems, policies of the governments and possible future
CO5: Able to evaluate possibility of integrated approach for regionalization and minimizing social, cultural and economic conflicts, and future growth.
CO6: Able to project on general geographical aspects of individual countries.

COs	Course Contents	TLS	AS
CO1	Geological origin and physiographic setup of South Asia.	Lecture, Discussion, Presentation, Assignment	Tutorial (quiz/ presentation/ assignments/exam), Terminal, Final examination
CO1	Climate of South Asia as foundation of social and economic region and river systems.		
CO2 & CO3	Basis of South Asia as a region and pattern of economic growth and social transformation.		
CO3	Conflicts, development inequality and foreign policies of South Asian nations.		
CO5	SAARC as regional cooperation of economic development and future of South Asia's economic growth and political stability.		
CO4	Environmental aspects of South Asia and management under current climate change scenario.		
CO6	Overall examination of geographical aspects of India.		
CO6	Overall examination of geographical aspects of Pakistan, Sri Lanka, Nepal, Bhutan and Maldives.		

TLS: Teaching- learning Strategy AS: Assessment Strategy

References:
Dobby, E.H.G. (1967). *South Asia*. London: University of London Press, Ltd.
Learmonth, E. A. and Spat, O.H.K. (Year). *Asia: East by South*
Wadia, D.N. (1987). *Geology of India*. New Delhi: Tata McGraw-Hill Publishing Co. Ltd.

Course Title: FOURTH YEAR PRACTICAL

Course No: GES 409 **Credit:** 10.0, **Unit:** 2.5, **Full Marks:** 250
Number of Classes: 40 approximately (90 minutes class duration)

Course Description:
The course provides practical knowledge about morphometric analysis, spatial analysis and mapping, environmental analysis, field techniques in geography, analyzing demographic and settlement data, and micro region survey. Rigorous training will be provided to carryout morphometric analysis, spatial analysis and mapping, environmental analysis, field techniques in geography, analyzing demographic and settlement data. Additionally, technique of micro region survey including Environmental Impact Assessment (EIA), collection and processing of field samples and presentation of results will be addressed in this practical course.

Course Outcomes (COs):
CO1: Able to acquire knowledge about morphometric analysis, spatial analysis and mapping, and environmental analysis.
CO2: Able to demonstrate knowledge about field techniques in geography, analyzing demographic and settlement data, and micro region survey.
CO3: Able to be skilled for drawing landform profiles, slope mapping, identifying drainage pattern, and analysis of spatial data for decision making process.
CO4: Able to conduct field work for micro region survey including environmental analysis, EIA, collection and processing of field samples and presentation of results.

Course Contents:

Part-A: Morphometric analysis

a. Fieldwork on physical landscape study.
b. Study and interpretation of various types of landforms using topo-sheets (by cross profiles), aerial, composite; superimposition and projected mapping, hypsographic curve and long valley curve (Thalweg).
c. Stream ordering and laws of drainage composition slope aspects, spatial distribution and methods of slope analysis (Henry, Raisz, Robinson and Strahler), Preparation of slope profile.
d. Geomorphological mapping.

Part-B: Spatial Analysis and Mapping

a. Site suitability analysis using Multi-Criteria Analysis (MCE).
b. Shortest path and least cost path analysis.
c. Watershed analysis.
d. Image interpolation and network analysis.
e. Natural resource mapping.
f. Pollution and hazard mapping.

Part-C: Environmental Analysis

a. Geographical Exercise: Topographical and hydrological change detection on the basis of old and current topographical maps and also on existing field situation (visual comparison); Preparation of geomorphological maps of a given village on the basis of field survey, using chain and tape and topographic survey using DGPS & Total Station.
b. Hydrological Exercise: Preparation of stage hydrography/ flood frequency curves on the basis of hydrological data of a river station (BWDB data); Analysis of stream flow and drainage characteristics of a river using conventional tools and techniques as well as using remotely

sensed images. Study features include fluvial-geomorphic profiles of the stream.

c. Sedimentological Tests: Identification of sand, silt and clay by manual techniques and instrumental techniques; Studies on the texture, structure, colour, organic matter and composition. pH physical (pH meter) and chemical tests on the basis of conventional, traditional and modern scientific techniques, measurements of the sedimentary horizons and identification of sedimentary characteristics.

d. **Floral and Faunal environmental tests:** Species identification with reference to different land levels (viz: high, medium, low etc.) and physiographic units, like (a) species of hills or terrace lands, (b) species of plain alluvial lands (c) species of marshes/swamps or other low-lying surfaces; Study the relationship between occurrence of vegetation species and soil types of specific study areas viz. loamy, secondary and salty-clay regions.

Part-D: Field Techniques in Geography

a. Approaching the field: Definition and concepts of fieldwork, getting the most out of fieldwork. Before you go: research design and preparation, working in groups and travelling together, establishing contacts, institutional permission, safety and security, packing.

b. Research Ethics: Positioning yourself and encountering others, Protecting researchers and participants, data storage and security.

c. Research Methods and Contexts: Reading and sketching the landscape, stages of producing a sketch, describing and interpreting field sites, sampling and finding respondents, rapport building, interviewing for fieldwork, participatory observation and note taking, photography and visual techniques, questionnaire preparation and surveying.

Part-E: Analyzing Demographic and Settlement data

a) Measurement of fertility, mortality and migration.
b) Population estimation and population projection.
c) Identification of settlement features.

Part-F: Field Work of Environmental Aspects: Eco-environmental Survey - collection and processing of field samples, EIA, and presentation.