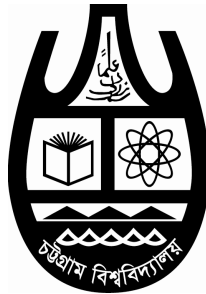


**DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES  
UNIVERSITY OF CHITTAGONG**

Website: [www.cugeography.com](http://www.cugeography.com)

**SYLLABUS**  
**B.Sc. Honours, MS and M.Phil**  
**(Session: 2013-2014 and 2014-2015)**



**FACULTY OF BIOLOGICAL SCIENCES  
UNIVERSITY OF CHITTAGONG, BANGLADESH**

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**DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES**  
**UNIVERSITY OF CHITTAGONG, BANGLADESH**  
**(At a glance)**

The Department of Geography and Environmental Studies is one of the well established departments in Chittagong University. The Department was started functioning with few students and teachers in 1996. At present, the teaching staff of this department consists of 19 teachers. Currently the total number of students in the department is around 200. With several changes in academic set up and curriculum, the department is now placed under the Faculty of Biological Sciences. Integrated Honours Program is running since 1996-1997 sessions and to meet the challenges of time four year Honours course was introduced in 1998-99 session. The courses for Honours Programme are designed to maintain a balance between physical, human and environmental Geography. Moreover the courses for MS program are designed to give the students specialized knowledge on different aspects of the subjects for application in national development.

The department is well equipped in respect of technical equipment and staffs. Besides library facilities, practical and fieldwork, the department has an adequate facility for advanced research works. There is a huge stock of maps, reference books, drawing and drafting equipment and cartographic apparatus. The laboratories of the department were not so developed at the beginning but remarkable progress has been made in this regard during the last decade. Now the department has physical, environmental, cartographic and GIS laboratories. Recently, a computerized weather monitoring station has been established by the joint collaboration with Norwegian Geographical Institute (NGI) and Geological Survey of Bangladesh (GSB), Government of Bangladesh.

The teachers of the department are actively engaged in different research activities in different fields of the discipline including agriculture, food security, health, environment, urban, Disaster, coastal zone, sustainable development, resource management, remote sensing and GIS application. A good number of teachers have also received trainings and advanced education in all the above areas of research from home and abroad. Currently a good number of teachers are also engaged in higher study academic programs in Scotland, Australia and Thailand. Senior teachers of this department are supervising a good number of Masters, M.Phil and Ph.D research works in this department. The department organizes seminar, conference and workshops at regular basis. Students of this department take part in sports, athletics and other co-curricular activities. All the members of the department are working hard to meet the challenges of higher education of this new millennium. Most of the teachers of the department are associated with the Bangladesh Geographical Society (BGS) and Bangladesh National Geographical Association (BNGA). The department has also established the Chittagong University Geographical Association (CUGA). All the Students and teachers are member of CUGA.

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**DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES  
UNIVERSITY OF CHITTAGONG**

**List of Faculty Members**

<b>SL</b>	<b>NAME</b>	<b>DESIGNATION</b>	<b>RESEARCH FIELD</b>
01	Muhammad Muhibbullah	Chairman and Associate Professor	Physical Geography, Environment, Agriculture
02	Dr. Mohammad Abu Taiyeb Chowdhury	Professor	Environment, Sustainable Development, Resource Management
03	Abdul Haque	Associate Professor (in Study leave)	Physical Geography, Coastal Environment
04	Dr. Alak Paul	Associate Professor	Public Health, Disaster Management, Qualitative Methodology
05	M. Edris Alam	Assistant Professor (in Study leave)	Disaster, Population
06	Salma Mamtaz	Assistant Professor	Gender, Climate Change, Waste Management
07	Md. Mahub Murshed	Assistant Professor	Physical, Environment, Water Resource
08	Kazi Md. Barkat Ali	Assistant Professor	Disaster, Environment, Geopolitics
09	Md. Iqbal Sarwar	Assistant Professor	Urban Environment, GIS, Disaster Management
10	Md. Ali Haider	Assistant Professor	Urban and Population
11	Taj Sultana	Assistant Professor	Physical, Coastal Environment
12	Nasreen Akter	Assistant Professor	Geomorphology, Coastal Environment, Urban
13	Biswajit Nath	Assistant Professor	Geoinformatics
14	Nahid Sultana	Assistant Professor	Coastal Geography and Environment
15	Md. Atiqur Rahman	Assistant Professor	Water, Land and Environment Management
16	Hiamul Islam	Lecturer	Tourism, Regional Planning
17	Naznin Nahar Sultana	Lecturer	Health
18	Shamsun Nahar	Lecturer	Urban planning, Environment
19	Shahidul Islam	Lecturer	

**List of Chairman**

<b>SL</b>	<b>NAME</b>	<b>PERIOD</b>
01	Professor Dr. Yousuf Sharif Ahmed Khan	04.06.1996 to 29.10.1997
02	Professor Dr. Mohammad Fazlee Hossain	30.10.1997 to 19.02.1998
03	Dr. Mohammad Shahidul Islam	20.02.1998 to 19.02.2001
04	Md. Nurul Islam	20.02.2001 to 11.04.2003
05	Dr. Mohammad Abu Taiyeb Chowdhury	12.04.2003 to 11.04.2006
06	Mr. Abdul Haque	12.04.2006 to 11.04.2009
07	Dr. Maksudur Rahman	12.04.2009 to 24.01.2010
08	Dr. Alak Paul	25.01.2010 to 24.01.2013
09	Muhammad Muhibbullah	25.01.2013 to

**DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES  
UNIVERSITY OF CHITTAGONG, BANGLADESH**

**Syllabus for B.Sc. (Hons.): 2013-2014 and 2014-2015**

Courses leading to the Degree of Bachelor of Science (Honours) in Geography and Environmental Studies will be extend over four academic years and will be divided into four parts confirming according to the Ordinance of Faculty of Biological Sciences. The course of study shall be an integrated one carrying a total of Marks: 4000 = 160 credits.

Examinations of the theoretical courses will be 4 hours duration for 3 or 4 credits and 3 hours duration for 2 credits and the duration of each practical examination will be as per the University examination rules. The distribution of marks for each year shall be as follows:

Course	YEAR							
	First		Second		Third		Fourth	
	Marks	Credits	Marks	Credits	Marks	Credits	Marks	Credits
<b>Major Courses</b>	450	18	450	18	850	34	950	38
<b>Related Courses</b>	350	14	350	14	----	----	----	---
<b>Sub total</b>	800	32	800	32	850	34	950	38
<b>Sessional</b>	100	4	100	4	100	4	100	4
<b>Viva Voce</b>	50	2	50	2	50	2	50	2
<b>Total</b>	<b>950</b>	<b>38</b>	<b>950</b>	<b>38</b>	<b>1000</b>	<b>40</b>	<b>1100</b>	<b>44</b>
*TOTAL MARKS 4000								
*TOTAL CREDITS 160								
*(1 Credit = 25 Marks)								

**CURRICULUM PLAN**  
**First Year**

Course Type	Course Code	Course Title	Marks	Credits	Total	
		Theory Courses			Marks	Credits
<b>Major</b>	GES-101	Introduction to Geography	75	3	<b>350</b>	<b>14</b>
	GES-102	Elements of Physical Geography	75	3		
	GES-103	Elements of Human Geography	75	3		
	GES-104	Introduction to Environmental Geography	75	3		
	GES-105	Geography of Bangladesh (Human)	50	2		
<b>Related</b>	GES-106	Introduction to Soil Science	75	3	<b>250</b>	<b>10</b>
	GES-107	Introduction to Cultural Geography	75	3		
	GES-108	Introduction to Statistics	50	2		
	GES-109	Introduction to Research Method	50	2		
<b>Practical Courses</b>						
<b>Major (Practical-1)</b>	GES-110 (a)	Scales and Cartographic Techniques in Geography	50	2	<b>100</b>	<b>4</b>
	GES-110 (b)	Survey -1 (Chain & Tape, Plane Table, GPS application)	50	2		
<b>Related (Practical -2)</b>	GES-111 (a)	Introduction to Computer	50	2	<b>100</b>	<b>4</b>
	GES-111 (b)	Study of Rocks, Minerals and Soil analysis (Physical)	50	2		
<b>Sessional</b>	GES-112 (a)	Tutorial+ Class attendance	50	2	<b>100</b>	<b>4</b>
	GES-112 (b)	Field Work	50	2		
<b>Viva Voce</b>	GES-113	Viva-Voce	50	2	<b>50</b>	<b>2</b>
<b>Total</b>					<b>950</b>	<b>38</b>

**CURRICULUM PLAN**  
**Second Year**

Course Type	Course Code	Course Title	Marks	Credits	Total	
		Theory Courses			Marks	Credits
<b>Major</b>	GES-201	Geography of Bangladesh (Physical)	75	3	<b>350</b>	<b>14</b>
	GES-202	Climatology	75	3		
	GES-203	World Regional Pattern (with SAARC region)	75	3		
	GES-204	Population Geography	75	3		
	GES-205	Settlement Geography	50	2		
<b>Related</b>	GES-206	Biogeography	75	3	<b>250</b>	<b>10</b>
	GES-207	Environmental Pollution Study	75	3		
	GES-208	Geo –Statistics	50	2		
	GES-209	Introduction to GIS	50	2		
<b>Practical Courses</b>						
<b>Major (Practical-3)</b>	GES-210 (a)	Map Projection	50	2	<b>100</b>	<b>4</b>
	GES-210 (b)	Survey-2 (Prismatic, Leveling, Total Station and Theodolite)	50	2		
<b>Related (Practical -4)</b>	GES-211 (a)	Taxonomy and Ecology study	50	2	<b>100</b>	<b>4</b>
	GES-211 (b)	Chemical analysis of Soil and Water	50	2		
<b>Sessional</b>	GES-212 (a)	Tutorial+ Class attendance	50	2	<b>100</b>	<b>4</b>
	GES-212 (b)	Field Work	50	2		
<b>Viva Voce</b>	GES-213	Viva-Voce	50	2	<b>50</b>	<b>2</b>
<b>Total</b>					<b>950</b>	<b>38</b>

**CURRICULUM PLAN**  
**Third Year**

Course Type	Course Code	Course Title	Marks	Credits	Total	
		Theory Courses			Marks	Credits
Theory	GES-301	Geographical Thoughts and Concepts	75	3	600	24
	GES-302	Geomorphology	75	3		
	GES-303	Oceanography	75	3		
	GES-304	Agricultural Geography	75	3		
	GES-305	Economic Geography	75	3		
	GES-306	Urban Geography	75	3		
	GES-307	Geo-Environmental Policy	75	3		
	GES-308	Research Methodology	75	3		
<b>Practical Courses</b>						
Practical-5	GES-309	Geo-statistical analysis on maps	50	2	250	10
Practical-6	GES-310	Digital Cartography	50	2		
Practical-7	GES-311	Study of Bangladesh Maps	50	2		
Practical-8	GES-312	Application of GIS	50	2		
Practical-9	GES-313	Application of Environmental Impacts Assessment (EIA) in Geography	50	2		
Sessional	GES-314 (a)	Tutorial+ Class attendance	50	2	100	4
	GES-314 (b)	Field Work	50	2		
Viva Voce	GES-315	Viva-Voce	50	2	50	2
<b>Total</b>					<b>1000</b>	<b>40</b>



**CURRICULUM PLAN**  
**Fourth Year**

Course Type	Course Code	Course Title	Marks	Credits	Total	
		Theory Courses			Marks	Credits
Theory	GES-401	Fluvial Morphology	75	3	675	27
	GES-402	Hydrology	75	3		
	GES-403	Quaternary Geography and Stratigraphy	75	3		
	GES-404	Rural Development and Planning	75	3		
	GES-405	Environmental Degradation and Management	75	3		
	GES-406	Political Geography and Geopolitics	75	3		
	GES-407	Transport Geography & Planning	75	3		
	GES-408	Resource Management and Planning	75	3		
	GES-409	Remote Sensing and Aerial Photograph	75	3		
<b>Practical Courses</b>						
Practical-10	GES-410	Quantitative Techniques in Geography	75	3	275	11
Practical-11	GES-411	Pollution study (Noise, Air and Water)	50	2		
Practical-12	GES-412	Paleo-environment and fossil study	50	2		
Practical-13	GES-413	Digital Image Processing	50	2		
Practical-14	GES-414	Application of Health study in Geography	50	2		
Sessional	GES-415 (a)	Tutorial+ Class attendance	50	2	100	4
	GES-415 (b)	Field Work	50	2		
Viva Voce	GES-416	Viva-Voce	50	2	50	2
<b>Total</b>					<b>1100</b>	<b>44</b>

### FIRST YEAR (Detail)

<b>GES : 101</b>	<b>Title: Introduction to Geography</b>	<b>Marks: 75</b>	<b>Credits : 3</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Geography: Definition, nature and scope, historical over view</li> <li>2. Geography as a discipline: As science, earth science and social science, scope of geography, physical and human basis; relation with other disciplines, development and approaches to study in geography</li> <li>3. Major views in contemporary geography: Regional view, ecological view, spatial organization view, earth science view, behavioral view and futuristic geography</li> <li>4. Fundamental concepts in geography: Space, location, site and situation, distribution, process and pattern, Interaction, shapes, size and distance;</li> <li>5. Tools in Geography: Maps, models, scales and GIS</li> <li>6. Introduction to world map: Physical, political, cultural and social</li> <li>7. The shape and the basic dimensions of the earth: Rotation and revolution of the earth and their effects; determining location on the earth surface, geographic grid of meridians and parallels, Cartesian grids</li> <li>8. The concept and type of region, regional system</li> <li>9. Man-environment relationships: Determinism, possibilism and neo-possibilism</li> </ol>		
<b>Selected Readings:</b>			
	<ol style="list-style-type: none"> <li>1. James, Preston E. <i>All Possible Worlds: History of Geographical Ideas</i></li> <li>2. Chorley, R. and Haggett, P. (ed.) <i>Models in Geography</i></li> <li>3. Hartshome, R. <i>The Nature of Geography</i></li> <li>4. Ahmed, Nafis. <i>Muslim Contributions to Geography</i></li> <li>5. Haggett, P. <i>Geography: A Synthesis</i></li> <li>6. Murphy, R. <i>An Introduction to Geography</i></li> <li>7. Hussain, Majid. <i>Evolution of Geographical Thought</i></li> <li>8. Dikshit, R. D. <i>Geographical Thought</i></li> <li>9. Harvey, David. <i>Explanation in Geography</i></li> <li>10. Islam, M. Aminul, <i>Attitude and Philosophy of Geography: Current Trends</i> (in Bengali)</li> </ol>		

<b>GES: 102</b>	<b>Title: Elements of Physical Geography</b>	<b>Marks:75</b>	<b>Credits: 3</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Physical Geography: Concept, nature, scope and relation with other subjects</li> <li>2. Solar system: Origin, development, expansion, characteristics and astronomical elements</li> <li>3. Introduction to earth: Size, shape, geographic grid (latitude and longitude), earth-sun relationship</li> <li>4. Origin of the earth: Different hypothesis, earth's development, geological time-scale</li> <li>5. Lithosphere: Earth's crust and interior, isostasy concepts, rocks and minerals, weathering and erosion, internal processes of earth- continental drift and plate tectonics, volcanism, folding, faulting, earthquake, agents of sculpture-(river, glacier, wind, wave).</li> <li>6. Atmosphere: Composition, vertical and horizontal structure of atmosphere, elements of weather and climate- Sunshine, temperature, pressure, precipitation, humidity and wind movement, atmospheric change and disturbances.</li> <li>7. Hydrosphere: Global distribution of water, hydrologic cycle, Ocean- types, shape, size and characteristics of ocean water, movement of ocean water- currents, wave and tide, surface and underground water- sources, uses and effects</li> <li>8. Biosphere : Flora and fauna- characteristics and association, biogeochemical cycle-the flow of energy, food chain, ecosystem and biomes, zoogeographical regions</li> </ol>		

**Selected Readings:**

1. Darrel Hess-Tesa, MC Knight's, *Physical Geography: A Landscape Appreciation*
2. Robinson, H. *Physical Geography*.
3. Thronbury, W. D. *Principles of Geomorphology*
4. Lake, P. *Physical Geography*
5. Monkhouse, F. J. *The Principles of Physical Geography*
6. Gupta and Kapoor, AN. *Principles of Physical Geography*
7. Singh, Savindra. *Physical Geography*

<b>GES: 103</b>	<b>Title : Elements of Human Geography</b>	<b>Marks:75</b>	<b>Credits: 3</b>
<b>SL</b>	<b>Topic</b>		
<ol style="list-style-type: none"> <li>1. Human Geography and Human Environment: Definition, scope and relation with other subjects, Themes</li> <li>2. Origin of man and human occupancy of the earth surface</li> <li>3. Human population: Factors, distribution, structure and dynamics of population, population problems with related theories</li> <li>4. Human settlement: Elements, types, pattern, characteristics, distribution</li> <li>5. Economic activities: Primary, secondary, tertiary and quaternary</li> <li>6. Transportation: Meaning, types and geographical implications</li> <li>7. Trade and commerce: Basic principles and characteristics, trade route, spatial interaction.</li> <li>8. Resources: Concept and classification</li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Chapman, K., <i>People Pattern and Process: An Introduction to Human Geography</i></li> <li>2. Chorley, R. and Peter Haggett (ed.). <i>Models in Geography</i></li> <li>3. Emrys, Jones. <i>Human Geography</i></li> <li>4. Hagget, P. <i>Locational Analysis in Human Geography</i></li> <li>5. Harvey, David. <i>Explanation in Geography</i></li> <li>6. Mirshull, Roger M. <i>The Changing Nature of Geography</i></li> <li>7. Rashid, K.B.S. <i>Cultural Geography</i></li> <li>8. Taaffe, Edward E.J. (eds.) <i>Geography</i></li> <li>9. Rubenstein, M. J. <i>The Cultural Landscape : An Introduction to Human Geography</i></li> <li>10. Aitken, S. and Valentine, G. (eds), (2006) <i>Approaches to Human Geography</i></li> <li>11. Hossain, M. <i>Human Geography</i></li> </ol>			

<b>GES: 104</b>	<b>Title : Environmental Geography</b>	<b>Marks : 75</b>	<b>Credits: 3</b>
<b>SL</b>	<b>Topic</b>		
<ol style="list-style-type: none"> <li>1. Environmental Geography: Definition and scope, subdivisions of environmental geography, relationship with other subjects</li> <li>2. Environment: Meaning, structure, types and components of environment, geography and environment, environment and society</li> <li>3. Man-environment relationships: approaches to the study, environment and man, man's interaction with the environment- man and the environmental processes</li> <li>4. Major components of environment: Land, water, biological, mineral energy and human resources</li> </ol>			

5. Ecology and Ecosystem: Meaning, types, components and functioning, productivity and stability
6. Circulation of elements in the ecosystems and bio-geochemical cycles: the nature of elements of ecosystem, biogeochemical cycles- the hydrological cycle, the carbon cycle, the nitrogen cycle, oxygen cycle, minerals and sediment cycle
7. Energy flow in the ecosystems: Sources of energy, ecological production, tropic levels, food chains and food webs, ecological pyramids, flow of energy.
8. Environmental problems: Environmental degradation, pollution, types, process and impacts
9. Environmental Changes : Types, causes and consequences
10. Environmental planning and management: Concept and approaches

**Selected Readings:**

1. Singh, S. *Environmental Geography*
2. L. Brown (ed.). *State of the world*, National Academy of Science
3. Wash, D.C. Repetto, R. (ed.), *The Global Possible*
4. Morgan, M. Joseph (et al). *Introduction to Environmental Science*
5. Strahler, A.H. *Geography and Man's Environment*
6. Jahid, H. *Knowing the environment*

GES: 105	Title : Geography of Bangladesh (Human)	Marks:50	Credits: 2
SL	Topic		
1.	Historical Background: Origin, formation and development, People, Race, Languages and Religion, Bangladesh in the region and in the world community		
2.	Population and settlements: Population distribution and dynamics, origin, development and diffusion of settlement, urban and rural settlements of Bangladesh.		
3.	Major economic activities in Bangladesh: (a) Primary- Agriculture, fisheries, livestock (b) Secondary- Industries and manufacturing (c) Tertiary- Trade and commerce, transport and communication, services (d) Spatial economic activities and development		
4.	Human Resource: Socio-economic and demographic aspects, rural-urban migration,		
5.	Issues and challenges of development: Constraints to development (a) Regional inequality and regional development (b) Land and water resources management (c) Physical and social constraints- agricultural growth, industrial development, transport, transit and infrastructure development. (d) Population- growth, pressure and impacts (e) Poverty alleviation (f) Gender issues- women empowerment and development (g) Urbanization and rural development		
6.	Global Issues for development: Bilateral export-import issue, labour migration, refugee problem, climate change and adaptation		
<b>Selected Readings:</b>			
1. Harun- or-Rashid, <i>Geography of Bangladesh</i>			
2. Harun-or- Rashid, <i>Economic Geography of Bangladesh</i>			
3. Elahi, KM. (ed). <i>Perspectives on Bangladesh Geography</i> , BNGA			
4. Brammer, H. <i>Geography of the Soil of Bangladesh</i>			
5. Khan, F. <i>Geology of Bangladesh</i>			

GES: 106	Title Introduction to Soil Science	Marks: 75	Credits: 3
SL	Topic		
<ol style="list-style-type: none"> <li>1. Soil science: Definition and subject matter, scope and relation to other subjects.</li> <li>2. Soil: Definition, formation of soil, soil as a natural body, dynamic nature of soil, major components of soil major properties of soil, soil forming process, soil forming factors and soil profile.</li> <li>3. Physical Properties of Soil: Texture, Structure, Density, Porosity, Colour, Temperature, soil consistence, soil Air and Water.</li> <li>4. Chemical properties of soil: Organic matter, Mineral nutrients, Soil reaction, Buffering, Colloids, Ion exchange, Salinity, Sodcity, Organic matter and Humus</li> <li>5. Biological characteristics of soil: Micro-organisms, Plant nutrients and their available form, nutrients availability, toxicity and stress, soil fertility, productivity, soil fertility evaluation, fertility-productivity relationship.</li> <li>6. Soil classification: Objectives, Geological classification, Physical classification and 7<sup>th</sup> Approximation classification</li> <li>7. Soil pollution and degradation: Contamination, pesticide interaction, soil erosion and conservation</li> <li>8. Soil of Bangladesh: Characteristics, problems and classification</li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Baver, L.D. <i>Soil Physics</i>, John willy and sons</li> <li>2. Miller, C.E., Turk, L.M and Fort, H.D. <i>Fundamentals of Soil science</i></li> <li>3. Marbut, C.F. <i>Soils: Their genesis and classification</i></li> <li>4. Brammer, H. <i>The Geography of Soils of Bangladesh</i></li> <li>5. Brady, N. C. <i>Nature and Properties of Soil</i></li> <li>6. Das, A. G. <i>Introduction to Soil Science</i></li> </ol>			

GES: 107	Title : Introduction to Cultural Geography	Marks: 75	Credits:3
SL	Topic		
<p>Cultural Geography: Definition, scope, method of study</p> <p>Culture: Definition, characteristics, region and ecology, cultural landscape</p> <p>Environment and man: Environmental determinism, neo-determinism, Possibilism</p> <p>Process of culture change: Invention, innovation, diffusion, integration, assimilation and acculturation</p> <p>Evolution of mankind: Ramapithecus to Homo-Sapiens</p> <p>Material culture development: Stone age (Paleolithic, Mesolithic and Neolithic), metal age</p> <p>Advancement of livelihood patterns: Plant and animals domestication, rise of urbanism, industrial revolution, urbanization</p> <p>Ancient civilization: Mesopotamian, Nile valley, Indus valley, Chinese and new world</p> <p>Cultural dimensions: Geographical variation of race, caste, religion, language, tribes</p> <p>10. Concept of cultural realms: Classification and distribution</p>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Wagner, P. <i>Readings in Cultural Geography</i></li> <li>2. H.J. de Blij and Peter O. Muller <i>Geography: Realms, Regions and Concepts</i>,</li> <li>3. Abdul Baquee <i>Cultural Geography</i> (in Bangla), Globe Library, Dhaka</li> <li>4. Jyotirmoy Sen, <i>A Textbook of Social and Cultural Geography</i>, Kalyani Publishers</li> <li>5. E. Peter Volpe, <i>Man, Nature and Society</i>, WCB</li> <li>6. Crane Brinton, J.B. Christopher and R.L. Wolff <i>A History of Civilization</i>,</li> <li>7. A.J. Kelso, <i>Physical Anthropology</i>, J.B. Lippincott Company</li> </ol>			

<b>GES : 108</b>	<b>Title: Introduction to Statistics</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Statistics: Definition, historical development, importance and limitation, uses in different field, geographical application, descriptive and inferential statistics, parametric and non-parametric</li> <li>2. Data: Meaning, types (descriptive, numerical, discrete, continuous), Population and sample, individuals and variables, sources (primary-surveys, field techniques, laboratory data and secondary-published, remote sensing, directories, census and historical documents)</li> <li>3. Simple arithmetic operation: Rounding of data, scientific notations, decimals, fractions, rectangular coordinates, equations, inequalities, Numbers (Natural, whole, prime and real)</li> <li>4. Measures of Central Tendency (mean)</li> <li>5. Frequency distribution: conceptual terms, data summarization and graphical presentation (frequency table: graphing techniques-histogram, frequency curve, frequency polygons, pie chart, Lorenz curve, ogive)</li> <li>6. Level of measurement: Nominal, ordinal, interval and ratio</li> <li>7. Visual presentation: Diagrams (graphs; cumulative graphs, smooth typed graphs, compound graphs, log and semi log graphs, n-dimensional graphs), symbols (pictorial, aerial, volumetric and proportional)</li> </ol>		
	<b>Selected Readings:</b>		
	<p>Islam, N. <i>Introduction to Statistics</i>, 2<sup>nd</sup> edn, 2011  Hammond, R. and McCullagh, P.S., 1975  Johnston, R.J. <i>Multivariate Statistical Analysis in Geography</i>  Mahmud, A. <i>Statistical Methods in Geographical Studies</i>  Shill, R.N. and Debnath, S.C. 2001, <i>An Introduction to the Theory of Statistics</i>  Taylor, P.J. <i>Quantitative Methods in Geography</i>  Toyne, A., 1971, <i>Techniques in Human Geography</i></p>		

<b>GES : 109</b>	<b>Title : Introduction to Research Method</b>	<b>Marks : 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Research: Definition, scope, types and importance</li> <li>2. Geographic and environmental research: Areas of interest, choosing research topic, study design, methods and techniques, research paradigm</li> <li>3. Geographic data: Data types (qualitative and quantitative), Sources (primary and secondary), data analysis and presentation (table, maps, graphs and photographs)</li> <li>4. Primary data: Sources, collection methods (Observation, field survey, lab test, description, analysis and synthesis, surveying and mapping), pilot survey and sampling</li> <li>5. Secondary data: Definition and function, sources, library use, literature search, compilation of data from various sources, electronic media, writing reviews</li> <li>6. Report writing: Making a report skeleton, writing abstract, Preparing contents, arranging the body of the text, summarizing and conclusion, references and bibliography, annexure/appendices, presentation of report.</li> <li>7. Research organizations: Govt., NGOs and others (with importance and activities)</li> </ol>		

**Selected Readings:**

1. M. Nurul Islam (2011) *An Introduction to Research Methods*, Mullick & Brothers
2. Abu Jafar Mohammad Sufian (2009) *Methods and Techniques of Social Research*, UPL
3. C. R. Kothari, *Research Methodology: Methods and Techniques*, Wishwa Prakashan
4. Earl Babbie (2004) *The Practice of Social Research*, Thomson
5. Black, J.A. & Dean, A. Champion- *Methods and Issues in Social Research*
6. Abu Jafar Mohammad Sufian, *Methods and Techniques of Social Research*
7. John & James- *Research in Education*
8. Rahman, Atiqur and Sawkatuzzaman: *Social Research Method* (in Bengali)
9. Zainul Abedin, *Introduction to Research Method*
10. Moser, C.A. & G. Kalton- *Survey Methods in Social Investigation*
11. Turabian, K. L- A Manual of writers of Term Papers, Thesis and Dissertation

**GES: 110 (Practical -1)**

<b>GES:110(a)</b>	<b>Scale and Cartographic Techniques in Geography</b>	<b>Marks:50</b>	<b>Credits:2</b>
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**SL Topic**

1. Cartography: Introduction, history and use of cartography, modern cartography
2. Determination of latitudes, longitudes and bearings.
3. Scale : Definition, Classification, importance and uses
4. Representative Fractions: Linear, descriptive methods of expression of scale
5. Maps: Definition, classifications; map enlargement- reduction, measurement of area.
6. Study of maps: World physical, political, regional and economic maps

**Selected Readings:**

1. Gopal Singh- *Map Work and Practical Geography*
2. Singh & Singh- *Elements of Practical Geography*
5. Zamir Alvi- *A Text Book of Practical Geography*
6. *Graphosman World Atlas*
7. Mac & Zeijlstra-*The Complete World Atlas; An up to date Atlas for the 21<sup>st</sup> century*
8. Robinson & Morrison- *Elements of Cartography*
9. Ashis Sarkar- *Practical Geography; A Systematic Approach*
10. Hossain, M. Makbul. *Practical Geography(in Bengali)*
11. Dulal and Judhithir, *Practical Geography (in Bengali)*
12. Rauf, K.A. *Applied and Practical Geography (in Bengali)*

<b>GES: 110 (b)</b>	<b>Survey-1 (Chain and Tape, Plane Table, GPS application)</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
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**SL Topic**

1. Survey : Definition, importance, types, use
2. Chain and Tape survey: Equipments; recording of field data, Tie line- principles and uses; open and closed traverse surveying, measuring against obstacles, drawing procedures, advantages and disadvantages of chain and tape survey.
3. Plane Table Survey: Equipments, method of preparation; open and closed, traverse surveying; advantages and disadvantages of plane table survey.
4. Introduction to GPS Survey: Working principles of GPS receiver, different features of GPS receiver, operational processes related to GPS survey, study of Google earth.

**Selected Readings:**

1. Singh, R .L. *Elements of Practical Geography*
2. Robinson, A.H. *Elements of Cartography*
3. Shahjahan and Aziz; *A Text Book of Surveying*
4. Engr. Ismail Hossain & Md. Nuruddin, *Advanced Surveying*
5. J.Uren and W.F.Price 2006 *Surveying for Engineering*

**GES: 111 (Practical-2)**

<b>GES: 111(a)</b>	<b>Introduction to Computer</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
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<b>SL</b>	<b>Topic</b>
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1. Computer: History, development and importance of computer study in geography
2. Computer hardware: CPU, motherboard, RAM and other components, storage, peripherals
3. Computer software: Types of software, topics of software, design and implementation
4. Operating systems: Types, components, real-time operating system
5. Introduction to internet: History, protocols, structure, governance, services, social impacts
6. Introduction to MS Word: File formats, features & flaws and versions
7. Introduction to database and MS Excel: Concept, types and functional areas of database, basic operation, charts, quirks, file formats etc.
8. Introduction to MS Power point: Major features and operations, cultural impacts
9. Practicing in Typing Master: Typing in English and Bengali, necessary techniques

**Selected Readings:**

1. Norton, Peter, *Introduction to Computer*
2. June Jamrich Parson; *Computer Concepts*
3. Bradbeer, Bono & Laurie; *The Beginner's Guide to Computers*
4. S.M Shahjahan Shajib; *Computer Operators Guide*
5. Robert & Brian; *Data Processing and Computers*

<b>GES: 111(b)</b>	<b>Study of Rocks, Minerals and Soil analysis (Physical)</b>	<b>Marks: 50</b>	<b>Credits:2</b>
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<b>SL</b>	<b>Topic</b>
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- a) Study of Soil:** Physical properties of soil: Texture, Grain size analysis, Shapes and colour collection and presentation of soil sample: Physical examination of soil, particle size analysis ( pipet, Hydrometer, sieve method), Study of soil moisture, TS, TDS
- b) Study of rocks and minerals:** Identification of igneous, sedimentary and metamorphic rocks and hand specimen, study of rocks forming and minerals.

**Selected Readings:**

1. Berry, MS. and Mason, B- *Elements of Mineralogy*
2. Imam, H. S.M and Alam, M.D.U *A hand book on analysis of soil, plan and water*
3. Read, M.H- *Rutley's Elements of Mineralogy*
4. Gopal Singh- *Map Work and Practical Geography*
5. Singh & Singh- *Elements of Practical Geography*

<b>GES: 112</b>	<b>Sessional</b>	<b>Marks: 100</b>	<b>Credits: 4</b>
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GES: 112(a)	Tutorial + Class attendance	Marks: 50	Credits: 2
GES: 112(b)	Field Work	Marks: 50	Credits: 2

<b>GES: 113</b>	<b>Viva-Voce</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
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**CURRICULUM PLAN**  
**Second Year**

Course Type	Course Code	Course Title	Marks	Credits	Total	
		Theory Courses			Marks	Credits
<b>Major</b>	GES-201	Geography of Bangladesh (Physical)	75	3	<b>350</b>	<b>14</b>
	GES-202	Climatology	75	3		
	GES-203	World Regional Pattern (with SAARC region)	75	3		
	GES-204	Population Geography	75	3		
	GES-205	Settlement Geography	50	2		
<b>Related</b>	GES-206	Biogeography	75	3	<b>250</b>	<b>10</b>
	GES-207	Environmental Pollution Study	75	3		
	GES-208	Geo –Statistics	50	2		
	GES-209	Introduction to GIS	50	2		
<b>Practical Courses</b>						
<b>Major (Practical-3)</b>	GES-210 (a)	Map Projection	50	2	<b>100</b>	<b>4</b>
	GES-210 (b)	Survey-2 (Prismatic, Leveling, Total Station and Theodelite)	50	2		
<b>Related (Practical -4)</b>	GES-211 (a)	Taxonomy and Ecology study	50	2	<b>100</b>	<b>4</b>
	GES-211 (b)	Chemical analysis of Soil and Water	50	2		
<b>Sessional</b>	GES-212 (a)	Tutorial+ Class attendance	50	2	<b>100</b>	<b>4</b>
	GES-212 (b)	Field Work	50	2		
<b>Viva Voce</b>	GES-213	Viva-Voce	50	2	<b>50</b>	<b>2</b>
<b>Total</b>					<b>950</b>	<b>38</b>

## SECOND YEAR (Detail)

GES: 201	Geography of Bangladesh (Physical)	Marks: 75	Credits: 3
SL	Topic		
<ol style="list-style-type: none"> <li>1. Introduction: Locational characteristics and importance; evolution of boundary</li> <li>2. The Geo- Environmental setting                             <ol style="list-style-type: none"> <li>(a) Geological and tectonic aspects</li> <li>(b) Relief and physiographic structure</li> <li>(c) River systems and wet lands</li> <li>(d) Climate and climatic hazard</li> <li>(e) Soils- classification, agro ecological zone</li> </ol> </li> <li>3. Issue of resource: Natural Resource- Land, Water, Minerals, Fuel and Energy, Agriculture, Fisheries, Livestock and Forests</li> <li>4. Major issues of environment                             <ol style="list-style-type: none"> <li>(a) Environmental pollution (Soil, Water &amp; Air)</li> <li>(b) Effect of climate change</li> <li>(c) Impact of major development (engineering) projects</li> <li>(d) Major regions of environmental concern</li> <li>(e) Hydro-metrological hazards- Riverbank erosion, flood and tectonic hazard</li> </ol> </li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Haroun- er-Rashid, <i>Geography of Bangladesh</i></li> <li>2. Elahi, K.M. (ed), <i>Perspectives on Bangladesh Geography</i>, Dhaka, BNGA</li> <li>3. Brammer, H. <i>Geography of the Soil of Bangladesh</i></li> <li>4. Khan, F. <i>Geology of Bangladesh</i></li> <li>5. Rasheed, K. B. S. <i>Bangladesh: Resource and Environmental Profile</i></li> <li>6. Ahmad, Nafis, <i>A New Economic Geography of Bangladesh</i></li> <li>7. Bangladesh Centre for Advanced Studies (1994), <i>Wetlands of Bangladesh</i></li> <li>8. Elahi, K, Moudood (Ed), <i>Perspectives on Bangladesh Geography</i></li> </ol>			

GES: 202	Title: Climatology	Marks : 75	Credits: 3
SL	Topic		
<ol style="list-style-type: none"> <li>1. Climatology: Scope and relation with other disciplines; climatology and meteorology, climatic factor and elements</li> <li>2. The atmosphere: Circulation, theories, essential features of atmospheric circulation, forces and motion, wind, structure and composition</li> <li>3. Insolation: Radiation and conduction processes; temperature factors; heat balances; annual and diurnal variation of temperature, horizontal and vertical distribution of temperature, inversion of temperature</li> <li>4. Pressure: Isobar, isobaric shapes, pressure system of the globe, thermal and dynamic causes of pressure, cyclones and anti-cyclones</li> <li>5. Local wind system: Land and sea breezes, mountain and valley breezes: drainage wind, Fhon and Chinook and other special winds</li> <li>6. Major wind system: Planetary wind, Zonal wind, jet stream, seasonal wind</li> <li>7. Humidity: Mechanism of condensation, precipitation, clouds</li> <li>8. Concept of air masses: Life history and classification of the air masses</li> <li>9. Fronts &amp; frontogenesis: Features and thermal structures, classification of fronts, frontogenesis, frontal zones</li> <li>10. Climatic types: KOPPEN'S and Thornthwait's classification; principal climatic types of the world</li> <li>11. Climate change: Concept, Causes and Impacts</li> </ol>			

**Selected Readings:**

1. Crithfield, H., *General Climatology*
2. Koeppe, C.E. and De Long, G.C., *Weather and Climate*
3. Tarbuck, E.J. and Lutgens, F.K. *The Atmosphere.*
4. Barry, R.G. and Chorley, R.J., *Atmosphere, Weather, and Climate*
5. Gates, E.S. *Meteorology and Climatology*
6. Ahmed, Rafique. *Weather and climatology (in Bengali)*

<b>GES: 203</b>	<b>Title : World regional pattern (With SAARC Region)</b>	<b>Marks : 75</b>	<b>Credits: 3</b>
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SL	Topic
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|----|---|
| 1  | Region: Concepts, types, world regionalization, grouping of areas with distinctive character  |
| 2  | World physical regions: Physiography, climate, vegetation and soil regions  |
| 3  | World cultural region: Concepts of culture, indices, characteristics of cultural world  |
| 4  | World economic region: Basic concepts, agricultural region, industrial region, trade region, urbanization   |
| 5  | World population region: Characteristics dynamics, densities and distribution   |
| 6  | Regionalization and economic development: Definition, Rastow's model, developed, developing and least developed world   |
| 7  | Regionalization and sociopolitical system: Historical background, capitalist society and mixed world  |
| 8  | Introduction to SAARC: Formation, aims and objectives, strategies and functional bodies, implementations, location, national boundaries, basic demographic and socio-economic database            |
| 9  | Physical environment of SAARC: Geology, physiography, climate, vegetation, drainage, soil, mineral and energy resources   |
| 10 | Culture of SAARC: Races, cultural similarity and diversity  |
| 11 | Agriculture: Systems, major crop productions, geographical distributions and green revolution   |
| 12 | Industry: Large and small scale industry, distribution of large scale industries, industrial policies   |
| 13 | Trade and commerce: Internal and external trade, trade flow between member countries and with rest of the world   |
| 14 | Major problems and cooperation of SAARC: Boundary problems, ethnic problems, water sharing of major rivers, regional transport and transit, migration and refugee rehabilitation, trade imbalance |

**Selected Readings:**

1. DeBlij, H.J. *Human Geography: Culture Society & Space*
2. Glasson, J. *An Introduction to Regional Planning*
3. Herbertson, A.J. *The Major Natural Regions of the World*
4. Jordan & Rowntree; *The Human Mosaic*
5. Peter Daniels *et al.*; *Human Geography*
6. Bradshaw *et al.*; *Contemporary World Regional Geography*

GES: 204		Title : Population Geography	Marks : 75	Credits: 3
SL	Topic			
1.	Population Geography: Definition, demography and social sciences. Scope of population geography and demography			
2.	Population data: Sources of population data, Types of population data and methods of data collection : Census, Vital registration etc			
3.	Population structure: Life table, age group, population pyramid, age-sex ratio, marital status, literacy and labor forces			
4.	Components of population change: (a) Fertility, (b) Mortality, and (c) Migration			
5.	Measurement of fertility, mortality and migration			
6.	Population distribution, redistribution and density, factors of population distribution			
7.	Theories of population growth: Malthus and Hung Lian chi (the chine Malthus) Optimum concept of population and Theory of demographic transition			
8.	Population policies of the following countries: Bangladesh, China, India, Japan			
9.	Trends of world population and its components			
10.	Migration: Types, causes, consequences, scope and management			
11.	Population projections: Major types and methods			
12.	Population problems and issues in Bangladesh			
<b>Selected Readings:</b>				
1.	Clark, J. , <i>Population Geography</i>			
2.	Johns. , <i>Population Geography</i>			
3.	Zelinsky, Wilber. , <i>A Prologue to Population Geography</i>			
4.	John, F. , <i>World population Policies : Their origin, Evolution and Impact</i>			
5.	Jones, H. R. , <i>Population Geography</i>			
6.	Pacione, M. , <i>Population Geography :Progress and Prospect</i>			
7.	Garnier, J. , <i>Geography of Population</i>			
8.	Afsar, R. , <i>Rural-Urban Migration in Bangladesh</i>			
9.	Siddiqui, T. , <i>Migration and Development-Pro-poor policy choices (UPL)</i>			
10.	Brown et al, <i>Beyond Malthus: Nineteen dimension of the population challenge</i>			

GES: 205		Title : Settlement Geography	Marks : 75	Credits: 3
SL	Topic			
1	Settlement geography: Definition, scope and relationship with geographical sub-fields			
2	Settlements: Definition, evolution, growth, elements, spatial distribution and morphology of settlement			
3	Structure of settlements and housing: Elements and parts of settlements			
4	Types of settlements and basis of classifications functional (rural and urban histogenetic and ecological), static and dynamic settlements			
5	Rural settlements: Characteristics, spacing and form, settlements and rural land use: housing and physical infrastructures			
6	Urban settlements: Characteristics, location, spacing, form, hierarchy of urban settlements			
7	Settlement pattern of some selected regions including Bangladesh			
8	Theories of settlement growth			
9	Policy of Settlement: Land and Housing policy of Bangladesh			
<b>Selected Readings:</b>				
1.	Daniel,P. <i>The Geography of Settlement</i>			
2.	Gordon, G. and Dick, W. <i>Settlement Geography</i>			
3.	Houston, J.M. <i>Geography of Settlement</i>			
4.	Singh, R.Y. <i>Settlement Geography</i>			
5.	Baquee, Abdul. <i>Rural settlement (in Bengali)</i>			

GES: 206		Title: Biogeography	Marks: 75	Credits: 3
SL	Topic			
1.	Biogeography: definition and scope, relationship with other disciplines			
2.	Environmental factors: biotic, habitat, climatic and edaphic factors for the growth of vegetation			
3.	Plant succession and climax; bio-climatology			
4.	The major plant communities and their animal associates, types of plant communities; forest communities: grassland and desert, animals and plants communities			
5.	Evolution, Dispersal and Distribution of Plants and animals: Origin and evolution of plants and animals, dispersal of plants and animals, extinction of plant animal species, Distribution of plants and animals			
6.	Taxonomic distribution of plants and animals: major fauna and flora areas and their significance the zoo- geographical realms and other faunas			
7.	Biodiversity: meaning, elements, characteristics, bio-diversity hot spots, bio-diversity loss, change and environmental implications, conservation of bio-diversity			
8.	Evolution and Diversity in Biomes, major biomes of earth, Management strategies in the deciduous forest and tropical forest biomes			
9.	Nature conservation & wildlife management, theory and practices			
10.	The role of botanical-zoological gardens in nature conservation			
11.	Flora and fauna of Bangladesh			
<b>Selected Readings:</b>				
1.	Edwards, K.C. <i>The Impotence of Biogeography</i>			
2.	Newbigin, M.L. <i>Plant and Animal Geography</i>			
3.	Anderson, M.S. <i>The Geography of Living Things</i>			
4.	Robinson, H. <i>Biogeography</i>			
5.	Densmore, <i>Introduction to Biogeography</i>			

GES: 207		Title :Environmental Pollution Study	Marks: 75	Credits:3
SL	Topic			
1.	Environmental pollution: Definition and types, importance of pollution study			
2.	Atmospheric pollution: Major sources, primary and secondary pollutants, indoor air pollution, environmental and health impacts, air pollution and global climate change, acid rain, Green house gases, ozone layer depletion			
3.	Water pollution: Surface and ground water pollution; sources and pollutants, eutrophication of lakes, physico-chemical aspects of marine environment, oceanic pollution			
4.	Soil pollution: Soil and agricultural pollution; top soil; pollutants; parameters of soil pollution analysis; remedial measures			
5.	Solid waste: Generation, management, disposal and related environmental problems, management of hazardous wastes, ocean dumping			
6.	Pesticides and allied chemicals: Use of synthetic pesticides, persistence of pesticides in the environment, ecological effects of pesticide pollution, detoxification of pesticides and allied chemicals, towards safer pesticides			
7.	Plastic and polymer pollution: Problems associated with the use plastic and polymer, management of plastic wastes, recycling			
8.	Pollution monitoring and analysis: Sampling, method of sample preservation, methods of analysis (volumetric and gravimetric analysis, color comparison method), instruments and their functions for pollution monitoring and analysis			

9. Environmental problems in Bangladesh: Environmental degradation from industries, vehicles, agricultural field, domestic and municipal wastes and disposal, ship breaking industry, arsenic hazard, environmental impacts of mining and energy development
10. Pollution control and management: Technological aspects, existing pollution prevention act, major laws and treaties (national and international) policy instruments for environmental management, environmental auditing and strategic environmental assessment, environmental planning, clean development mechanism, role of NGOs and govt. and civil society

**Selected Readings:**

1. Asthana, D.K. and Asthana, M. 2001, *Environment: Problems and Solutions*
2. Daniel, B. and Keller, E.A.1995, *Environmental Science: Earth as a Living Planet*
3. Wright & Nebel, 2002, *Environmental Science: Towards a Sustainable Future*
4. Routray, J.K. (ed).2006, *Environmental Management Tools: A Training Manual*
5. Rana, S.V.S. 2003, *Essential of Ecology and Environmental Science*
6. Revelle & Revelle, 1981, *The Environment: Issues and Choices for Society*
7. Dara, S. S. 2001, *A Textbook of Environmental Chemistry and Pollution Control*
8. De, A. K. 2000, *Environnemental Chemistry*

<b>GES : 208</b>	<b>Title: Statistics</b>	<b>Marks: 50</b>	<b>Credits:2</b>
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<b>SL</b>	<b>Topic</b>
1.	Sampling: Systematic, random and clustered, stratified; sample size; area sampling using maps and remote sensing data
2.	Measures of central tendency: Mean, median and mode
3.	Measures of dispersion: standard and quartile deviation, application in cartographic exercises, Momentum, kurtosis, and skewness
4.	Comparison & association: Co-variance; co-efficient of correlation; Spearman's rank correlation and Pearson's product moment correlation, scatter diagrams; regression, Index number
5.	Introduction to set and probability theory
6.	Computer techniques: Basic theoretical concepts; programming and software uses ( SAS, SPSS) an introduction to geographic application

**Selected Readings:**

1. Johnston, R.J. *Multivariate statistical analysis In Geography*
2. Cole, J.P. & King, C.A. M. *Quantitative Geography techniques and theories in Geography*
3. Yeates, M. *An introduction to Quantitative analysis in Human Geography*
4. Negi. Dr. B. S. *Statistical Geography*
5. Elahi K.M. *Statistical Geography (in Bengali)*

<b>GES: 209</b>	<b>Title : Introduction to GIS</b>	<b>Marks : 50</b>	<b>Credits: 2</b>
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<b>SL</b>	<b>Topic</b>
1.	GIS (Geographic Information Systems): Definition and history of GIS, key components of GIS, GIS-an integration of spatial and attribute information
2.	Functions and advantages of GIS: Functions of GIS, application areas of GIS, advantages of GIS, uses of GIS, limitations of GIS, GIS software
3.	Spatial Data Model: Vector and raster data in GIS, thematic and temporal dimensions of geographic data, spatial entity, spatial data model, file formats of spatial data

<ol style="list-style-type: none"> <li>4. Attribute Data Management and Metadata Concept: Concept of database and DBMS types, Advantages of DBMS, functions of DBMS, file and data access, data models, data models in GIS, concept of SQL, and concept of metadata.</li> <li>5. Process of GIS: Data capture, data sources and acquisition method, data encoding methods, linking of spatial and attribute data, organizing data for analysis.</li> <li>6. Database Query: Geospatial measurements overlay operations, network analysis, surface analysis, geo-visualization.</li> <li>7. Geospatial Analysis: Geospatial data analysis, integration and modeling of spatial and attribute data, geospatial data analysis method</li> <li>8. DEM, TIN, Geo-referencing, Digitizing.</li> <li>9. Web GIS: Concept and application</li> </ol>
<b>Selected Readings:</b>
<ol style="list-style-type: none"> <li>1. Tsung Chang; 2002; <i>Introduction to GIS</i></li> <li>2. C.P.Lo. Albert K.W. Yeung; 2007; <i>Concepts and Techniques of GIS</i></li> <li>3. John R. Jensen, 2000; <i>Remote Sensing of the Environment-An Earth Resource Perspective</i></li> <li>4. <i>Cartography: visualization of Geospatial Data, 2<sup>nd</sup> edition</i></li> <li>5. Person, Heywood Cornelius, Carver; <i>An introduction to Geographical Information systems</i></li> <li>6. Chandra, A. and Ghosh, S. K. <i>Remote Sensing and Geographical Information System</i></li> <li>7. Mahmud, K. H. <i>Introductory GIS</i></li> <li>8. Al-Amin, M. <i>Visualizing environment and forest considering climate change using GIS</i></li> <li>9. Hossen, M. A. <i>Adhunik GIS Porichiti (Arc GIS)</i></li> </ol>

<b>GES: 210 Practical -3</b>			
<b>GES: 210 (a)</b>	<b>Map Projection</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Definition, classification and uses.</li> <li>2. Geographic Coordinate System , Projected Coordinate System, Ellipsoid, Spheroid, Datum, Scale factor, false easting, false northing</li> <li>3. Construction of the following projections: Cylindrical Equal Area Projection, Mercator's Projection, Conical Projection with one Standard Parallel, Conical Projection with two Standard Parallel, Zenithal Equal Area Projection, Zenithal Equidistant Projection, Stereographic Projection (Polar case), Orthomorphic Projection (polar case), UTM, BTM</li> </ol>		
	<b>Selected Readings:</b>		
	<ol style="list-style-type: none"> <li>1. Singh, R.L. <i>Elements of Practical Geography</i></li> <li>2. Keats, J.S. <i>Cartography</i></li> <li>3. Monk house, F.J. <i>Maps and Diagrams</i></li> <li>4. Robinson, A.H. <i>Elements of Cartography</i></li> </ol>		
<b>GES 210 (b)</b>	<b>Survey-2 (Prismatic, Leveling, total Station and Theodolite)</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Introduction: Principles and concepts of geometric survey</li> <li>2. Levels and leveling: Definition, classification, terminology, adjustment of level, procedure of leveling operation, Effect of curvature &amp; refraction on leveling, errors in leveling, types of leveling.</li> <li>3. Contouring: Definition, characteristics of contour, methods of contouring</li> <li>4. Introduction to Total Station Survey: Introduction to the machine, setting up the, machine, methods of angle measurement, methods of coordinate measurement, principles of operation</li> <li>5. Uses and operation of Theodolite</li> </ol>		

**Selected Readings:**

1. Engr. Ismail Hossain & Md. Nuruddin, *Advanced Surveying*
2. Engr. M. Shahjahan & Eng. M.A.Aziz, *A Text Book of Surveying*
3. J.Uren and W.F.Price; *Surveying for Engineers*

<b>GES: 211</b>	<b>Practical -4</b>		
<b>Geo 211(a)</b>	<b>Taxonomy and Ecology study</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
<p>Taxonomy: Definition, binominal nomenclature, natural and artificial classification of plants and animal</p> <p>Identification of monocot and dicot plants</p> <p>Ecology and adaptation characteristics study of hydrophytic, xerophytic and mesophytic plants</p> <p>Identification of floral and faunal species of different geomorphic units (Hilly areas, Pleistocene terraces, coastal areas and mangrove ecology; pneumatophore)</p> <p>5. Vegetation survey study: Presentation of floral and faunal species (Herbarium and zoo museum)</p>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Polunin, Nicholas. <i>Introduction to Plant Geography</i></li> <li>2. Newbigin, Marion. <i>Plant and Animal Geography</i></li> <li>3. Raven, P. H. and Evert, R. F. <i>Biology of Plan</i></li> </ol>			

<b>GES: 211(b)</b>	<b>Chemical Analysis of soil and water</b>	<b>Marks:50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
<p>a) Chemical properties of soil and water</p> <p>b) Chemical examination (pH, Ec total solids, Alkalinity, salinity, DO,BoD, CoD)</p>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Imam, H. S.M and Alam, M.D.U <i>A hand book on analysis of soil, plant and water</i></li> </ol>			

<b>GES: 212</b>	<b>Title: Sessional</b>	<b>Marks: 100</b>	<b>Credits: 4</b>
GES- 212(a)	Tutorial + Class attendance	Marks: 50	Credits: 2
GES- 212(b)	Field Work	Marks: 50	Credits: 2
<b>GES: 213</b>	<b>Viva-Voce</b>	<b>Marks: 50</b>	<b>Credits: 2</b>



**CURRICULUM PLAN**  
**Third Year**

Course Type	Course Code	Course Title	Marks	Credits	Total	
		Theory Courses			Marks	Credits
Theory	GES-301	Geographical Thoughts and Concepts	75	3	600	24
	GES-302	Geomorphology	75	3		
	GES-303	Oceanography	75	3		
	GES-304	Agricultural Geography	75	3		
	GES-305	Economic Geography	75	3		
	GES-306	Urban Geography	75	3		
	GES-307	Geo-Environmental Policy	75	3		
	GES-308	Research Methodology	75	3		
<b>Practical Courses</b>						
Practical-5	GES-309	Geo-statistical analysis on maps	50	2	250	10
Practical-6	GES-310	Digital Cartography	50	2		
Practical-7	GES-311	Study of Bangladesh Maps	50	2		
Practical-8	GES-312	Application of GIS	50	2		
Practical-9	GES-313	Application of Environmental Impacts Assessment (EIA) in Geography	50	2		
Sessional	GES-314 (a)	Tutorial+ Class attendance	50	2	100	4
	GES-314 (b)	Field Work	50	2		
Viva Voce	GES-315	Viva-Voce	50	2	50	2
<b>Total</b>					<b>1000</b>	<b>40</b>

### THIRD YEAR (Detail)

GES: 301	Title: Geographical Thoughts and Concepts	Marks:75	Credits:3
SL	Topic		
	<ol style="list-style-type: none"> <li>1. Classical geography (prior to Second World War): Greek and Roman period</li> <li>2. Modern geography: Concepts and development</li> <li>3. A detailed and critical analysis of the German, French and Anglo-American geography</li> <li>4. The concept of region: Identification, classification and interpretation, regional hierarchies and region building</li> <li>5. Themes of modern geography: Man-environment relationship, spatial organization, regional tradition, behavioral geography</li> <li>6. Theories, laws and models and paradigm in geographical explanation</li> <li>7. Quantitative and qualitative approaches in geography</li> <li>8. System analysis and system models</li> <li>9. Applied Geography</li> <li>10. Development of geography in Bangladesh: Geography and Geographers, Geography and related organizations: Govt. and NGOs, Professional geographical associations</li> </ol>		
	<b>Selected Readings:</b>		
	<ol style="list-style-type: none"> <li>1. Adhikari, S.(ed.),2001, <i>Fundamentals of Geographical Thought</i></li> <li>2. Dikshit, R.D., 2001, <i>Geographical Thought: A Conceptual History of Ideas</i></li> <li>3. Frayier, J.W. (ed), 1982, <i>Applied Geography Selected Perspectives</i></li> <li>4. Harvey, D. (ed.) 1973, <i>Explanation in Geography</i></li> <li>5. Hussain, M. (ed.), 2004, <i>Evolution of Geographical Thought</i></li> <li>6. Jensen, A. H. 1988, <i>Geography: History and Concepts</i></li> <li>7. Minshull, R. M. <i>The Changing Nature of Geography</i></li> <li>8. Chorley, R. and Peter Haggett (ed.) <i>Models in Geography</i></li> <li>9. Haggett, P. <i>Locational Analysis in Human Geography</i></li> </ol>		

GES: 302	Title: Geomorphology	Marks:75	Credits:3
SL	Topic		
	<ol style="list-style-type: none"> <li>1. Geomorphology: Definition, nature and scope; Concepts- form, process, pattern and system, historical development</li> <li>2. Scale and method in geomorphology</li> <li>3. Endogenetic process: Introduction, types and scale               <ol style="list-style-type: none"> <li>a) Continental drift and plate tectonic theory: Concept, explanation, evidence and implication</li> <li>b) Geoid, gravity anomaly and isostasy</li> <li>c) Orogenic movement and mountain formation: Types, form, pattern and distribution</li> <li>d) Tectonic activities: Fault, fold and their types</li> <li>e) Volcanic activities and landform: Causes, distribution and implication</li> </ol> </li> <li>4. Exogenesis process: Introduction, types and scales               <ol style="list-style-type: none"> <li>a) Weathering and erosion: Causes and classification</li> <li>b) Fluvial process and landform: Definition, types and origin of rivers, pattern of floodplain morphology</li> <li>c) Glacial process and landform: Causes, classification, distribution and glacial features</li> <li>d) Peri-Glacial process and landform: Introduction, causes, distribution and geomorphic features</li> <li>e) Aeolian process and landform: Wind, wind action, dunes, and their distribution</li> <li>f) Slope and landform: Definition, profile measurement and geomorphic features</li> <li>g) Coastal process and landform: Definition of coast, types, coastal ecology and landform</li> </ol> </li> <li>5. Application of geomorphology: Types of landform, human adjustment and measures</li> </ol>		

**Selected Readings:**

1. Thornbury, W. D. 1969. *Principles of Geomorphology*
2. Bloom, A. L. 1998. *Geomorphology: A Systematic Analysis of Late Cenozoic Landforms*
3. Derbyshire, E. et. al. 1979. *Geomorphological Processes*
4. Woolridge and Morgan. 1959. *An Outline of Geomorphology*
5. Pethick, J. 1984. *An Introduction to Coastal Geomorphology*
6. Montgomery, C. W. 1987. *Physical Geology*
7. Spencer, E. W. 1983. *Physical Geology*
8. Strahler and Strahler. 2002. *Physical Geography*

GES: 303	Title : Oceanography	Marks : 75	Credits:3
SL	Topic		
1.	Oceanography: Definition, scope, relation with other subjects, distribution of ocean over the globe		
2.	Relief of the ocean: Continental shelves & slope, ocean floor, coral reef, relief of the Atlantic, pacific and Indian ocean, coastal morphology		
3.	Ocean sediments: Source of sediments, types, characteristics, depositional environments		
4.	Ocean temperature and salinity: Change, causes, vertical and horizontal distribution, implication		
5.	Ocean currents: Causes, types, ocean current in Atlantic, pacific and Indian ocean		
6.	Tide and Wave: causes and effects, characteristics wave actions		
7.	Storm surges and cyclones: Causes, characteristics, environmental consequences and management		
8.	Sea-level change: Definition, causes, past, present and future trends of sea level changes, consequences of sea level changes		
9.	Marine environment: Marine climatic zone, El-nino, La-nina, ocean pollution, man-ocean relation, ocean policy, organization		
10.	Ocean resources: Fisheries, minerals and power resources, marine resources		
11.	Bay of Bengal: Geographical, Physical and economic and Resource utilization, sea level change. govt. policy on bay of Bengal		
12.	Ocean delineation : Bangladesh, India, Myanmar, ITOLS		
<b>Selected Readings:</b>			
1.	Bhatt, J.J., <i>Oceanography</i>		
2.	King, C.A.M., <i>Oceanography for Geographers</i>		
3.	Lake, P. <i>Physical Geography</i>		
4.	Sharma, R.C. and Vatal, M. <i>Oceanography for Geographers</i>		
5.	Carson, R.J. <i>The Sea Around</i>		
6.	Oliver, J.E. <i>Physical Geography</i>		
7.	Das, Suvash Chandara, <i>Adhunik Samudra Biggan</i> (In Bengali)		

GES: 304	Title: Agricultural Geography	Marks : 75	Credits:3
SL	Topic		
1.	Agricultural Geography: Definition , scope, nature, significance, development		
2.	Origin and spread of agriculture: Views of origin (Carl-O- Sawar, N.I Vavilov, Cicel Krone, Jossep Ward Swain), Spread- Feudal system, industrial revolution		
3.	Approaches to study of agricultural geography: Commodity, regional, systematic approach		
4.	Influence of various factors on agriculture: The role of physical, economic, socio-cultural and technological factors		

<ol style="list-style-type: none"> <li>5. Agricultural land use and cropping pattern: Types of cropping pattern, crop concentration, crop diversification, crop specialization, degree of commercialization</li> <li>6. Models and theories in agriculture: Von Thunen's model, Game theory</li> <li>7. Agricultural system and classification: Whittlesey's classification of agricultural system- Shifting cultivation, primitive subsistence agriculture, intensive subsistence agriculture, plantation agriculture, commercial farming, dairy and mixed farming</li> <li>8. Concepts in agriculture: Sustainable development, agribusiness, diffusion of innovation, agricultural revolution, food security, green revolution- component and impacts</li> <li>9. Agricultural region: Classification and regional pattern</li> <li>10. Agriculture in Bangladesh: Characteristics, problems and prospect, recent trends of land use , policies (Community, Kinship, Samaj-salish-conflict, BRDB, Co-operative, Krishi Bank, Grameen Bank)</li> </ol>
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**Selected Readings:**

<ol style="list-style-type: none"> <li>1. Moefan, W.B. and Muntan, R.J.C. <i>Agricultural Geography</i></li> <li>2. McCarty, H.H. <i>Agricultural Geography</i></li> <li>3. Alam, A. <i>Agriculture in Bangladesh</i></li> <li>4. Hussain, M. <i>Agricultural Geography</i></li> <li>5. Shafi, Muhammad, <i>Agricultural Geography</i></li> </ol>
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GES: 305	Title: Economic Geography	Marks : 75	Credits:3
SL	Topic		
1.	Definition, concept, field and objective of economic geography; relation between geography and economics; changing concept of economic geography Economic geography of production: Characteristics and classification of economic activities- primary, secondary and tertiary and Quaternary. Geographical distribution of economic activities. a) Primary production: (i) gathering, hunting, lumbering, fishing mining and anching; (ii) agriculture, economy of agriculture, specialization and world distribution of principal products b) Secondary production: manufacturing; characteristics and physico-economic factors for growth of industries, industrial revolution, manufacturing of forest and agricultural products, extraction and utilization of minerals for manufacturing of heavy industries: case studies of some industrial complexes c) Tertiary activities: trade, transport and other services , d) Quaternary activities		
2.	Economic development and theories of economic development, characteristics and of developed, developing and LDC countries, obstacles to economic development (vicious circle of poverty, low rate of capital formation, socio-cultural constraints, human resource constraints)		
3.	Sectoral economics with reference to Bangladesh: Agriculture sector: trends of rice and non rice, cash crop production, food grain, livestock, fisheries, forestry production marketing and govt. policies, green revolution		
4.	Industrial sectors: Recent industrial performance, govt. industrial structure, private and public sectors, labour force, industrial development, problems, govt. policies, industrial zoning, EPZ		
5.	External sectors: Export, import, trade, and trade gap, govt. policy on export, import and trade, foreign aid and investment, regional cooperation, SAPTA/SAFTA, ASEAN, NAFTA, reshaping economic geography		
6.	Human resource development: Human development index, education, poverty alleviation, NGOs activities, model of human resource development.		

**Selected Readings:**

1. Alexander. *Economic Geography*
2. Chisholm, M. *Geography and Economics*
3. Harvey, J. *Mastering Economics*
4. Barkley, P. W. *Economics: The way we choose*
5. Barlowe, R. *Land Resource Economics*
6. Decenzo David A. and Robinsons Stephen P. *Human Resource Management*
7. Jhingan, M.L. *The economics of development and planning*

GES: 306	Title : Urban Geography	Marks-75	Credit-3
SL	Topic		
<ol style="list-style-type: none"> <li>1. Introduction to urban geography: Basic concepts, definition, scope and history</li> <li>2. The processes and patterns of urbanization (world and Bangladesh )</li> <li>3. Urbanization in major geographic regions, the city in the developing countries</li> <li>4. Urban population characteristics</li> <li>5. Urban economic base and related concepts</li> <li>6. Functional classification of cities</li> <li>7. Review of the central place theories and the distribution of towns</li> <li>8. The city-regions: delimitation of cities spheres of influence, methods of ranking towns</li> <li>9. General nature of city structure: centrifugal and centripetal forces, locational distribution of urban activities</li> <li>10. Internal structure of the city: Ecological models (concentric zone, multiple nuclei, sector theory), factorial ecology</li> <li>11. The components of urban structure:               <ol style="list-style-type: none"> <li>(a) Central business district; evolution and delimitation</li> <li>(b) Manufacturing areas (c) Residential areas</li> <li>(a) Rural-urban fringe (e) Slums and squatters</li> </ol> </li> <li>12. Urban land use survey : Classification and methods</li> <li>13. Urban environment and management</li> <li>14. Major global urban environmental issues: Developed and developing countries</li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Mayer, H.M. and C.F. Kohn. <i>Readings in Urban Geography</i></li> <li>2. Hortshone, J.H. <i>Urban Geography</i></li> <li>3. Gibbs, J.P. <i>Urban Research Method</i></li> <li>4. Carter, H. <i>Urban Geography</i></li> <li>5. Northam, R.M. <i>Urban Geography</i></li> <li>6. Islam, N. Dhaka: <i>From City to Megacity</i></li> <li>7. Islam, N. (ed.). <i>The Urban Poor in Bangladesh</i></li> <li>8. Hardoy, J.E, Mitlin, D and Saterthwaite, <i>Environmental Problems in Urbanizing World</i></li> <li>9. Yadav. <i>Medels in Urban Geography</i></li> <li>10 Baquee, Abdul. <i>Urban settlement</i> (in Bengali)</li> <li>11. Latham, A., McCormack, D. and McNeil, D., <i>Key concepts in Urban Geography</i></li> </ol>			

<b>GES: 307</b>	<b>Title: Geo-Environmental Policy</b>	<b>Marks: 50</b>	<b>Credits:2</b>
<b>SL</b>	<b>Topic</b>		
1.	Geo-environment policy: Principles and process of formulating policies connected with environmental matters, Sustainable environment mechanism		
2.	Urban land and Rural environment: Land use change, Land Degradation, Land Management, Public Utilities and Facilities, Brick burning act, Building Construction Rules and acts,		
3.	Agriculture and Food: Agricultural land protection, Food security, GM Food		
4.	Water and Wetland: Inland water protection, Preservation, Rights, Maritime law, Bay of Bangle, Fish culture rules, Wetland Encroachment rules		
5.	Forest: Land cover, Forest ecosystem and Management		
6.	Environmental Pollution and Bio-diversity: Pollution control (air, water, land, noise), EIA planning, Environmental management, Conservation		
7.	Act and ordinance: Environmental pollution control ordinance 1977, Environmental Action Plan 1992, Environmental conservation rules 1997, Environmental court act 2000, Bangladesh Environment Conservation Act 1995, revised 2002)		
8.	Disaster: Disaster management act, Mitigation and Adaptation		
9.	Energy and Minerals: Energy use and Efficiency, Mineral Preservation		
10.	Environment Control: Mechanisms, RIO Summit-1992 and Rio+20, role of DoE to implementation and enforcement regarding environmental act.		
<b>Selected Readings:</b>			
1.	Anon.1990. <i>Environmental problems in Bangladesh: NGO perspective for policies</i>		
2.	Asaduzzaman, M.1989. <i>Socio-economic issues in Environment management in Bangladesh.</i>		
3.	Farooque and Hasan 1996. <i>Laws Regulating Environment in Bangladesh</i> , BELA		
4.	GOB.1994. <i>The Environmental Policy, Implementation and Action Plan</i> , Ministry of Environment and Forest, Peoples Republic of Bangladesh.		
5.	Rahman, A. A.2003, <i>Environment and Development in Bangladesh</i> (in two Vol.).		
6.	E. Hoque, BEMP-1995- <i>A Compilation of Environmental laws administered by the Department of Environment</i> . E-16 Agargaon, Sher-e-Banglanagor, Dhaka.		
7.	P. Gain (2002) <i>Bangladesh Environment: facing the 21<sup>st</sup> Century</i> , SEHD		

<b>GES: 308</b>	<b>Title: Research Methodology</b>	<b>Marks: 50</b>	<b>Credits:2</b>
<b>SL</b>	<b>Topic</b>		
1.	Research: Approaches and methods, Philosophical debates, Linking theory and practice, Research hypothesis, Research questions, Research proposal, Research process		
2.	Geographical and Environmental research: Selecting and defining research problem (characteristics/ qualities, evaluation/ justifying merit), Literature review, Selection of sites		
3.	Qualitative research: Qualitative approaches, Secondary sources, Collection of data (question theme design and sampling, survey techniques, FGDs, participatory approach, interview method, case study), Data processing, Analysis and interpretation		
4.	Quantitative research: Data types, Data collection process, Sampling and sample design, Data analysis and interpretation (hypothesis testing, statistical analysis, spatial analysis)		
5.	Presentation of research result: Cartographic and graphical presentation, Organizing and drafting of thesis and research report, References techniques, Footnotes		
6.	Secondary sources: Monograph, Document analysis, Reprints, Maps, Seminar proceedings,		
7.	Research Management: Files management, Bibliography management, Research software (SPSS, End Note, NVivo etc), Plagiarism in Research		
8.	Seminar Presentation: Communication Skills and Techniques		

<b>Selected Readings:</b>			
1.	M. Nurul Islam (2011) <i>An Introduction to Research Methods</i> , Mullick & Brothers		
2.	Abu Jafar Mohammad Sufian (2009) <i>Methods and Techniques of Social Research</i> , UPL		
3.	C. R. Kothari (2001) <i>Research Methodology: Methods and Techniques</i> , Wishwa Prakashan		
4.	Earl Babbie (2004) <i>The Practice of Social Research</i> , Thomson		
5.	Black, J.A. & Dean, A. <i>Champion. Methods and Issues in Social Research</i>		
6.	Moser, C.A. & G. Kalton. <i>Survey Methods in Social Investigation</i>		
7.	Kothari, C.R. <i>Research Methodology: Methods and techniques</i>		
8.	Bailey, K.D. <i>Methods of Social Research</i>		

<b>GES: 309 (Practical – 5)</b>	<b>Title: Geo-statistical analysis on Maps</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
Map showing various types of techniques: Prepare Bar, line graph, pie diagram, dot, isopleth, proportional square using geographical data			
<b>Selected Readings:</b>			
1.	Taylor, P.J. <i>Quantitative Methods in Geography</i>		
2.	Mahmud, A. <i>Statistical Methods in Geographical Studies</i>		
3.	Johnston, R.J. <i>Multivariate Statistical Analysis in Geography</i>		
4.	Taher, K.M.A. <i>Quantitative Techniques in Geography</i> (in Bengali)		

<b>GES: 310 (Practical – 6)</b>	<b>Title: Digital Cartography</b>	<b>Marks : 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
1.	Digital cartography: Meaning, importance, scope, traditional vs digital cartography		
2.	Conceptualization digital cartography, Elements of digital cartography.		
3.	Models: Computer based models		
4.	Visual presentation of data: Map, chart, pie-chart, flow chart etc.		
5.	Lab using software: Photoshop, Illustrator		
6.	Map layout and map digitizing		
<b>Selected Reference :</b>			
1.	Kraak, Memo, Jan and O. Ferjan (2003), <i>Cartography: Visualization of Geospatial Data</i> , 2 <sup>nd</sup> edn, Personal education, UK.		
2.	Aibsum, P.J. (2000), <i>Digital Image Processing</i>		

<b>GES: 311 (Practical – 7)</b>	<b>Title: Study of Bangladesh Maps</b>	<b>Marks: 50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
1.	Basics of Map Reading; Methods of Showing Relief		
2.	Gradient Analysis: Slope determination, Contour and interpolation of Cross section		
4.	Interpretation of Topographical Maps: Marginal Information, Conventional Signs, Symbols;		
5.	Identification and Interpretation of Physical Features and Cultural Features from Toposheet or Satellite imageries.		
6.	General Understanding of Land Uses and Map preparation		
7.	Geological Map: Definition, Types and Interpretation, Study of Outcrop, Bedding, Unconformity, Folding, Faulting, Strike and Lineament.		

8. Understanding the Weather Maps; Differences of Weather and Climatic Maps; Signs and Symbols of Weather Maps and its interpretation

**Selected Readings:**

1. Bygott, John, *An Introduction to Mapwork and Practical Geography*
2. Singh, R.L., *Elements of Practical Geography*
3. Ajaegbu, H.I. and Faniran, A., *A New Approach to Practical Work in Geography*

<b>GES: 312 (Practical – 8)</b>	<b>Title: Application of GIS</b>	<b>Marks:50</b>	<b>Credits : 2</b>
<b>SL</b>	<b>Topic</b>		
<ol style="list-style-type: none"> <li>1. Introduction to Geographic information system: Overview and Background, importance of GIS for geographical research</li> <li>2. Essential elements of GIS: Functional Elements and Technological setting for spatial Data Acquisition, Preprocessing, Manipulation and Analysis Product Generation.</li> <li>3. Spatial Data structures and Data Base Management System, Basic principles of Data management, Raster vs. Vector Data Acquisition, Geo-referencing.</li> <li>4. Hands-on-Exercise: Introduction to various GIS software's: Arc GIS, ERDAS Imagine and their uses using Google earth and Landsat TM/ETM+ satellite imagery, DEM</li> <li>5. GIS data sources in Bangladesh : SPARRSO, SoB, CEGIS, CDA.</li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Eastmen, J.R <i>Idrisi for Windows User's Guide</i>, Clark University.</li> <li>2. Cracknell, A &amp; Hays L., <i>Introduction to Remote Sensing</i>, Taylor &amp; Francis, London.</li> <li>3. Curran, Paul, J., <i>Principles of Remote Sensing</i>, ELBS/Longman.</li> <li>4. Burrough, P.A. <i>Principles of Geographical Information Systems for Land resource Assessment</i>, Oxford, : Clarendon Press.</li> <li>5. Peuquet, D.J. &amp; Duane F. Marble. <i>Introductory. Readings in Geographic Information Systems</i>, London : Taylor &amp; Francis.</li> <li>6. Lillesand, T.M. and Kiefer R.W. <i>Remote sensing and Image interpretation</i>, John wiley &amp; Sons, Inc. 1994.</li> <li>7. Mather, P.M., <i>Computer Applications in Geography</i>, Chichester : John Wiley &amp; Sons.</li> <li>8. Huxhold, W.E., <i>An Introduction to Urban Geographic Information Systems</i>, Oxford University Press.</li> </ol>			

<b>GES: 313 (Practical - 9)</b>	<b>Title: Application of Environmental Impacts Assessment (EIA) in Geography</b>	<b>Marks:50</b>	<b>Credits: 2</b>
<b>SL</b>	<b>Topic</b>		
<b>Marks Distribution (Exam: 30 marks and Report: 20 marks)</b>			
<b>a. Lecture/ Discussion Section</b>			
<p><b>Topic 1:</b> Introduction and overview of EIA: Concept, Significance, History, Purpose and principles, Cotemporary issues of EIA, Explain the role of EIA in environmental management, development planning and decision-making process in any project implementation.</p> <p><b>Topic 2:</b> The Context of Environmental analysis: Policy framework, social context, institutional framework and EIA, Legal framework for EIA, Building institutional capacity, Available resources, Related law and act (both national and international)</p>			



**Topic 3:** EIA Process: Screening, Scoping, Predictions and mitigation, Management and monitoring, Auditing, Public participation and consultation, Managing uncertainty, EIA Tools/Techniques (Checklist, Baseline Studies Matrices, Map overlay, Network diagrams, Mathematical modeling, Expert advice, Economic techniques) Report formulation.

**Topic 4:** National and international activities in Environmental Impact assessment: Local and global affairs.

**b. Field: Practical report submission**

(A number of groups of student will perform field study by following EIA techniques under the supervision of course teacher(s) by following EIA techniques)

\*\* Problem Identification of various development projects: Projects may be on brick field, Fuel station, Power station, Solar panel, Road construction, Dams/bridge, Irrigation project, Industrial site, Consumption and efficiency assessing of energy (home, commercial building, manufacturing, transportation) etc.

\*\* Student will be provided problem/topic/development projects for making a complete plan for assessing rationality, impacts/effectiveness of the project by following every steps of EIA. Problem may be related to contemporary geographical and environmental issues like water treatment plant, green house gas emission from industry, building construction, power plant, wind mill, disaster mitigation project, bio-fuel, hydropower, petroleum/gas/coal nuclear plant, solar plant, coastal projects, business project or other development project.

**c. Presentation:** Presentation will be based on study findings from various groups

**Selected Readings:**

1. International Association for Impact Assessment (IAIA) and the Institute of Environmental Management and Assessment (IEMA) (1999) *Principles of EIA Best Practice*. IAIA, Fargo, North Dakota. (<http://www.iaia.org/publications>).
2. Sadler B (1996) *Environmental Assessment in a Changing World: Evaluating Practice to Improve Performance*. (Final Report of the International Study of the Effectiveness of Environmental Assessment). Canadian Environmental Assessment Agency and International Association for Impact Assessment, Ottawa, Canada.
3. Scott Wilson Ltd. (1996) *Environmental Impact Assessment: Issues, Trends and Practice*. Environment and Economics Unit, UNEP, Nairobi.
4. Petts J (1999) Introduction to Environmental Impact Assessment in Practice: Fulfilled Potential or Wasted Opportunity, in Petts J (ed) *Handbook of Environmental Impact Assessment* (Vol. 2) pp. 3-9. Blackwell Science Ltd, Oxford, UK.
5. Introduction and overview of EIA: EIA Training Resource manual, Second ed (2002)
6. Morris and Therivel, *Methods of Environmental Impact Assessment*,
7. Routledge, 2009.[https://www.iaia.org/.../EIA/ManualContents/Intro\\_manual.PDF](https://www.iaia.org/.../EIA/ManualContents/Intro_manual.PDF)
8. Jain, R.K. *Environmental Assessment*, Mc Graw Hill, 1993. Canter, L. *Environmental Impact Assessment*, Mc Graw Hill, 1996.
9. *EIA Guidelines for Industries 1997*, Dept. of Environment, Ministry of Environment and Forest, Bangladesh.

GES: 314	Title: Sessional	Marks: 100	Credits: 4
GES 314(a)	Tutorial + Class attendance	Marks: 50	Credits: 2
GES 314(b)	Field Work	Marks: 50	Credits: 2
GES: 315	Viva-Voce	Marks: 50	Credits: 2

**CURRICULUM PLAN**  
**Fourth Year**

Course Type	Course Code	Course Title	Marks	Credits	Total	
		Theory Courses			Marks	Credits
<b>Theory</b>	GES-401	Fluvial Morphology	75	3	<b>675</b>	<b>27</b>
	GES-402	Hydrology	75	3		
	GES-403	Quaternary Geography and Stratigraphy	75	3		
	GES-404	Rural Development and Planning	75	3		
	GES-405	Environmental Degradation and Management	75	3		
	GES-406	Political Geography and Geopolitics	75	3		
	GES-407	Transport Geography & Planning	75	3		
	GES-408	Resource Management and Planning	75	3		
	GES-409	Remote Sensing and Aerial Photograph	75	3		
<b>Practical Courses</b>						
<b>Practical-10</b>	GES-410	Quantitative Techniques in Geography	75	3	<b>275</b>	<b>11</b>
<b>Practical-11</b>	GES-411	Pollution study (Noise, Air and Water)	50	2		
<b>Practical-12</b>	GES-412	Paleo-environment and fossil study	50	2		
<b>Practical-13</b>	GES-413	Digital Image Processing	50	2		
<b>Practical-14</b>	GES-414	Application of Health study in Geography	50	2		
<b>Sessional</b>	GES-415 (a)	Tutorial+ Class attendance	50	2	<b>100</b>	<b>4</b>
	GES-415 (b)	Field Work	50	2		
<b>Viva Voce</b>	GES-416	Viva-Voce	50	2	<b>50</b>	<b>2</b>
<b>Total</b>					<b>1100</b>	<b>44</b>

### FOURTH YEAR (Detail)

GES: 401	Title: Fluvial Morphology	Marks:75	Credits:3
SL	Topic		
<ol style="list-style-type: none"> <li>1. Fluvial morphology: Definition, concept and importance</li> <li>2. Origin and evolution of river, rill, gullies, and stream flow</li> <li>3. Stream channel and their characteristics, discharge measurements, velocity, flow, hydrograph</li> <li>4. Processes in channel: Energy and force, erosion, transportation of load and deposition characteristics and landform produced</li> <li>5. Drainage basin morphometric analysis, drainage and channel pattern</li> <li>6. Concept of hydraulic geometry, longitudinal and cross profile</li> <li>7. Floods: Causes, types and mitigation</li> <li>8. Ground water-factors affecting the formation location and movement of ground water</li> <li>9. Water resource management in Bangladesh</li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Morisawa, M. <i>Streams: Their Dynamics and Morphology</i></li> <li>2. Leopold, Wolman and Miller. <i>Fluvial Processes in Geomorphology</i></li> <li>3. Ward, R. C. <i>Principles of Hydrology</i></li> <li>4. Chorley R.J. <i>Introduction to Physical Hydrology</i></li> <li>5. Chorley, R.J., Dunn, A.J. and Backinsale. <i>The History of the Study of Landforms</i></li> <li>6. More, R.J. <i>Hydrological Models and Geography</i></li> <li>7. Subramunium, <i>Engineering Hydrology</i></li> <li>8. Linsley, R.K. et.al. <i>Applied Hydrology</i></li> <li>9. Rashid, K.B.S. <i>Water Resources Management</i></li> </ol>			

GES: 402	Title: Hydrology	Marks:75	Credits:3
SL	Topic		
<ol style="list-style-type: none"> <li>1. Hydrology: Definition, scope, brief history, occurrence of water, hydrological cycle</li> <li>2. Precipitation: Types, variation, measurements, determining of rainfall pattern</li> <li>3. Interception: Definition, factors affecting interception, loss from vegetation, calculation, measurement of interception, interception loss from different types of vegetation, interception and water balance, surface storage</li> <li>4. Evaporation: Definition, process, factors, estimations, measurement and variation of evaporation</li> <li>5. Evapo-transpiration: Definition, factors, variation of potential and actual evapotranspiration</li> <li>6. Subsurface water: Storage of soil moisture, movement of soil moisture, infiltration</li> <li>7. Groundwater: The occurrence and storage of groundwater, water movement, ground water quality and pollution</li> <li>8. Snow hydrology: Definition, Factors affecting, measurements and estimation</li> <li>9. Runoff: Process, factors, variation estimation, prediction and forecasting</li> <li>10. Water resource: Identification, evaluation, utilization and management</li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Ward, R.C. <i>Principles of Hydrology</i></li> <li>2. Chorley R.J. <i>Introduction to Physical Hydrology</i></li> <li>3. Chorley R.J. Dum, A.J. &amp; Backirirsale More, R.J. <i>Hydrological Models and Geography</i></li> <li>4. Subrainuoiyum, <i>Engineering Hydrology</i></li> <li>5. Linsley, R.K. et. al. <i>Applied Hydrology</i></li> </ol>			

<b>GES: 403</b>	<b>Title: Quaternary Geography and Stratigraphy</b>	<b>Marks:75</b>	<b>Credits:3</b>
<b>SL</b>	<b>Topic</b>		
1.	Quaternary environment: Extent, duration, major division, characteristics		
2.	Quaternary climate change: Cause, Pleistocene- Holocene interaction and its significance on quaternaries especially on sea level change		
3.	Quaternary human evolution and cultural development		
4.	Methods of Paleo environmental reconstruction: Geological evidences, lithological evidence, biological evidences, dating technique		
5.	Quaternary in Bangladesh: Lithology, landforms, human occupancies		
6.	Stratigraphy: Definition, nature, scope, importance		
7.	Sedimentary processes and depositional environment: Agents of transportation and deposition (stream, sea, wind, ice), glacial, lake, desert, fluvial, deltaic, coastal, estuarine, marine and lagoon environment- nature, types, sequences, sedimentation characteristics, implications		
8.	Facies and facies changes: Definition, types, factors, distribution, relationship, interpretation, correlation		
9.	Bedding: Nature and types of bedding, significance, physical, biological and chemical parameters		
10.	Sediment grain parameters: Texture, grain size analysis, roundness, shapes		
11.	Field study of sediment: Engineering approaches, Torels-Smith scheme		
12.	Stratigraphy of Bangladesh: Bengal basin, flood plain & coastal stratigraphy		
<b>Selected Readings:</b>			
1.	Khan, F.H. 2000. <i>Geology of Bangladesh</i>		
2.	Imam, B. 2005. <i>Energy Resources of Bangladesh</i>		
3.	Phillip, A. and J.R. Allen .1990. <i>Basic Analysis: Principle and Application</i>		
4.	H.G. Reading. 1995. <i>Sedimentary Environment and Focus</i>		
5.	H.E. Reineck and I.B. Singh. 1980. <i>Depositional Sedimentary Environment</i>		
6.	Dunber and J. Rodgers. 1957. <i>Principles of Stratigraphy</i>		
7.	Sam Boggs. <i>Principles of Sedimentology and Stratigraphy</i>		
8.	Gary Nichols. <i>Sedimentology and Stratigraphy</i>		

<b>GES: 404</b>	<b>Title: Rural Development and Planning</b>	<b>Marks:75</b>	<b>Credits:3</b>
<b>SL</b>	<b>Topic</b>		
1.	Definition, Concepts of Development and Rural Development		
2.	Elements of Rural Development: Physical, Social, Cultural, Economic, Political etc.		
3.	Problems of Rural Underdevelopment: Physical, Social, Economic etc.		
4.	Rural Land Management and Land Reforms in Bangladesh		
5.	Rural Settlement: Elements, Pattern, and Characteristics		
6.	Rural Marketing: Growth and changing nature of the Rural Markets, Marketing channel, Marketing Structure in rural Bangladesh and China		
7.	Patterns of Rural Development in Bangladesh: Government Organizations (Bangladesh Rural Development Board, Rural Electrification Board, Local Government Engineering Department, etc.) Non-Government Organization (National/International NGOs)		
8.	Rural Development Models: Growth Pole Concept, Schuitz Model, Okorian Model, Comilla Model, Grameen Bank, etc.		
9.	Rural Development Planning: Rural Land use Planning, Agriculture and National Economy, Network of Constraints and Planning, Migration and Rural Development, Rural Infrastructure Planning (Road, Electrification etc), Rural Industrialization, Rural Change.		

**Selected Readings:**

1. H.D.Cloud, Rural Geography and Introductory Survey
2. Abdul Hamid, Palli Unnayan Bangladesh (in Bengali)
3. Abdul Baquee, Grameen Bashati (in Bengali)
4. J. Foster et al. Present Society: A Reader

<b>GES: 405</b>	<b>Title: Environmental Degradation and Management</b>	<b>Marks:75</b>	<b>Credits:3</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"><li>1. Fundamentals of environment; Definition, basic terms, components and functioning of environment</li><li>2. Major concepts, scope and approaches of environmental studies: environmental parameters, economic approach, structural approach, geographical approach, integrated approach</li><li>3. Environmental quality: Definition, objectives, quality indices, water quality, air quality, food and soil quality</li><li>4. Environmental degradation: Meaning, types and processes</li><li>5. Extreme events: Hazard and disaster; causes and impacts, natural hazard and disaster: flood, tropical cyclone, drought and earthquake; man-made hazards and disaster-dam and reservoirs, deforestation, agricultural practices, technological hazards, urban and industrial problems</li><li>6. Environmental pollution: Definition, causes and impacts; types of pollutant and pollution-air, water, noise, heat, pesticides and radioactive pollution, social and economic pollution</li><li>7. Environmental monitoring, forecasting and impact assessment: Definition, objectives, methods and techniques</li><li>8. Environmental protection and planning: Sustainable development, economics of environmental degradation (land degradation, erosion, desertification, intensity of farming practice), environmental politics, conservation strategy, waste management, hazard management and pollution control measures</li><li>9. Coastal environmental management: Protection of coastal area from natural disasters (cyclone and surge)</li><li>10. Global warming: Concept, measures, management strategies</li></ol>		
<b>Selected Readings:</b>			
<ol style="list-style-type: none"><li>1. Ahmad, M.F.2000. <i>Bangladesh Environment: 2000</i></li><li>2. Gain, P. (ed.) 2002. <i>Bangladesh Environment Facing the 21<sup>st</sup> Century</i></li><li>3. Koromondy, E.J. <i>Concept of Ecology</i></li><li>4. Burton, I. Kates, R.W. and White, G.F. <i>The Environment as Hazard</i></li><li>5. The World Bank. <i>Mainstreaming the Environment</i></li><li>6. Kannen, Krishnaan.1991. <i>Fundamentals of Environmental Pollution</i></li><li>7. Khuda, Z.R.M.M., 2001. <i>Environmental Degradation</i></li><li>8. Mitchell, Bruce. <i>Geography and Resource Analysis</i></li><li>9. Nishat, A.et. al. (ed.), 2001. <i>Bangladesh Environment Outlook: 2001</i></li><li>10. Rashid, K.B.S.2008, <i>Bangladesh: Resource and Environmental Profile</i></li><li>11. Singh, S. 1991, <i>Environmental Geography</i></li></ol>			

GES: 406	Title: Political Geography and Geo-politics	Marks :75	Credits:3
SL	Topic		
	<ol style="list-style-type: none"> <li>1. Political geography: Definition, nature and scope; political geography and geopolitics</li> <li>2. Approaches to political geography: Landscape/historical evolution school, political ecology/national economy school, organism school, power hood analysis</li> <li>3. World Political Region: Definition, Factors, Characteristics, Classification and Spatial Distribution</li> <li>4. The state as an unit of politico-geographical study: Definition, elements and other attributes of state, the state concept through ages, types of state, governmental systems, classification of governments, organizational framework of state</li> <li>5. The state: Territorial space, location, size, shape; anatomical framework: the capital, core, domain, boundary and frontiers, and sphere of influence</li> <li>6. Development of geopolitical thoughts: Ancient and medieval thinkers; Modern thinkers: Kant, Ritter, Guyot, Burgess, Mahan, Ratzel, Kjellen, Mackinder, Fairgrieve, Haushofer, Otto Maull, Spykman, Renner, Seversky, Slessor, Wallerstein and Modelski, concepts of heartland and rimlands</li> <li>7. International boundaries and frontiers: Definition, de-facto and de-jure boundaries, maritime boundary, no man's land, buffer zone/state                      Boundary types: physical, cultural, geometric and complex Boundary-making: territorial allocation, delineation and demarcation, Boundary functions; boundary problems and solution, transit, asian highway, Talpatti issues, enclave and exclave</li> <li>8. Population as a factor of world politics: Population and labour force. world population: distribution and density, growth trends and population explosion, international migration</li> <li>9. The United Nations and the world peace; UNO: Formation, chief organs, inter-governmental organizations related to UNO</li> <li>10. World political patterns: Colonialism and neo-colonialism; The capitalist and the developing world; the developed and the developing world; military alliances; economic and cultural alliances; the non-aligned movement; the balance of power and power conflicts and current affairs</li> <li>11. Military organization, Balance of power and World politics</li> <li>12. Economical Organization and World Politics: WB, IMF, ADB, IDB, WTO, EBRD, ECO</li> </ol>		
	<b>Selected Readings:</b>		
	<ol style="list-style-type: none"> <li>1. Alexander, <i>World Political Patterns</i></li> <li>2. Pounds, <i>Political Geography</i></li> <li>3. Cohen, <i>Geography and Politics in a Divided World</i></li> <li>4. Saidi, <i>Readings in Political Geography</i></li> <li>5. Weigert et.al, <i>Principles of Political Geography</i></li> </ol>		

<b>GES:407</b>	<b>Title: Transport Geography and Planning</b>	<b>Marks:75</b>	<b>Credits:3</b>
<b>SL</b>	<b>Topic</b>		
1	Transport geography: definition, objectives and scope		
2.	Network analysis of transport connectivity		
3.	Transportation Planning: Planning process, Model, Policy for Sustainable transport development.		
4.	Location theories and transport: Cooley, Von Thunen, Weber, Pender and Christaller		
5.	Essentials of transport: way, terminal, unit of carriage and power		
6.	Characteristics of transport and transport operation: road, rail, sea, inland waterway and air Locational effects of transport cost		
6.	Development of Transport system: Factors, Theories and Model (Taffe, Morrill and Guld model. The Rimmer model.		
7.	Competition in transport: competitive condition, perfect and imperfect competition, economies of scale, susceptibility of route structure, subsidies, transport and development		
8.	Transport and Environmental Issue		
9.	Patterns of transport network in USA, Bangladesh and India		
10.	Problems and issues in Bangladesh transport: disaster-environment friendly transport infrastructure, traffic congestion and management, importance of water transport, Urban and Rural transport.		
<b>Selected Readings:</b>			
1.	White, H.P. 1983. <i>Transport Geography</i>		
2.	Burke, M. <i>Transport and Trade</i>		
3.	Hurst, Michael, et al. <i>Transportation Geography</i>		
4.	Wilson, G.L.1954, <i>Transportation and Communication</i>		
5.	Taffe E.J. and Gauthier H.J. <i>Geography of Transportation</i>		
6.	Saxena, H.M. <i>Transport Geography</i>		

<b>GES: 408</b>	<b>Title: Resource Management and Planning</b>	<b>Marks: 75</b>	<b>Credits:3</b>
<b>SL</b>	<b>Topic</b>		
1.	Concepts of resources: Definition, Classification, Use and exploitation of resources, Resource Planning		
2.	Resource Management: Definition, Processes, Resource management model		
3.	Resource ecosystem: Unaltered and altered ecosystem, Food ecosystem, Forest ecosystem, Energy ecosystem, Water ecosystem, Conservation of resource		
4.	Resources appraisal: Demand and Supply		
5.	Resource allocation and utilization: Perception, Attitude, Behaviour		
6.	Relationships and conflicts between resource user and manager		
7.	Natural hazards: Types and Characteristics		
8.	Carrying capacity: Biophysical and behavioral, Basic consideration of evaluation, Cost-benefit analysis, Probabilistic analysis		
9.	Environmental Impact Assessment: Methods, Steps and techniques		
10.	Environmental management and degradation		
11.	Green House effects and Global warming: Global and Local example		
12.	Environmental management in Bangladesh: Planning for Food, Forest, Energy and Water ecosystem		
<b>Selected Readings:</b>			
1.	Bruce Michael, <i>Geography and Resources Analysis</i>		
2.	Ian Simmons, <i>The Ecology of Natural Resource</i>		
3.	M.Aminul Islam, <i>Environment, Landuse and Natural Hazards in Bangladesh</i>		
4.	Zimmerman, <i>Introduction to Resource Management</i>		

<b>GES: 409</b>	<b>Title: Remote Sensing and Aerial Photograph</b>	<b>Marks :75</b>	<b>Credits:3</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Remote Sensing: Definition, Concept, Elements, Remote Sensing Process, Sources of energy and interaction with atmosphere and target, Interpretation and Analysis, Advantages and Limitations of RS.</li> <li>2. Remote Sensing Platforms and Sensor Characteristics: Characteristics of images, Remote sensing platforms, Passive and Active Remote Sensing, Image referencing system.</li> <li>3. Brief History of Remote Sensing: Different Age of RS, Space Program of different countries worldwide.</li> <li>4. Digital Imaging: PAN/ Multispectral Imaging/ Hyper spectral Imaging, Thermal Imaging, Imaging by Digital Aerial Cameras.</li> <li>5. Microwave Remote Sensing: Passive and Active Microwave Remote Sensing, Radar Imaging, Airborne Versus Space Borne Radars, Radar systems.</li> <li>6. Visual Image Interpretation: Information Extraction by Human and Computer, Remote sensing data products, Metadata of Photographic products, Image Interpretation, Elements of Visual Image Interpretation, Interpretation Keys, radar Image Interpretation.</li> <li>7. Digital Image Processing: Systems and Categorization of Image Processing, data formats of Digital Image, Metadata of Digital Image, Preprocessing, Image Enhancement, Image transformation, Image classification.</li> <li>8. Applications of Remote Sensing: Land Cover and Land Use study on Agriculture, forestry, Geomorphology, Hydrology, Oceans and Coastal Monitoring, Monitoring of Atmospheric Constituents, Remote Sensing of Soil Properties, Disaster Emergency Response.</li> <li>9. Aerial photograph: Nature, types and importance of aerial photograph, Application of aerial photograph in Geographical and environmental study.</li> </ol>		
<b>Selected Readings:</b>			
	<ol style="list-style-type: none"> <li>1. Cracknell, A &amp; Hays L., <i>Introduction to Remote Sensing</i></li> <li>2. Curran, Paul, J. <i>Principles of Remote Sensing</i></li> <li>3. Burrough, P.A. <i>Principles of Geographical Information Systems for Land Resource Assessment</i></li> <li>4. Perouquet, D.J. &amp; Duane F. Marble. <i>Introductory Readings in Geographic Information Systems</i></li> <li>5. Lillesand, T.M. and Kiefer R.W. <i>Remote Sensing and Image interpretation</i></li> <li>6. Mather, P.M., <i>Computer Applications in Geography</i></li> <li>7. McGuire, D.J., <i>Computers in Geography</i></li> </ol>		

<b>Practical Courses</b>			
<b>GES: 410 (Practical-10)</b>	<b>Title: Quantitative Techniques in Geography</b>	<b>Marks:75</b>	<b>Credits:3</b>
<b>SL</b>	<b>Topic</b>		
	<ol style="list-style-type: none"> <li>1. Basic mathematical and statistical concept in Geography</li> <li>2. Frequency distribution and forms of distribution</li> <li>3. Level of Measurement: Nominal, ordinal, interval and ratio scale</li> <li>4. Measures of central tendency: Mean, median and mode</li> <li>5. Measures of dispersion: Absolute measures (Range, mean deviation, standard deviation, quartile deviation), Relative measures (coefficient of variation, coefficient of mean deviation, coefficient of quartile deviation)</li> <li>6. Introduction to set theory and probability distribution (binominal, normal Poisson)</li> <li>7. Hypothesis testing: Null hypothesis, T- test, F-test, Chi-square test, analysis of variance</li> <li>8. Correlation and regression: Pearson's product, moment, Spearman's rank, correlation and regression by least square methods</li> <li>9. Principle component and time series analysis: Excel data analysis and SPSS</li> </ol>		



<b>Selected Readings:</b>	
1.	Islam, N. <i>Introduction to Stastics</i> , 2 <sup>nd</sup> edn, 2011
2.	Cole, J.P. and King, C.A.M. <i>Quantitative Geography: Techniques and Theories</i>
3.	Chao, L.L., <i>Statistics: Methods and Techniques</i>
4.	Hammond, R. and McCullagh, P.S., 1975, <i>Quantitative Techniques in Geography: An Introduction</i>
5.	Yeates, M. <i>An Introduction to Quantitative Analysis in Human Geography</i>
6.	Johnson, R.J. <i>Multivariate Statistical Analysis in Geography</i>
7.	Taylor, P.J. <i>Quantitative Methods in Geography</i>

<b>GES: 411 (Practical-11)</b>	<b>Title: Pollution Study ( Noise, air and water)</b>	<b>Marks:50</b>	<b>Credits:2</b>
<b>SL</b>	<b>Topic</b>		
1.	Environmental pollution: Definition and types, importance of study		
2.	Noise pollution: Major sources, environmental and health impacts, indoor/outdoor Noise pollution, Measurement of noise		
3.	Air pollution: Major sources, environmental and health impacts, Measurement of air quality		
4.	Water pollution: Surface and ground water pollution; sources and pollutants, eutrophication of lakes, physico-chemical aspects of marine environment, oceanic pollution		
<p><b>Note:</b> Course teacher(s) will provide the training/lesson for testing water, air, soil and noise in the practical classes. Students will perform their test in the environmental lab. Student will test either water or air or soil in different locations of CU as their practical part. Or, collected water samples will be examined by the examinees during the exam.</p>			
<b>Selected Readings:</b>			
1.	Imam & Didar- <i>A Handbook on Analyses of Soil, Plant and water</i>		
2.	Manahan, Stanley, E. (2000); <i>Environmental Chemistry</i>		
3.	De, Anil Kumar (2007) <i>Environmental Chemistry</i>		
4.	Asthana, D.H. and Meera Asthana; <i>Environmental Problem and Solution</i>		
5.	Stephen H Stoker and Spencer, L Seager (1970); <i>Environmental Chemistry</i>		

<b>GES: 412 (Practical-12)</b>	<b>Title: Paleo-environment and fossil study</b>	<b>Marks:50</b>	<b>Credits:2</b>
<b>SL</b>	<b>Topic</b>		
1.	Paleoenvironment: Meaning and characteristics		
2.	Methods of reconstruction: Geological evidence, lithological evidence, biological evidences and dating techniques		
3.	Fossil identification:		
	(a) Macro		
	(b) Micro		
<b>Selected Readings:</b>			
1.	Lowe, J.J and Wuker, M.J.C(1984), <i>Reconstructing Quaternary Environment</i> , Longman Scientific and technical, UK.		
2.	Islam, M. S (2001), <i>Sea Level Changes in Bangladesh: The Last Ten Thousand Years</i> , Asiatic society of Bangladesh.		

<b>GES: 413 (Practical-13)</b>	<b>Title: Digital Image Processing</b>	<b>Marks:50</b>	<b>Credits:2</b>
<b>SL</b>	<b>Topic</b>		
<ol style="list-style-type: none"> <li>1. Introduction to Digital Image and Image Processing System <ol style="list-style-type: none"> <li>(a) Introduction to digital image processing- Concept and steps of DIP</li> <li>(b) Image processing systems –hardware and software considerations</li> <li>(c) Digitization of photographic image , converting digital image to visual form image</li> <li>(d) Digital image data formats, Image data storage and retrieval</li> </ol> </li> <li>2. Image Subsetting</li> <li>3. Image Enhancement and Analysis</li> <li>4. Principal Component Analysis and Image Transformation</li> <li>5. Pattern Recognition and Image Classification <ol style="list-style-type: none"> <li>(a) Pattern recognition and image classification, Unsupervised classification – advantage, disadvantage and limitations</li> <li>(b) Supervised classification - training site selection , Classifiers used in supervised classification – Minimum distance to mean, Parallelepiped, maximum likelihood</li> <li>(c) Classification Accuracy Assessment</li> </ol> </li> <li>6. (a) Change detection analysis using Multi-temporal satellite data (b) Exercise on Image Classification (based on satellite imagery) and map lay out preparation and presentation)</li> </ol>			
<b>Selected Readings:</b>			
<ol style="list-style-type: none"> <li>1. Drury, S.A., 1987: <i>Image Interpretation in Geology</i></li> <li>2. Gibson, P.J. 2000: <i>Digital Image Processing</i></li> <li>3. Gupta, R.P., 1990: <i>Remote Sensing Geology</i>.</li> <li>4. Joseph George, 2003: <i>Fundamentals of remote sensing</i></li> <li>5. Lillesand, T.M and Kieffer, R.M, 1987: <i>Remote Sensing and Image interpretation</i></li> <li>6. Nag P and Kudrat M. 1998: <i>Digital Remote Sensing</i></li> <li>7. Pratt.W.K. 2004: <i>Digital Image processing</i></li> <li>8. Sabbins, F.F., 1985: <i>Remote sensing Principles and interpretation</i></li> </ol>			

<b>GES: 414 (Practical-14)</b>	<b>Title: Application of health study in Geography</b>	<b>Marks:50</b>	<b>Credits:2</b>
<b>SL</b>	<b>Topic</b>		
<b>Marks distribution: Report+ Practical (20+30)</b>			
<u>[The report will be submitted on the basis of selected topic (disease, health impact, health planning etc.) by collecting and analyzing both primary and secondary data]</u>			
<ul style="list-style-type: none"> <li>• <b>Practical section: Total Marks: 30</b> <ol style="list-style-type: none"> <li>1. <b>Diseases issues:</b> Infectious/chronic disease, Diseases mapping or Spatial distribution of disease, Disease factor analysis, Occupational health hazard, Health condition of target groups (children, women, aged, disadvantaged, marginalized etc.), Environmental change and health, health inequality etc.</li> <li>2. <b>Disease Planning:</b> <ol style="list-style-type: none"> <li>i) Assessing/ Evaluating values of a existing public health program (Physical, Mental, Sexual) on the basis of Quality; result of resource or capital investments; importance and output; Finding gaps and provide suggestions.</li> </ol> </li> </ol> </li> </ul>			

[Probable issues: Health service, health care access of different groups, injury protection and control, national immune program, pregnancy and child delivery program, condition of public health professionals, health staff, managers, organizational setting of health care

ii). Establishing a framework for improving public health program: it may include  
 a) Target group (for whom), b) Geographical area, c) Cost-effectiveness/feasibility,  
 d) Funding source, d) local and national benefits

[Probable issues: community health program, day care center, waste management/disposal, medical waste, drinking water treatment plant, family planning service, child delivery service center, urban and rural health service etc.]

**Selected Readings:**

1. G.F. Pyle *Applied Medical Geography*
2. N.d. McGlashan, (eds.), *Medical Geography: Techniques and Field Studies*
3. R. Akter, *Environment and Health Rowland, Environment and Health*

<b>GES: 415</b>	<b>Title: Sessional</b>	<b>Marks: 100</b>	<b>Credits: 4</b>
GES-415(a)	Tutorial + Class attendance	Marks: 50	Credits: 2
GES- 415(b)	Field Work	Marks: 50	Credits: 2
<b>GES: 416</b>	<b>Viva-Voce</b>	<b>Marks: 50</b>	<b>Credits: 2</b>