Outcome Based Curriculum for
B.Sc. (Honours) Program
Session: 2022-2023

Department of Geography and Environment

Islamic University
Kushtia-7003, BANGLADESH

www.iu.ac.bd

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Dept. of Geography and Environment, IU.

OVERVIEW OF THE UNIVERSITY AND DEPARTMENT

(At a glance)

Name of the University
Islamic University

Establishment of the University

November 22, 1979

Founder Vice Chancellor of the University

Professor Dr. A. N. M Momtaz Uddin Choudhury

Current Vice Chancellor of the University
Professor Dr. Shaikh Abdus Salam

First Academic Session of the University
1986-87

Official Website of the University
www.iu.ac.bd

Official Contact Detail of the University
Tel: +88 071 74904 E-mail: registrar@iu.ac.bd Fax: +880 71 74905

Name of the Department
Geography and Environment (GE)

Founder Chairman of the Department
Prof. Dr. S. M. Mostafa Kamal

Current Chairman of the Department
Md. Inzamul Haque

Program Offering
BSc (Hons.), MSc, MPhil, PhD

First Academic Session of the Department
2017-18

Official Website of the Department
www.ge.iu.ac.bd

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CURRENT FACULTY AND OFFICERS LIST

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The Ordinance for the B.Sc. (Hons) Programme at Faculty of Sciences, IU

DEGREE:
The name of the degree shall be "Bachelor of Science with Honours in Geography and Environment". In short, it will be "B.Sc. (Hon's.) in Geography and Environment".

DURATION, COURSES AND CREDITS:
Courses leading to the Degree of Bachelor of Science (Hons.) in Geography and Environment (GE) will extend over four academic years and will be divided into 8 semesters conforming to the Academic Ordinance of the Faculty of Science of Islamic University. The B.Sc. (Hons.) program will consist of 160 credits.

There shall be a non-credit course (NCC) namely Islamic Studies/Bangladesh Studies carrying 100 marks to be completed within the first semester. However, if any student failed to pass the NCC (obtained <50% marks) in the first semester, he/she must complete the NCC within following academic year. Students coming from Madrasa stream (both Dakhil and Alim) and non-Muslim students shall take "Bangladesh Studies" as NCC and those from college stream (both S.S.C. & H.S.C./Dakhil and H.S.C.) shall take the Islamic Studies.

MEDIUM OF INSTRUCTION
The medium of instruction shall be English. For Non-credit courses the medium of instruction shall be either English or Bengali.

COURSE IDENTIFICATION SYSTEM
Each course shall be identified by the code name of the department concerned, comprising a maximum of 05 (five) letters, followed by a hyphen and then by four digits. The first one of these four digits will indicate the academic year; the second digit will indicate the semester, and the last two digits will denote the ordinal number of the course in the syllabus. For Example, GE-1101 will denote the 1st course of the 1st semester of the 1st academic year in the syllabus of the Department of Geography and Environment. Similarly, GE-3203 will denote the 3rd course of the 2nd semester of the 2nd academic year in the syllabus of the Department.

DURATION AND DISTRIBUTION OF SEMESTER ACTIVITIES

a) The Bachelor of Science with honours programme shall extend over a period of 04 (four) academic years, each of a normal duration of one calendar year, divided into 2 semesters. Thus the B.Sc. (Honours) Programme will consist of 08 (eight) consecutive semesters.
b) The activities of each semester consisting of six consecutive academic calendar months shall be distributed as follows:

i) Classes : 13 (thirteen) active weeks
ii) Preparatory Leave : 02 (two) weeks
iii) Semester Final Examination : 03 (three) weeks
iv) Vacation : Only the usual University vacation will be applicable
v) Result publication : Within 30 (thirty) days from the last exam date

CREDIT REQUIREMENT AND DURATION OF STUDY

a) For theoretical courses, 13 (thirteen) class-hours of 60 (sixty) minutes is defined as one credit.
b) For practical or lab courses, 26 (twenty-six) lab hours work is defined as one credit.
c) Course load: A maximum of 24 credits with not more than 12 courses (theoretical and practical) may be allowed in a semester.
d) Based on course pattern, content and weightage, individual courses may have different credit hour.
e) The total credits required to be earned or fulfilled for obtaining a Bachelor of Science (B.Sc.) with Honours degree will be 160. However, the Committee of Courses of the respective Department shall design the distribution of credits among the courses in the curriculum keeping the total credits 160 intact. The curriculum must be approved by the Academic Council through the Faculty.
f) There shall be a **non-credit University Course** namely Islamic Studies/ Bangladesh Studies to be completed within the 2nd Year of study. Students coming from Madrasa stream (both Dakhil and Alim) and non-Muslim students shall take **Bangladesh Studies** as the university course, while those coming from college stream

(both S.S.C. & H.S.C./Dakhil & H.S.C.) shall take **Islamic Studies**. The pass mark of the course shall be 50%.

DISTRIBUTION OF MARKS

a) **For Theoretical Courses:**
   i) Class attendance :10%
   ii) Quiz/presentation/*Viva-Voce* : 05%
   iii) In-course/tutorial exam/assignment : 15%
   iv) Semester end final examination : 70%

b) **For Practical/Laboratory Courses:**
   i) Laboratory performance during lab hours : 05%
   ii) Lab attendance : 10%
   iii) Lab notebook on experiment : 05%
   iv) Viva-voce on experiment during practical exam : 10%
   v) Semester end final exam : 70%

c) **For Industrial Tour/Field work/In-plant Training Courses:**
   i) Report of the Industrial Tour/Field work/In-plant Training : 50%
   ii) Overall performance in the Tour/Field work/Training : 30%
   iii) *Viva-Voce*/Quiz/Presentation : 20%

d) **For Project/Internship Courses:**
   i) Dissertation of the Project/Internship work : 50%
   ii) Presentation of the Project/Internship work : 30%
   iii) Supervisor's overall performance evaluation during the work : 20%

REQUIREMENTS TO SIT FOR SEMESTER FINAL EXAMINATION

a) Students having 75% or more attendance on average is eligible to appear in the semester final examination.
b) Students having an average of 60-74% attendance will be allowed to sit for the examination with fine.
c) Students having average attendance below 60% will not be allowed to sit for the semester final examination but may seek re-admission in the program.

GRADING SYSTEM

Grades and Grade Points:

Marks	Letter Grade	Grade Point	Interpretation
80% and above	A+ (A plus)	4.00	Outstanding
75% to less than 80%	A (A regular)	3.75	Excellent
70% to less than 75%	A- (A minus)	3.50	Very Good
65% to less than 70%	B+ (B plus)	3.25	Good
60% to less than 65%	B (B regular)	3.00	Satisfactory
55% to less than 60%	B- (B minus)	2.75	Below Satisfactory
50% to less than 55%	C+ (C plus)	2.50	Average
45% to less than 50%	C (C regular)	2.25	Below Average
40% to less than 45%	D	2.00	Poor
less than 40%	F	0.00	Fail
	I		Incomplete

(b) In the case of the theory courses only "D" and higher grades will be counted as credits earned by a student.
(c) In the case of the Industrial Tour, Field work, In-plant Training, Project, Internship, Practical and *Viva-Voce* courses grades lower than C+ will not be counted as credits earned by a student.
(d) Absence from the examination will be considered as **Incomplete**.
(e) The calculations of the Grade Point Average (GPA), the Accumulated Grade Point Average (AGPA), and the Cumulative Grade Point Average (CGPA) shall be done according to the rules followed by the public universities in the country.

PROMOTION SYSTEM

a) In any academic year, the promotion from 1st semester to 2nd semester will be automatic. However, the Department shall inform the students about their results of the 1st-semester examination with prior approval of the university authority sought through the Controller of Examinations.
b) All the promotions from the 1st year to 2nd year, 2nd year to 3rd year, and 3rd year to 4th year shall be on the basis of combining the results of the 1st- and 2nd-semester examinations of that academic year.
c) In order to be promoted to the next year a student must earn the full credits assigned to the current academic year.
d) For promotion from 1st year to 2nd year, a student shall be required to earn a minimum **AGPA of 2.00** taking into consideration the entire published retake grades (if any).
e) For promotion from 2nd year to 3rd year, a student shall be required to earn a minimum **AGPA of 2.25** taking into consideration the entire published retake grades (if any).
f) For promotion from 3rd year to 4th year, a student shall be required to earn a minimum AGPA of **2.50** taking into consideration the entire published retake grades (if any).
g) If a student fails to earn credit in any of the viva-voce/presentation, industrial tour, field work, in-plant training, project, internship course, he/she shall not be promoted to the next year.
h) If a student fails to get promotion to the next year, he/she shall get readmission to the same year of the next academic session.
i) The result of any academic year comprising the results of the 1st and 2nd semester examinations of that year must be published before the start of the 1st semester examination of the respective academic year of the successive academic session.
j) For students having undergone the BNCC training, their B.Sc. (Hons) Final results shall be published after adding 0.04, according to BNCC ordinance, to their scores obtained from the Departmental Examinations.
g) If a student fails to pass the University Course within the 2nd academic year of his/her study, he/she will not be promoted to the 3rd year.

RETAKE AND IMPROVEMENT EXAMINATIONS:

a. If a student obtains "F" grade in a theoretical/practical course or has incomplete a theoretical/practical course, from the 1st to the 4th academic year, he/she must apply for the Retake Examination (Compulsory Retake or CR) to the Controller of Examinations through the Chairman of the Department within 15 days of publication of the results at the end of the 2nd semester of the respective academic year. And subject to the approval of the Authority, the Examination Committee of the respective academic year shall conduct the CR examination. The applicant shall have to pay the required fee for each course he/she retakes.
b. After the publication of the results of the 4th year Final Examination, a student shall be allowed to apply within 15 days to the Controller of Examinations through the Chairman of the Department for Improvement Examinations of only those theoretical courses from the 1st year to the 4th year in which he/she has obtained GP of 2.75 (Letter Grade B-) or less. And subject to the approval of the Authority, the Examination Committee of the respective 4th-year examinations shall conduct the improvement examinations. The applicant shall have to pay the required fee for each course he/she takes.
c. A student shall not be allowed to improve the scores of the Internal Evaluation part of any theoretical or practical course.
d. A student shall not have the opportunity to improve his/her grade in any course if he/she has got CGPA of 3.25 (Letter Grade B+) or more as the result of the 4th year final examination.
e. A student shall have the opportunity to Retake/Improvement Examinations only once.
f. For practical courses, the students shall have only the opportunity for Compulsory Retake, but not the Improvement Examinations.
g. If a student fails to improve his/her grade in a course, his previous grade will be retained.
h. Students shall not be allowed to retake/improve the scores of *viva-voce*/presentation, industrial tour, fieldwork, in-plant training, project, and internship course.
i. A physically sick student may apply through the Chairman of the Department and the Head of the Medical Centre for the approval of siting for the examination in a different seat in the respective examination hall.

DROP OUT:

If a student fails to complete the program within six (06) academic years (consecutive 12 semesters) from any of the departments under this faculty, he/she shall be dropped out from the program.

AWARD OF THE BACHELOR OF SCIENCE (B.Sc.) WITH HONOURS DEGREE

a) A student must complete a total of 160 credits offered by the Departments under this Faculty.
b) A student shall be required to earn a minimum Cumulative Grade Point Average (CGPA) of 2.50 (Letter grade-"C+") in the program.
c) The final result (CGPA) must be published with two digits after the decimal point.
d) The Non-credit course marks shall not be added to the final result, but a student must pass (pass marks 50%) the Non-credit course within his/her second year of study.

ADOPTION OF UNFAIR MEANS:

a. If a student adopts unfair means in any semester (1st Year 1st& 2nd semester/2nd Year 1st& 2nd semester/ 3rd Year 1st& 2nd semester/ 4th Year 1st& 2nd semester) final examination or any other examination of B.Sc. (Honours), he/she shall be penalized in accordance with the Islamic University rules.
b. If any student adopts unfair means in any examination, invigilator (s) shall report his/her nature of unfair means to the Chief-invigilator and Chairman of the examination committee. The Chairman of the respective examination committee with recommendation from the Chairman of the Department will take necessary action for onward transmission to the disciplinary committee of the university for such student.

READMISSION:

a) If a student fails to get promotion from1st year to 2nd year or 2nd year to 3rd year or 3rd year to 4th year,or fails to appear at any of the above examinations due to any reason, he/she shall have to get himself/herself readmitted in the same year of the next academic session.
b) A student shall have opportunity to take readmission in any academic year only once, and he/she shall not be allowed to take readmission more than twice during the whole B.Sc. (Honours) program.
c) A student having readmission in any year shall take all the courses of the two semesters comprising that academic year.

ACADEMIC CALENDER:

The academic calendar showing dates for starting and finishing classes, commencement of examinations and publication of the results shall be published by the academic committee of the respective Department before commencement of each academic semester, unless any special and unavoidable circumstances, the academic calendar shall not be changed.

REVIEW OR ALTERATION OF THE ORDINANCE:

If necessary, the ordinance will be reviewed by the Academic Council of Islamic University on recommendation of the Faculty of Applied Science and Technology.

DEAN'S AWARD:

In recognition of excellent academic performance, students may be given Dean's Award for the top scorers (CGPA) from every batch among the students of each Department after completion of the B.Sc. (Honours) program as per following criteria-

a) An awardee must not have appeared in any improvement exam during his or her studentship.
b) An awardee must be top scorer and having CGPA 3.75 or above.
c) However, the number of awardees of each Department will not exceed one. In case of equal CGPA the final semester GPA will be considered to break the tie.

OTHER GENERAL REGULATIONS

a) For any matter not covered in the above guidelines, existing rules of Islamic University will be applicable.
b) Disciplinary and punishable actions will be applied according to the existing rules of the Islamic University.
c) In case of any ambiguity, which is not covered by this ordinance, should be solved by the Honorable Vice-chancellor of Islamic University.

Curriculum for B.Sc. (Hons.) Program
(Session: 2022-23)

PART-A

Program Overview

Degree	Bachelor of Science/B.Sc. (Honours)
Duration of the Degree	04 years
Program Offering Entity (POE)/Discipline	Department of Geography and Environment
Faculty/School	Faculty of Sciences
Awarding Institution	Islamic University
Location	Kushtia, Bangladesh
Bangladesh National Qualifications Framework (BNQF) Code	0532
Mode of Study	Full Time
Medium of Study	English
Applicable Session	2021-22 and onwards

Vision of the University

- To create a new generation of people who will be equipped with academic excellence, professional expertise, and encored with moral height.

- To extend the scope and increase opportunities for higher education and research in every branch of human knowledge and ensure the quality of all along.

Mission of the University

The mission of establishing Islamic University is "to provide instruction in technology and other fields of Islamic Studies and comparative jurisprudence and such other branches of learning at the graduate and post-graduate level as the University may think fit and make provision for research including Post-Doctorate research and training for the advancement and dissemination of knowledge" (The Islamic University Act,1980).

Quality Policy

To provide services of the highest quality both curricular and co-curricular; so that our graduates can integrate their skills and serve the different education sector, industry, and society equally well at a global level.

Vision of the Department

The department of Geography and Environment endeavors to generate world-class graduates in Geography and Environment by providing state-of-art knowledge and skills who will be able to contribute for the sustainable development of society and the environment.

Mission of the Department

M1	To provide quality education for producing competent graduates in Geography and Environment to contribute to different sectors including environment, agriculture, and industry.
M2	To facilitate the development of scientists, academicians, entrepreneurs and policymakers toward nation-building programs.
M3	To foster ethically strong graduates who effectively disseminate knowledge and skills for the betterment of the society and promote meaningful collaboration with academia, industry and research organization across the globe.

Graduate Attributes (Knowledge Profile)

This program will provide students with an opportunity to develop the Graduate Attribute(s) specified below:

Attribute 1: Deep discipline knowledge and intellectual breadth

Graduates have comprehensive knowledge and understanding of their subject area, the ability to engage with different traditions of thought, and the ability to apply their knowledge in practice including in multi-disciplinary or multi-professional contexts.

Attribute 2: Creative and critical thinking, and problem solving

Graduates are effective problem-solvers, able to apply critical, creative, and evidence-based thinking to conceive innovative responses to future challenges.

Attribute 3: Teamwork and communication skills

Graduates convey ideas and information effectively to a range of audiences for a variety of purposes and contribute in a positive and collaborative manner to achieving common goals.

Attribute 4: Professionalism and leadership readiness

Graduates engage in professional behaviour and have the potential to be entrepreneurial and take leadership roles in their chosen occupations or careers and communities.

Attribute 5: Intercultural and ethical competency

Graduates are responsible and effective global citizens whose personal values and practices are consistent with their roles as responsible members of society.

Attribute 6: Self-awareness and emotional intelligence

Graduates are self-aware and reflective; they are flexible and resilient and have the capacity to accept and give constructive feedback; they act with integrity and take responsibility for their actions.

Program Educational Objectives (PEO)

PEO1	To provide an intensive and in-depth knowledge to the students in different areas of Geography and Environment
PEO2	To train the students to take up wide variety of roles like researcher, academician, and entrepreneur independently or in a team through in-house state of the art laboratory exposures and dissertation activities on experiences.
PEO3	To enhance the analytical and critical thinking skill as well as skill for communicating scientific results effectively in written, oral and in interactive presentation.
PEO4	To acquaint moral and ethical values aspects of geo ethics inculcating a value system among students.
PEO5	To enable entrepreneurship abilities contributing to self and national development.

Program Learning Outcome (PLO)

PLO1	Demonstrate a comprehensive understanding of the interdisciplinary as well as multidisciplinary fundamental concepts in Geography and Environment.
PLO2	Analyze, synthesize, and integrate knowledge and information with the context of multidisciplinary as well as interdisciplinary areas in Geography and Environment.
PLO3	Develop practical skills including experimental design, data generation, data analysis and data presentation for addressing the problems in geoscience.
PLO4	Operate and maintain the geo-environmental instrument's adhering to good laboratory practices, environmental safety and geo-environmental issues.
PLO5	Communicate and demonstrate adequate interpersonal skills with time management.
PLO6	Recognize and practice the concept of lifelong learning for continuous self-improvement.
PLO7	Appreciate social, moral and ethical perspectives in Geography and Environment education and research.
PLO8	Ability to work in team towards solving broad societal and national issues.
PLO9	Ability to inculcate an attitude of enquiry towards developing innovative ability and enhancing entrepreneurship skills.

Mapping Mission of the Program with PEOs

Mission Statements	PEO1	PEO2	PEO3	PEO4	PEO5
M1	✓	✓			
M2		✓	✓		
M3				✓	✓

Mapping PLOs with PEOs

Mission Statements	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
PEO1	✓	✓	✓				✓		
PEO2		✓	✓	✓					
PEO3	✓	✓	✓	✓	✓				
PEO4						✓	✓	✓	✓
PEO5					✓	✓		✓	✓

Mapping of Courses with the PLOs

Courses	Credit	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
GE-1101	3	*	*						*	*
GE-1102	2	*	*	*						
GE-1103	3	*	*			*	*			
GE-1104	3	*	*	*	*					
GE-1105	3	*		*			*			*
GE-1106	1.5	*	*			*				
GE-1107	1.5			*	*				*	
GE-1108	1.5	*			*		*		*	
NCC	0									
GE-1201	3	*	*					*	*	
GE-1202	3	*	*					*		
GE-1203	2	*	*						*	*
GE-1204	3	*	*			*	*			
GE-1205	2	*	*							*
GE1206	1.5			*	*				*	
GE-1207	1.5			*		*	*			
GE-1208	1.5		*	*	*					
GE-1209	2					*		*	*	*
GE1210	1					*	*			
GE-2101	2	*	*			*	*			
GE-2102	2	*	*						*	*
GE-2103	3	*	*	*			*		*	
GE-2104	2	*		*			*		*	
GE-2105	3	*	*	*			*	*		
GE-2106	3	*	*	*						
GE-2107	1.5			*	*					
GE-2108	1.5	*		*					*	
GE-2109	1.5			*	*			*		
GE-2201	2	*	*	*				*		
GE-2202	3	*	*	*				*		
GE-2203	2	*	*	*						
GE-2204	3	*	*					*	*	*
GE-2205	2	*	*						*	*
GE-2206	2	*	*					*	*	
GE-2207	1.5			*	*	*				
GE-2208	1.5		*	*	*		*			
GE-2209	2		*	*	*	*				
GE-2210	1					*	*			
GE-3101	3	*	*	*	*					
GE-3102	3		*				*	*		
GE-3103	3		*				*	*	*	
GE-3104	3		*				*	*	*	
GE-3105	3	*		*		*	*			
GE-3106	2	*	*	*			*			*
GE-3107	1.5			*	*		*			
GE-3108	1.5			*	*	*				
GE-3109	1.5	*	*	*	*		*			
GE-3201	2	*	*						*	
GE-3202	3	*	*				*	*		
GE-3203	2	*	*					*		
GE-3204	3	*	*					*	*	*
GE-3205	3	*	*		*	*				
GE-3206	3	*	*	*	*					
GE-3207	1.5			*	*	*				
GE-3208	1.5	*		*	*					
GE-3209	1.5	*			*		*			
GE-3210	2			*	*	*				
GE-3211	1					*	*			
GE-4101	2	*	*	*						
GE-4102	3	*	*		*			*	*	
GE-4103	2	*	*				*	*	*	
GE-4104	2	*	*	*					*	
GE-4105	3	*	*							*
GE-4106	1.5		*	*	*		*			
GE-4107	1.5	*				*				
GE-4108	1.5		*	*	*		*			
GE-4109	2		*	*	*	*	*			
GE-4201	3	*		*			*		*	*
GE-4202	3	*	*			*	*		*	
GE-4203	2	*	*	*				*	*	
GE-4204	2	*	*							*
GE-4205	1.5			*	*				*	
GE-4206	1.5	*		*	*					*
GE-4207	4	*	*	*		*	*			
GE-4208	1					*	*			

PART-B

Summary of the Courses

1st Year 1st Semester 2023								
Sl. No.	**Course code**	**Course**	**Credit**	**Marks**				
				CIE			**SEE**	**Total**
				Incourse/Tutorial/ Assignment (15)	**Class Attendance (10)**	**Presentation/ Quiz (5)**		
1	GE-1101	Introduction to Geography	3	15	10	5	70	100
2	GE-1102	Introduction to Physical Geography	2	15	10	5	70	100
3	GE-1103	Principles of Map Reading and Cartography	3	15	10	5	70	100
4	GE-1104	Mathematics in Geography and Environment	3	15	10	5	70	100
5	GE-1105	Physics in Geography and Environment	3	15	10	5	70	100
7	GE-1106	Cartographic Techniques Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-1107	Physical Geography Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-1108	Computer Application Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
10	NCC	Islamic Studies\Bangladesh Studies	Nil	Nil	Nil	Nil	100	100

1st Year 2nd Semester 2023								
Sl. No.	**Course code**	**Course**	**Credit**	**Marks**				
				CIE			**SEE**	**Total**
				Incourse/Tutorial/ Assignment (15)	**Class Attendance (10**	**Presentation/ Quiz (5)**		
1	GE-1201	Introduction to Human Geography	3	15	10	5	70	100
2	GE-1202	Environmental Geography	3	15	10	5	70	100
3	GE-1203	Introduction to Geo-information Science & Technology	2	15	10	5	70	100
4	GE-1204	Fundamentals of Environmental Chemistry	3	15	10	5	70	100
5	GE-1205	Fundamentals of Statistics	2	15	10	5	70	100
6	GE-1206	Environmental Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
7	GE-1207	Map Projection and Topographical Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-1208	Plane Survey Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-1209	Questionnaire Based Field Survey: Socio-Economic Assessment Lab	2	50 (Field Report)	30 (Overall FW Performance)	20 Viva/Quiz/ Presentation	0	100
10	GE-1210	Viva-Voce	1	Nil	Nil	Nil	100	100

2nd Year 1st Semester 2024								
Sl. No.	**Course code**	**Course**	**Credit**	**Marks**				
				CIE			**SEE**	**Total**
				Incourse/Tutorial/ Assignment (15)	**Class Attendance (10**	**Presentation/ Quiz (5)**		
1	GE-2101	Biogeography	2	15	10	5	70	100
2	GE-2102	Geology	2	15	10	5	70	100
3	GE-2103	Hydrology and Fluvial Morphology	3	15	10	5	70	100
4	GE-2104	Meteorology	2	15	10	5	70	100
5	GE-2105	Social and Cultural Geography	3	15	10	5	70	100
6	GE-2106	World Regional Pattern	3	15	10	5	70	100
7	GE-2107	Rocks and Minerals Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-2108	Geographic Information System (GIS) Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-2109	Biophysical Environment Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100

2nd Year 2nd Semester 2024								
Sl. No.	**Course code**	**Course**	**Credit**	**Marks**				
				CIE			**SEE**	**Total**
				Incourse/Tutorial/ Assignment (15)	**Class Attendance (10**	**Presentation/ Quiz (5)**		
1	GE-2201	Climatology	2	15	10	5	70	100
2	GE-2202	Geomorphology	3	15	10	5	70	100
3	GE-2203	Soil and Environment	2	15	10	5	70	100
4	GE-2204	Economic Geography	3	15	10	5	70	100
5	GE-2205	Resource Management and Planning	2	15	10	5	70	100
6	GE-2206	Settlement Geography	2	15	10	5	70	100
7	GE-2207	Soil and Environment Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-2208	Geodetic Surveying Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-2209	Observational Survey: Physical Environment Lab	2	50 (Field Report)	30 (Overall FW Performance)	20 Viva/Quiz/ Presentation	0	100
10	GE-2210	Viva-Voce	1	Nil	Nil	Nil	100	100

3rd Year 1st Semester 2025								
Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-3101	Geographical Concept and Methodology	3	15	10	5	70	100
2	GE-3102	Geography of Bangladesh: Physical and Human Environment	3	15	10	5	70	100
3	GE-3103	Agricultural Geography	3	15	10	5	70	100
4	GE-3104	Water Supply, Health and Sanitation	3	15	10	5	70	100
5	GE-3105	Remote Sensing	3	15	10	5	70	100
6	GE-3106	Quantitative Techniques in Geography & Environment	2	15	10	5	70	100
7	GE-3107	Statistical Tools and Techniques Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-3108	Remote Sensing Application Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-3109	Climate Modeling Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100

3rd Year 2nd Semester 2025								
Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-3201	Environmental Impact Assessment (EIA)	2	15	10	5	70	100
2	GE-3202	Solid and Liquid Waste Management	3	15	10	5	70	100
3	GE-3203	Population Geography	2	15	10	5	70	100
4	GE-3204	Political Geography	3	15	10	5	70	100
5	GE-3205	Spatial Analysis	3	15	10	5	70	100
6	GE-3206	Research Methods and Techniques	3	15	10	5	70	100
7	GE-3207	EIA and Auditing Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
8	GE-3208	Waste Management Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
9	GE-3209	UAV Photogrammetry Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
10	GE-3210	EMS in Industries of BD: Industrial Lab	2	50 (Field Report)	30 (Overall FW Performance)	20 Viva/Quiz/ Presentation	0	100
11	GE-3211	Viva-Voce	1	nil	nil	nil	100	100

4th Year 1st Semester 2026								
Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-4101	Environmental Pollution and Control	2	15	10	5	70	100
2	GE-4102	Oceanography and Marine Environment	3	15	10	5	70	100
3	GE-4103	Climate Change and Mitigation	2	15	10	5	70	100
4	GE-4104	Transport Geography	2	15	10	5	70	100
5	GE-4105	Urban Geography and Planning	3	15	10	5	70	100
6	GE-4106	Research Methods and Techniques Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
7	GE-4107	Environmental Pollution Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-4108	GIS Programming and Spatial Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-4109	Field Work on Micro Region Survey Lab	2	50 (Field Report)	30 (Overall FW Performance)	20 Viva/Quiz/ Presentation	0	100

4th Year 2nd Semester 2026								
Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-4201	Hazard and Disaster Management	3	15	10	5	70	100
2	GE-4202	Environmental Law, Protocol and Ethics	3	15	10	5	70	100
3	GE-4203	Health Geography	2	15	10	5	70	100
4	GE-4204	Land Use Planning and Development	2	15	10	5	70	100
5	GE-4205	Spatial Data Analysis in Health Geography Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
6	GE-4206	LULC Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
7	GE-4207	Research Project (Report + Defense= 3+1)	4	nil	nil	nil	100	100
8	GE-4208	Viva-Voce	1	nil	nil	nil	100	100

***CIE= Continuous Internal Evaluation,**

***SEE= Semester End Examination**

FIRST YEAR FIRST SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total marks
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10)	Presentation/ Quiz (5)		
1	GE-1101	Introduction to Geography	3	15	10	5	70	100
2	GE-1102	Introduction to Physical Geography	2	15	10	5	70	100
3	GE-1103	Principles of Map Reading and Cartography	3	15	10	5	70	100
4	GE-1104	Mathematics in Geography and Environment	3	15	10	5	70	100
5	GE-1105	Physics in Geography and Environment	3	15	10	5	70	100
7	GE-1106	Cartographic Techniques Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
8	GE-1107	Physical Geography Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
9	GE-1108	Computer Application Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
10	NCC	Islamic Studies\Bangladesh Studies	Nil	Nil	Nil	Nil	100	100
Total			18.5					800

Course Code: GE-1101	Course Title: Introduction to Geography	Course Type: Core Course	Total Marks: 100
Level: 1st Year 1st Semester		Contact Hours: 39	Credit: 3

Course Rationale:

The course is designed to examine the key themes, concepts, and ideas in geography and to develop a geographical perspective of the contemporary world so that the students can develop their core understanding of the environment and the relationship between human in terms of space, time and location.

Course Objectives:

1. To introduce students to the field of geography and is structured around the major research traditions of the discipline.
2. To develop the concepts of geographic terms and key concepts, describe types and features.
3. To gain basic working knowledge of astrophysics.
4. To develop knowledge on human impact on the environment and contemporary environment, social, and economic challenges.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Understand the fundamental principles and concepts of geography as a field.
2. Develop critical thinking skills and the ability to conceptualize geographic perspectives.
3. Identify and familiar with the primary sub-disciplines of geography, how they fit within the field, and their unique contributions both to the field and to broader society.
4. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
5. Understand the basics about principles of astronomy and astrophysics.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3		✓							
CLO4								✓	
CLO5									✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to Geography and Earth System Science: Definition; Scope and subject matter; Development of Geography as a discipline.	CLO1 CLO2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Concepts in Geography: Fundamental themes and concepts; Major Approaches; Geographical Data; Tools and Techniques, Analysis of Human-Environment system; Dualism; Points and Circle of Reference	CLO3		
Environment: Meaning, types and components; Environment and society; Ecology; Sustainability.	CLO4		
The Physical Dimension: Solar System and Celestial Objects; Galaxies & Physical Cosmology; Landforms and Processes.	CLO5		
The Human Dimension: Philosophical and theoretical approaches; Human dynamics; Man-Environment relation; Human impact and Environmental systems	CLO4		
Practicing Geography: How geographers work; Relevance and application; Communities; The present and future.	CLO2		

Books Recommended:

1. Holt-Jensen, Arild. 2018. *Geography: History and Concepts*. Sage. Singapore.
2. Castree, N and Rogers, A. 2005. *Questioning Geography.* Blackwell. USA
3. Singh, S. 2001. *Environmental Geography*. Prayag Pustak Bhawan. India.
4. Park, C. 2008. *The Environment* (2nd Edition). Taylor & Francis Inc. USA.
5. Adhikari, S. 1999. *Fundamentals of Geographical Thought*. B House. Allahabad.
6. Dikshit, R.D. 2001. *Geographical Thought*. Prentice Hall. New Delhi.
7. Botkin, D. And Keller, E. 2014. *Environmental Science: Earth as a Living Planet.* Wiley.

Course Code: GE-1102	**Course Title: Introduction to Physical Geography**	**Course Type: Core Course**	**Total Marks: 100**
Level: 1st Year 1st Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

This course serves as a broad introduction to the field of earth science and designed to provide the basis for understanding and reading the earth landscape, by underlining the relationships among the environmental components.

Course Objectives:

1. To give the student knowledge and skills about landscape forms and processes as well as commonly used methods and techniques in physical geography.
2. To study of the physical elements of the Earth, including their interrelationships and importance to man and his activities systematically.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Describe what Geography and Physical Geography are.
2. Explain the structure and composition of the earth, and the fundamental geological processes that have shaped the Earth.
3. Understand the physical principles and processes governing the circulation and characteristics of the atmosphere and hydrosphere.
4. Understand the basic geomorphic processes that shape the landscape.
5. Understand the directional and locational systems employed on the surface of the Earth.

Mapping of CLOs with PLOs:

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓	✓							
CLO2	✓								
CLO3	✓								
CLO4	✓								
CLO5			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Definition, subject matter, scope and branches.	CL01	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Earth as a planet: Size and shape, rotation and revolution, tilt of the earth's axis, solar altitude, Solstices and equinoxes, Geographic grid, World time zones.	CL01 CL05		
Origin and evolution: Theories of Earth origin, geologic time scale, continental drift and plate tectonics, the Gaia Hypothesis.	CL04		
Structure of the Earth: Interior structure (core, mantle, crust), crustal structure (rocks and minerals)	CL02		
Processes of Land formation: Endogenic Process (Diastrophism, Volcanism, Earthquakes); Exogenic Process (weathering, Erosion, Mass wasting, Deposition)	CL04		
Earth's Spheres: The Lithosphere (Rock cycle, soil formation, crustal formation and deformation process), The Atmosphere (Compositions of atmosphere, elements and factors of weather and climate; global Scale circulation of the atmosphere), The Hydrosphere (The hydrological cycle and processes, Distribution of oceans and seas on the Earth), The Biosphere (Component of biosphere, Organization of Life-Species, Populations, Communities, and Ecosystems).	CL03 CL04		
Earth as a system with subsystem: System approach to physical environment; System Typology: Morphologic, cascading, process-response, systems and ecosystems, open, closed and isolated systems; System feedback.	CL05		

Books Recommended:

1. Strahler, A. H., & Strahler, A. N. 1992. *Modern Physical Geography*. Wiley, Singapore.
2. Singh, S. 2002. *Physical Geography*. Prayag Pustak Bhawan, India.
3. Miller, E.W. 1985. *Physical Geography*. Columbus Press, USA.
4. Park, C. 2008. *The Environment* (2nd Edition). Taylor & Francis Inc., USA.

Course Code: GE-1103	**Course Title: Principles of Map Reading and Cartography**	**Course Type: Core Course**	**Total Marks: 100**
Level: 1st Year 1st Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

The course is designed to examine the key themes, concepts, and ideas about maps, map reading, and cartography. Besides developing a cartographic knowledge perspective of the contemporary world.

Course Objectives:

1. To understand the history of maps and cartography.
2. To Achieve map presentation skills by using cartographic knowledge.
3. To acquire knowledge of map scale and the conversion techniques of map scale simultaneously.
4. To understand the basics of cartographic designing.
5. To Identify and interpret different types of maps within a short time.

Course Learning Outcomes (CLOs): After successful completion of the course the students will be able to

1. Explain cartographic history.
2. Interpret maps, atlases, and aerial photography effectively.
3. Apply cartographic and geographic skills to various mapping projects.
4. Develop various themes and methods for data presentation.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2					✓				
CLO3		✓							
CLO4						✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to Cartography: Definition, historical evolution, and development of cartography; Emergence of GIS; Map as a tool of geographical study.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Understanding Maps: Definition; Background; Classification; Importance and applications; Basic Elements. Conventional signs and symbols, marginal information	CLO 2		
Map Scale: Types and applications of different map scales (graphical, verbal, R.F)	CLO2		
Cartographic Designing: Principles of map design; Symbology; International Color Scheme; Map production and reproduction.	CLO5		
Thematic Map: Definition and Concept; Thematic mapping methods (Choropleth, Isopleths, Dot, Flow, Proportional symbol, Isarithmic and Diagrammatic method, Cartogram)	CLO1		
Basic Map Reading and Interpretation: The Language of Maps; Determination of latitudes and longitudes; Measurement of time and distance in maps; Data extraction from maps; Familiarity with maps (physical, topographical, geological, weather, political, regional, and economic) in Bangladesh and World perspective.	CLO6		

Books Recommended:

1. Elements of Practical Geography – R L Singh.
2. Map work and Practical Geography-Gopal Singh.
3. Keats, J. S. 1989. *Cartographic Design and Production*, (2nd edition). Essex: Longman Scientific & Technical, England.
4. Robinson, A. H. 1995. *Elements of Cartography*. New York: Wiley.
5. Monkhouse, F. J. & Wilkinson, H. R. 1971. *Maps and Diagrams* (3rd Edition). London: Methuen and Co.

Course Code: GE-1104	**Course Title: Mathematics in Geography and Environment**	**Course Type: Core Course**	**Total Marks: 100**
Level: 1st Year 1st Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

This course offers students access to important mathematical ideas to develop the mathematical knowledge and skills that they will need and apply in their disciplinary studies.

Course Objectives:

1. To solve real problems that can arise from the everyday world.
2. To understand the Earth system operations and its underlying mathematical principles.

Course Learning Outcomes (CLOs): After successful completion of the course the students will be able to

1. Learn the application of mathematics in the field of geography and environment.
2. Understand the basic and advanced mathematical calculations and earth geometry.
3. Develop the concept of modelling in geo-environmental analysis.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓	✓						
CLO3			✓	✓					

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Basic Concepts of Mathematics: Set theory, Venn diagram, combination and permutation, logarithm and indices and their applications in geographical and environmental studies.	CL02	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Algebra: Fundamentals of algebra; algebraic expressions – number, value, variables, exponent, logarithm; square root, fraction, decimal, percentage, perimeter, circumference, density; ratio and proportion; equation and function in algebra; factor analysis	CL02		
Geometry: Graphing on the coordinate plane; graphing with intercept; slope of a line; Euclidean geometry; angle basic and measurements; point, line, triangles, rectangles, circles: types, structures and functions; topology, Pythagorean theory, fundamentals of trigonometry.	CL02		
Calculus: Fundamentals of calculus; differential calculus – limits, tracking derivatives, derivative applications; integral calculus – integrals, integrations techniques; integrations applications; multivariable calculus – double and triple integrals, partial derivatives, gradients, divergence.	CL02		
Differential Equations: Definitions and classifications of differential equations; Solutions – implicit solutions, singular solutions; Problems - Initial Value Problems (IVP), Boundary Value Problems (BVP); Formation of differential equations.	CL02		
Mathematical Approaches of the Earth and Environmental Systems: Basics of numerical solutions by finite systems, Box Modeling-Unsteady, Uniform and conservation of mass, one dimensional diffusion problems, multidimensional diffusion problems, advection dominated problems, advection and diffusion (Transport Problems). Basic computing models of climatology, hydrology, fluid mechanics; flood models, cyclone models, earthquake models	CL01 CL03		

Books Recommended:

1. Lipschutz, S. 2015. *Set Theory and Related Topics*. Schaum's Outline Series.
2. Khanna, M. L. & Pundir, S. K. *Matrices*. Jai Prakash Nath & Co., India.
3. Das, B. C. and Mukharjee B. N. 2015. *Differential Calculus*. India: UN Dhur & Sons Pvt. Ltd.
4. Das, B. C. and Mukharjee B. N. 2015. *Integral Calculus*. India: UN Dhur & Sons Pvt. Ltd.
5. Mohammad, K. 2001. *Coordinate Geometry and Vector Analysis*. Dhaka: Ideal Library.
6. Mathematical Methods in the Earth and Environmental Sciences- Adrian Burd.
7. Mathematical Geography- Willis Ernest Johnson
8. Mathematics for the Environment- Martin Walter

Course Code: GE-1105	Course Title: Physics in Geography and Environment	Course Type: Core course	Total Marks: 100
Level: 1st Year 1st Semester		Contract Hours: 39	Credit: 3

Course Rationale: The course is designed to understand the key themes, concepts, and ideas about Earth physics, motion, geomagnetism, seismology, and tectonics.

Course Objectives:

1. Understand major laws of Physics.
2. Apply the laws of mechanics, hydrostatics, kinetic theory of gases, heat and work, electromagnetism, oscillatory motion and waves, electricity and magnetism, and optics for explaining physical phenomena and solving problems.
3. Trace the contributions of scientists to the development of laws governing physical phenomena and the concepts/theories which integrate them.
4. Develop a clear understanding of the scientific method and its application to the fundamental principles governing the physical universe.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Acquire knowledge about the earth's interior mechanism.
2. Students can develop their practical knowledge through different laws and theories.
3. Discuss the gravity and earth rotation, plate reconstruction, and currents plate.
4. Understand the geomagnetism of the earth.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2						✓			
CLO3			✓						
CLO4									✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Mechanics: Motion in two dimensions; projectile motion; Newton's laws of motion; Central forces and Gravitation; Kepler's law.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Interior Earth Physics: Crust; Mantle and Core; Thermal properties; Models of the Earth's internal structure; Mapping the earth's interior; Geothermal gradient; Crustal and mantle deformation- Thermal convection	CLO1		
Heat, Thermodynamics and Radiation: Principles of thermometry; zeroth law of thermodynamics. Kinetic theory of gases; first and second law of thermodynamic; entropy; black-body radiation. Wein's law; Planck's law.	CLO2		
Geomagnetism: Electromagnet Theory; Earth's magnetic field; Properties- Intensity, Inclination, Declination; Geographical variation; Dipolar approximation; Magnetic poles; Magnetosphere; Crustal Magnetic anomalies; Aeromagnetic survey; Paleomagnetism.	CLO2		
Gravitational dynamics: Gravitational theory and equations; Gravitational force; Surface gravity of the earth; Principles of gravimetry; Isostasy- Pratt and Airy models.	CLO3		

Seismology: Elasticity Theory; Seismic Waves- Type and Propagation; Travel time curves; The Seismograph- Principle, Equation; Earthquake seismology- Location of Epicenter, Global seismicity, Earthquake focal mechanism, Secondary effects e.g. landslide and tsunami, Size & frequency, Release of energy, Prediction and monitoring, Monitoring nuclear explosion.	CLO2		
Tectonics: Planetary tectonics; Key principles; Plate boundary typology; Driving forces and Mantle dynamics, Gravity, Earth rotation; Relative significance of forces; Development of theory; Plate reconstruction and current plates	CLO4		

Books Recommended:

1. Halliday. D. and Resnick, R.: Physics (Vol. I and Vol II)
2. Puri, S. P.: Fundamentals of Vibrations and Waves
3. Saha and Srivastava: A Treatise of Heat
4. Beiser, A.: Prespective of Modern Physics

Course Code: GE-1106	**Course Title: Cartographic Techniques Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 1st Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

The course is designed for applications of cartographic knowledge and map design procedure, developing the map-making skills with computer systems.

Course Objectives:

1. Acquire knowledge about the components of the maps and cartography.
2. Achieve map presentation skills by using cartographic knowledge.
3. Create different types of scales on different types of maps.
4. Identify and interpret various types of thematic maps easily.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Identify the fundamentals of cartography, e.g., layout and design, color, symbology, scale, and text.
2. Analyze geographic data including demographics.
3. Identify various map types and determine when it is best to use a specific kind of map.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Materials and Techniques: Drawing instruments and drawing media. Mechanical and free-hand lettering.	CLO1	Lecture PPT, Video, Demonstration, Lab Experiment, Single and Group exercise, Q/A	Lab Report, Mini Project, Lab Performance, Final Examination
Construction of scale: Scale factor mathematics (R.F); Construction of Linear, Diagonal, Comparative and proportional Scales.	CLO2		
Map Scale: Types and applications of different map scales (graphical, verbal, R.F)	CLO3		
Measurement of area: graphical and instrumental.	CLO5		

Books Recommended:

1. Elements of Practical Geography – R L Singh.
2. Map work and Practical Geography-Gopal Singh. https://books.google.co.in/books?id=XPwk7aDymKIC&printsec=frontcover
3. Keats, J. S. 1989. *Cartographic Design and Production*, (2nd edition). Essex: Longman Scientific & Technical, England.
4. Robinson, A. H. 1995. *Elements of Cartography*. New York: Wiley.
5. Monkhouse, F. J. & Wilkinson, H. R. 1971. *Maps and Diagrams* (3rd Edition). London: Methuen and Co.

Course Code: GE-1107	**Course Title: Physical Geography Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 1st Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

This course is designed for spatial study of the earth's dynamic physical systems and processes practically.

Course Objectives:

1. To develop an understanding of the basic processes related to the planet we call "Earth".
2. To expand student's skills in problem solving related to weather and landform development
3. To gain knowledge of interpreting maps and diagrams.
4. To gain a greater appreciation of physical geography, earth sciences, our planet and life in general.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Think critically and apply the basic knowledge, skill, and principles of physical geography.
2. Be familiar and proficient with some simple techniques for analyzing basic geographic and physical environmental information.
3. Undertake an independent field study of the natural environment and understand the problems associated with making field measurements of natural phenomena.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Sketching and mapping of landscape: How to develop a field sketch for physiographic survey, Interpreting Topographic Maps, Aerial Photos.	CL03	Lecture PPT, Video Demonstration, Lab Experiment, On-field Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Earth/Sun Relationships: Earth-Sun geometry, Study of seasons.	CL01		
Sedimentological Tests Identification of sand, silt, and clay by manual techniques; Studies on the texture, structure, colour, organic matter and composition.	CL03		
Representation of Relief in Maps: Relief representation – pictorial, graphical and mathematical; Relief by contours– interpolation of contours.	CL02		
Study of Weather: Interpreting weather maps, Making weather reports.	CL02		

Books Recommended:

1. Physical Geography Lab Manual, 4th Ed. - Dalton W. Miller, Andrew E. Mercer.
2. Laboratory Manual for Introduction to Physical Geography, 2nd Ed. - Stuart MacKinnon; Chani Welch.

Course Code: GE-1108	Course Title: Computer Application Lab	Course Type: Core Course	Total Marks: 100
Level: 1st Year 1st Semester		Contact Hours: 39	Credit: 1.5

Course Rationale:
This course has been designed for the newly admitted students with little to no computer experience in the field of geo-computing.

Course Objectives:
1. To understand the basics of computer and working with OS.
2. To develop working skills with productivity tools, graphics designing and the Internet.
3. To acquire knowledge on elementary programming.
4. To learn using basic geospatial applications in problem solving.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Develop skills for productivity software and OS.
2. Develop interests in using computers for professional work.
3. Discover their interests in geospatial applications and programming.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1				✓					
CLO2	✓					✓			
CLO3				✓		✓		✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Microsoft Office Applications: Word Processing- Basic operations; Text manipulation; Formatting; Content Organization; Visual Content; Reference management; Printing preparation; Using open-source processors.; **MS Excel-** Excel basics; Working with cells and worksheets; data calculation; Formatting Workbook; Analysing data; **PowerPoint:** Interface overview; Working with Graphics and Media; Formatting; Slide animation techniques; Presentation preparation.	CLO1	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Geospatial Software: Brief introduction and uses	CLO2		
Programming Basics: C and Python	CLO3		

Books Recommended:

1. Rogler, Harold L., 2021. *Introduction to Computer Systems.* Kendall Hunt Publishing Company
2. Mclnerney, D. and Kempeneers, P., 2014. *Open-source geospatial tools: applications in earth observations: Earth Systems Data and Models,* Springer.
3. Norton, P., 2000. *Peter Norton's Introduction to Computers*. McGraw-Hill Technology Education.
4. Brands, G., 2013. *Introduction to Computer Science: A Textbook for Beginners in Informatics*. CreateSpace Independent Publishing Platform.

FIRST YEAR SECOND SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-1201	Introduction to Human Geography	3	15	10	5	70	100
2	GE-1202	Environmental Geography	3	15	10	5	70	100
3	GE-1203	Introduction to Geo-information Science & Technology	2	15	10	5	70	100
4	GE-1204	Fundamentals of Environmental Chemistry	3	15	10	5	70	100
5	GE-1205	Fundamentals of Statistics	2	15	10	5	70	100
6	GE-1206	Environmental Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
7	GE-1207	Map Projection and Topographical Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-1208	Plane Survey Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-1209	Questionnaire Based Survey: Socioeconomic Assessment Lab	2	50 (Field Report)	30 (Overall FW Performance)	20 Viva/Quiz/ Presentation	0	100
10	GE-1210	Viva-Voce	1	Nil	Nil	Nil	100	100
Total			20.5					1000

Course Code: GE-1201	**Course Title: Introduction to Human Geography**	**Course Type: Core Course**	**Total Marks: 100**
Level: 1st Year 2nd Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

The course is designed to develop an understanding and appreciation of the interactions between people, places, and environment through the core themes of globalization, development, urbanization, diversity and inequality.

Course Objectives:

1. To apply key geographical concepts relating to the functioning and interaction of population, society, settlement, and the development of resources.
2. To demonstrate understanding of processes affecting places and their populations at a range of scales: global, national, and local by identifying, describing and analyzing geographic phenomena.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Integrate knowledge critically in the socio-economic and the bio-geo-physical areas.
2. Conduct interdisciplinary analyzes of issues relating to globalization, environment and social change.
3. Explain the underlying structures and driving forces for global environmental change.
4. Discuss and argue critically on issues of globalization, environment and social change.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3		✓					✓		
CLO4								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Development; Nature and Scope; Philosophical and theoretical approaches; Basic concepts	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Perspectives in Human Geography: Major geographical concepts underlying the geographical perspectives, Aerial differentiation, nature and society, Regionalization, globalization. Politics.	CLO1 CLO4		
Population and Settlement: Population composition; World population; Demographic attributes; Migration: Classification, Causes and consequences; Settlement: Urban and rural, Types and patterns; Environmental issues, Hierarchy; Human development.	CLO2		
Urbanization: Development; Causes; Conurbation; World urbanization trend; Environmental effects; Health and Social effects; sustainable development of cities and towns.	CLO3		
Economic Aspects: Economic activity- Primary, Secondary, Tertiary and Quaternary; Economic Systems	CLO3		
Transportations and Trade: Spatial interaction; Modes; Routes; Aspects of international trades.	CLO3		
Environmental Aspects: Principles of ecology, human ecological adaptations; Influence of man on ecology and environment; Man and environmental process; Population and Environment nexus.	CLO2 CLO4		

Books Recommended:

1. Bednarz, S. et al., 2020. *Human Geography A Spatial Perspective.* National Geographic School Pub.
2. Dorrell, D., Henderson, J.P., Connor, G. and Lindley, T., 2018. *Introduction to Human Geography*. University of North Georgia Press.
3. Rubenstein, J.M., 2018. *The cultural landscape: An introduction to human geography*. Pearson.
4. Cloke, P., Crang, P. and Goodwin, M., 2013. *Introducing human geographies*. Routledge.
5. Fouberg, E.H., Murphy, A.B. and De Blij, H.J., 2015. *Human geography: people, place, and culture*. John Wiley & Sons.Majid Husain. 2005. Human Geography. India: Rawat Publications.
6. Knox, P. L. and Marston, S. A. 2012. Human Geography: Places and Regions in Global Context (6th edition). Prentice Hall.

Course Code: **GE-1202**	**Course Title:** **Environmental Geography**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 1st Year 2nd Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

The course is designed to develop an understanding and appreciation of the interactions between people, places and environment through the core themes of globalization, development, urbanization, diversity and inequality.

Course Objectives:

1. Develop core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Apply basic principles of the natural and social sciences to current issues of natural resources and the environment.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Integrate knowledge critically in the socio-economic and the bio-geo-physical areas.
2. Conduct interdisciplinary analysis of issues relating to globalization, environment and social change.
3. Explain the underlying structures and driving forces for global environmental change.
4. Discuss and argue critically on issues of globalization, environment, and social change.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3		✓							
CLO4							✓		

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Environmental Geography: Meaning and definition, Scope of environmental geography, Basic concepts of ecology, environmental geography and related sciences	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Human-environment relationships: Major approaches, environment and human, Man's interaction with the environment; Environmental management.	CLO1 CLO2		
Ecosystems and Ecosystem dynamics: Definition and concepts of ecosystem, structure, components and functions, classification, ecosystem dynamics and energy flow, inter-relationships of ecosystem; Homeostasis; Biogeochemical cycles- principles, concepts, pattern, types, Nutrient cycling.	CLO1 CLO4		
Community and Community Dynamics: Definition and concepts of community; Characters-Species diversity, Growth form and structures, Organization, Dominance, Relative abundance, Trophic structure, Community succession; Ecotone and edge effect.	CLO2		
Population and Population regulations: Autecology and Synecology; Species- type, variation, change; Extinction; Population- definition, characteristics, dynamics, structure, measures, Growth and regulation; Dispersal- type and pattern; Factors of growth; Regulation- type, limiting factors	CLO3		
Stress and plant response: Basic concepts; Plant responses to different stress - water , temperature, chilling, freezing, salt; plant responses to Environmental Pollutants; Environmental factors and their impacts on vegetation- Climatic, edaphic, Physiographic and Biotic factors.	CLO3		
Geographical distribution of Biological Community: Biomes- Definition and meaning, Classification, Characteristics, Effects of climate change; Ecoregions; Ecotope and Ecotype; Life Zone.	CLO3		
Threats and Conservation of Biodiversity: biodiversity and species concept, status of biodiversity in Bangladesh. Depletion and causes of threatening biodiversity, IUCN categories of endangered species, red data book, measures for Biodiversity conservation, protected areas and biosphere.	CLO2 CLO4		

Books Recommended:

1. Botkin, D. and Keller, E. 2014. Environmental Science: Earth as a Living Planet, Wiley.
2. Jorgensen, S.E. and Johnsen, I. 1989. Principles of Environmental science and technology, Elsevier.
3. Saravanan, K. 2004. Principles of environmental science and technology. New Age International.
4. Cunningham, W.P. and Cunningham, M.A. 2012. Environmental Science: A Global Concern. 12th Edition. McGraw-Hill.
5. Enger, E.D. and smith, B.F. 2010. Environmental Science: a study of interrelationships. 12th Edition.

Course Code: GE-1203	Course Title: Introduction to Geo-Information System and Technology	Course Type: Core Course	Total Marks: 100
Level: 1st Year 2nd Semester		Contact Hours: 26	Credit: 2

Course Rationale:
This course provides an introduction to the theory, practice and applications of contemporary geo-information technologies and of geographic information systems (GIS).

Course Objectives:
1. To develop understanding on what makes spatial data special data.
2. To get acquaintance with geoinformation engineering systems and technologies.
3. To learn spatial analysis, and how to make use of these techniques in studying physical and social processes and phenomena.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Understand fundamental concepts, practices, applications and advances of GI technologies in a variety of fields.
2. Comprehend basic concepts of digital photogrammetry, mapping and Global Navigation Satellite Systems.
3. Develop cognizance of spatial information science

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓	✓							
CLO2		✓							
CLO3		✓							
CLO4								✓	✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Basics of Geo-information Technology: Geomatics; Scope; Subject Matter; Branches	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Digital Cartography: Definition, Principles and Use; Dynamic/Interactive mapping, Computer Mapping Software, GIS system: Geo-visualisation; Web Mapping.	CLO1 CLO2		
Geodesy: Definition; Geographical distance; Geoid and reference ellipsoid; Coordinate systems; Heights; Geodetic data; Geodetic system; Point positioning; Physical and Satellite geodesy.	CLO1 CLO3		
Geographic Information System: History and development; Components; GIS Hardware; GIS Operations; Geospatial Data; Techniques and technology; Applications; GIS and Society	CLO1 CLO3		
Spatial Analysis: Definition; History; Fundamental Issues: Spatial characterization, dependence, association, scaling, sampling; Common errors; Types of spatial analysis; Geospatial analysis	CLO1 CLO3		
Satellite Navigation: Classification; History and theory; Applications; Global navigation satellite system architecture (GPS, GLONASS, BeiDou); Regional navigation satellite systems (NavIC, QZSS); Comparison of systems; Augmentation; Related radio techniques.	CLO1 CLO2		
Photogrammetry and Remote Sensing: Definition; History; Methods; Elements; Applications	CLO1 CLO2		

Books Recommended:

1. Lemmens, M. (2011). *Geo-information: technologies, applications and the environment* (Vol. 5). New York, NY, USA: Springer.
2. Shellito, B.A., 2018. *Introduction to geospatial technologies*. Macmillan Higher Education.

3. Abdalla, R., 2016. *Introduction to geospatial information and communication technology (GeoICT)*. Springer International Publishing.
4. Pourabbas, E. ed., 2014. *Geographical information systems: Trends and technologies*. CRC press.

Course Code: GE-1204	**Course Title: Fundamentals of Environmental Chemistry**	**Course Type: Core course**	**Total Marks: 100**
Level: 1st Year 2nd Semester		**Contract Hours: 39**	**Credit: 3**

Course Rationale:
This course aims to provide an introduction to the fundamentals of chemistry in an environmental context. The student will gain an increased understanding of chemical processes and reactions, which take place in and are important for the natural world. Furthermore, the influence of human activities on the chemical aspects of the environment will be examined in detail. This course will also give an appreciation of scientific methodology and enable us to develop those problem-solving and critical-thinking skills necessary to analyze and discuss chemical and physical phenomena in the environment.

Course Objectives:
1. Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil.
2. Apply basic chemical concepts to analyze chemical processes involved in different environmental problems (air, water & soil).
3. Discuss local and global environmental issues based on the knowledge gained throughout the course.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Understand and apply fundamental concepts of chemistry in geo-environmental studies.
2. Display technical competence in basic chemistry specifically collect, accurately record, interpret, and draw conclusions from scientific data.
3. Plan a chemical investigation including developing a testable hypothesis and work effectively, responsibly, and safely in an individual or team context.
4. Develop an independent and self-directed learner of environmental chemistry.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3					✓				
CLO4						✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to Environmental Chemistry: Introduction and concept of Environmental Chemistry; Historical Development and Background; Components of Environmental Chemistry, and Significance and role of Environmental Chemistry for Geography and Environment.	CLO 1 CLO 2	Lecture PPT, Video, Group discussion, Q/A, Discussion,	Class Test, Quiz, Assignment, Presentation, Final Examination
Atmospheric Chemistry: Introduction and concept of Atmospheric Chemistry; Structure and composition of Atmosphere; Atmospheric element and particles; Chemical and Photochemical reactions in Atmosphere, Photochemical smog and Atmospheric Pollutants, Effects of atmospheric pollution	CLO 1		
Lithospheric Chemistry: Composition of Lithosphere; Organic and inorganic components in soil and their properties; Acid-base and ion exchange reactions in soil;	CLO 3		

Chemical and Physical weathering in soil, and Nutrients in soil			
Hydrospheric Chemistry: Components and concepts of Hydrosphere; Chemistry of Natural Water (Hard water and soft water); Water cycle; Chemistry of Sea Water and Redox processes in aquatic environment, Electron activity and pE	CLO 4		
Chemistry of Pollutants: Pesticides: Bio-concentration, Biomagnification; Heavy metals: Biochemical effects of Cd, Ar, Pb, and Hg, Hydrocarbons, and Radioactive Elements, Biochemical effects of radioactive materials	CLO 1		
Some Issues on Environmental Chemistry: Biodegradation, Photochemical smog, Acid rain; Some environmental accidents: Bhopal accident, Chernobyl disaster; Sedimentation, Filtration, Separation Techniques and Incineration.	CLO 4		

Books recommended-

1. Manahan, S.E. 2000. Environmental Chemistry, 10th Edition, Lewis Publishers.
2. De, A. K. 2012. Environmental Chemistry. 7th Edition, New Age International Pvt. Limited, New Delhi.
3. Berner, E.K. and Berner, R.A. 1987. The Global Water Cycle – geochemistry and environment, Prentice Hall.

Course Code: GE-1205	**Course Title: Introduction to Statistics**	**Course Type: Core Course**	**Total Marks: 100**
Level: 1st Year 2nd Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

The course is designed to understand the concepts, and importance of statistics, the level of data measurements, frequency distribution and central tendency, and sampling methods.

Course Objectives:

1. Perform basic statistical calculations and graphical analyses.
2. Understand and apply probability rules and concepts related to various probability distributions and concept of sampling distributions.
3. Analyze research questions based on statistical data, draw relevant conclusions, and be familiar with the limitations of particular statistical methods.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Acquire knowledge about the scope of statistics.
2. Students can develop their practical knowledge through different methods and techniques.
3. Discuss the level of data measurement.
4. Understand the sampling methods.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2									✓
CLO3		✓							

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	**CLO**	**Teaching-Learning Strategies**	**Assessment Strategies**
Introduction: Definition of statistics and environmental statistics, Importance and scope of statistics, Limitations of statistics.	CLO3		

Basic statistical concept: Data nature, sources, classification and analysis of environmental and geographical data.	CLO3	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Levels of Measurement: Data measurement and scaling techniques. (Nominal Scale; Ordinal Scale; Interval Scale and Ratio Scale).	CLO1		
Frequency distribution and Measures of Central Tendency: Summarizing data, frequency distribution types, scatter diagram, frequency table and graphical presentation of quantitative and qualitative data, mean, median and mode.	CLO1		
Measures of dispersion: Dispersion, Characteristics of ideal measures of dispersion, Range, quartile deviation, mean deviation, standard deviation and root mean square deviation, relation between standard deviation and root mean square deviation, Moments: Concepts, properties and measures of moments: moments of group data; population moment; Relation between moments about mean in terms of moments about any point and vice versa, Effect of change of origin and scale on moments, Skewness and Kurtosis	CLO1		
Sampling: Concept of population, sample and sampling, Types of sampling in geographical and environmental research.	CLO1,2		

Books Recommended:

1. Gregory, S. 1963. *Statistical Methods and the Geographer*. London: Longman.
2. Gupta, S. P. and Gupta M.P. 2007. *Business Statistics.* India: Sultan Chand.
3. Imon, A. H. M. R. 2016. *Introduction to Environmental Statistics*. Dhaka: Nandita Prokash.
4. Freund, J. E. 2006. *Modern Elementary Statistics* (12th Edition). Prentice-Hall, Inc.

Course Code: **GE-1206**	**Course Title:** **Environmental Analysis Lab**	**Course Type:** **Lab**	**Total Marks: 100**
Level: 1st Year 2nd Semester		**Contract Hours: 39**	**Credit: 1.5**

Course Rationale:

Through this course, the students will be able to perform quantitative analysis of various physical, chemical and biological parameters involved in water, air and soil research. The students will be exposed to various standard protocols used in environmental monitoring.

Course Objectives:

1. Apply basic chemical concepts to different environmental problems.
2. Discuss local and global environmental issues based on the knowledge gained throughout the course.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1: Develop sampling and analytical skills of the students.
2: Understand various standard protocols, acquire analytical and conceptual skills required for environmental chemistry research; and correlate environmental impacts and field processes.
3: Develop the essential skills of the students which are required in environmental monitoring.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Environmental Chemical Analysis: Introduction, sampling techniques, basic concept of quantitative techniques, instrument methods of analysis, standard solutions	CLO 1 CLO 2		

Water Analysis: Sampling, Storage, analysis -pH, DO, TSS, TDS, BOD, COD, N-species, P-specis, salinity	CLO 1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Presentatio, Final Examination
Air Analysis: sampling for particulate and gaseous pollutants analysis, PM-analysis, Gaseous pollutants analysis	CLO 3		
Soil analysis: sampling, extraction of pollutants from soil.	CLO 3		

Books recommended-

1. Vowles, P. D., and Connell, D. W. 2013. *Experiments in environmental chemistry: a laboratory manual* (Vol. 4). Elsevier.
2. De Levie, R. 1997. *Principles of quantitative chemical analysis*. McGraw-Hill Science, Engineering & Mathematics.

Course Code: GE-1207	**Course Title: Map Projection and Topographical Analysis Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 1st Year 2nd Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

The course is designed to understand the concepts, and mathematical construction of map projection and its suitability including topographical analysis.

Course Objectives:

1. Acquire theoretical knowledge of map projections.
2. Interpret the differences between two-dimensional and three-dimensional depictions of the Earth.
3. Achieve map-making procedures with different projections.
4. Gain mathematical processes involved in coordinate conversions and datum transformations system.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Develop an insight into the theoretical nature of map projections.
2. Critically discuss the differences between two-dimensional and three-dimensional depictions of the Earth.
3. Explain why a specific datum, map projection, and grid system was adopted for various mapping situations.
4. Explain the mathematical processes involved in coordinate conversions and datum transformations.
5. Interpret survey data and topographic symbols; and produce topographical drawings.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2						✓			
CLO3					✓				
CLO4						✓			
CLO5					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Map Projection: Basic concept; Application; Metric properties; Identification and Suitability; Geodetic datum and Geographic coordinate system (UTM, UPS, ENU, NED); Military Grid Reference System (MGRS) and Geostationary coordinates.	CLO1	Lecture PPT, Video, Demonstration, Lab Experiment, Single and Group exercise, Q/A	Lab Report, Mini Project, Lab Performance, Final Examination
Construction of Projections: Graphical and Mathematical- Projection surface, orientation and aspect, case and tangency, scale; Merits and demerits of different construction methods; Classification (by surface and preservation of metric properties). • Cylindrical Equal Area Projection • Mercator's Projection • Conical Projection with one standard and two standard Parallel	CLO2 CLO3 CLO4		

• Bonne's Projection • Zenithal Equal Area Projection. • Zenithal Equidistant Projection. • Stereographic Projection. • Orthographic Projection (Polar Case). • Conventional Projection (Mollwide's). • Universal Transverse Mercator (UTM) projection • Map Transformation.			
Topo-map/sheet interpretation: Conventional Signs and Symbols; Concept of Sheet Number; Understanding the Relief and Slopes; Interpreting the Physical Features; Identifying for Physiographic Regions; Interpreting the Human/Cultural Features; General Understanding of the Land uses; Communication Network; Analysis of the Relationship between Physical and Cultural Features, Spatial patterns – observation and identification; Distribution, Density and Regions	CLO5		

Books Recommended:

1. Robinson, A. H. 1995. *Elements of Cartography*. New York: Wiley.
2. Monkhouse, F. J. & Wilkinson, H. R. 1971. *Maps and Diagrams* (3rd Edition). London: Methuen and Co.
3. Ahmed, K. S., Simple Map Projection
4. Singh, R.L., Elements of Practical Geography
5. Bygott, J., AN Introduction to Map Work and Practical Geography

Course Code: GE-1208	**Course Title: Plane Surveying Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 1st Year 2nd Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

This course is designed to provide with basic understanding of the theory and practice of basic engineering surveying techniques.

Course Objectives:

1. Develop an understanding of the basic principles of surveying including the Traditional measurements and representations.
2. To obtain and use topographic information that can help their design projects, such as highway design and land development.
3. To gather field data and use them for preparing maps.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Conduct standard tests, measurements, and experiments and analyze and interpret the result.
2. Be technically adept in Surveying Technology as well as supporting math and science disciplines, allowing to assist professional land surveyors in various surveying and mapping projects.
3. Measure, collect, conduct testing data accuracy standards, and manage spatially referenced data from different sources into common surveying information and mapping systems.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1				✓					
CLO2		✓							
CLO3			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Surveying concepts, Features and Applications	CLO 1		

Chain Surveying	CLO 3	Lecture PPT, Group discussion, On-field demonstration.	FW Report, Presentation, Viva
Plane Table Surveying	CLO 3		
Prismatic Compass Surveying	CLO 3		

Course Code: GE-1209	**Course Title: Questionnaire Based Survey: Socio-Economic Assessment Lab**	**Course Type: Lab (FW Based)**	**Total Marks: 100**
Level: 1st Year 2nd Semester			**Credit: 2**

Course Rationale:
This course will deal with the basic concepts of field work and covers both human and physical aspects based on man-environment interrelationship.

Course Objectives:

1. To understand the basics of the KII, and FGD via on-field experience.
2. To demonstrate various socio-economic phenomena by on-field observation.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to

1: Develop the basic concepts of socio-economic survey.
2: Acquire fundamental knowledge of observational survey.
3: Explain the typical relationship between man and their surrounding environment.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1					✓		✓	✓	
CLO2					✓				
CLO3							✓	✓	✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	**CLO**	**Teaching-Learning Strategies**	**Assessment Strategies**
KEY informant interview (KII).	CLO 1 CLO 3	Lecture PPT, Group discussion, On-field demonstration.	FW Report, Presentation, Viva
Focus group discussion.	CLO 1 CLO 3		
Socio-economic observation and questionnaire survey	CLO 2 CLO 3		

Course Code: GE-1210	**Course Title: Viva Voce**	**Total Marks: 100**
Level: 1st Year 2nd Semester		**Credit: 1**

Rationale:
The course aims to enable the students to attend placements and be better performers in their future.

Objective:
This viva aims to assess students' understanding based on course objectives covering all the courses of 1st year 1st semester and 2nd semester.

Course Learning Outcomes (CLOs):

1. Prepare to face interview both in the academic and the service sectors.
2. Express themselves confidently with good communication skills.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1					✓	✓			
CLO2					✓	✓			

SECOND YEAR FIRST SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-2101	Biogeography	2	15	10	5	70	100
2	GE-2102	Geology	2	15	10	5	70	100
3	GE-2103	Hydrology and Fluvial Morphology	3	15	10	5	70	100
4	GE-2104	Meteorology	2	15	10	5	70	100
5	GE-2105	Social and Cultural Geography	3	15	10	5	70	100
6	GE-2106	World Regional Pattern	3	15	10	5	70	100
7	GE-2107	Rocks and Minerals Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-2108	Geographic Information System (GIS) Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-2109	Biophysical Environment Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
Total			19.5					900

Course Code: GE-2101	**Course Title: Biogeography**	**Course Type: Core Course**	**Total Marks: 100**
Level: 2nd Year 1st Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:
The course is designed to study the geographic variation in biota.

Course Objectives-
The course focuses to understand the concepts, and importance of biogeography, bio spheric cycle, and biomes, plant geography, zoogeographical realms, and conservation of biomes.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Appreciate the variety of processes which can be responsible for species distributions at global, regional, landscape and island scales.
2. Understand the relative importance of processes of speciation, extinction, dispersal, and ecological succession in explaining biogeographical patterns.
3. Recognize the role of humans in modifying plant and animal distributions, with a specific understanding of the issues surrounding alien species introductions.
4. Appreciate how knowledge from the past can inform future predictions of biogeographic change, while realizing the limitations of this approach.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3						✓			
CLO4					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to biogeography: definition, concept, element, scope and branches of biogeography. Biogeography and Plate Tectonics. Biogeographic Realms.	CLO1		

Biosphere: Nature; Limit and composition; Subdivision; Biospheric cycle of solar energy; Biocycle; Biochores and formation. Biomes: Terrestrial and Aquatic.	CLO2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Plant geography: Plant response to environmental-habitat factors- climatic, edaphic, physiographic and biotic factors; Plant classification and distribution- Geographical aspects; Plant succession, adaptation and association; Insular floras; Flora of Bangladesh: classification, distribution, importance and conservation	CLO3		
Conservation Biogeography: Emergence and Scope; Origin and value of protected areas; Baseline, Patterns and Process; Biodiversity estimation; Biological invasions and Homogenization; Systematic conservation planning; Prospects and challenges	CLO4		

Books Recommended:

1. Dansereau, P. M. 1957. *Biogeography: An Ecological Perspective*, Ronald Press
2. Huggett. R. 1998. *Fundamentals of Biogeography*, Routledge. London.
3. Kormondy. E.J. 1996. *Concepts of Ecology*, *4thE edition* Prentice-Hall.
4. Robinson, H. 1972. *Aspect Geographies-Biogeography*, London: Macdonald & Evans Ltd.

Course Code: **GE-2102**	**Course Title:** **Geology**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 2nd Year 1st Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

The subject of geology encompasses the inner structure and processes of the earth as well as the landforms and processes active at the earth's surface.

Course Objectives-

1. To introduce the structure, composition, and processes of the earth from center to surface.
2. To establish a fundamental introduction to the most central aspects of geology.
3. To provide insight to the structure and composition of the earth, and the elements, minerals and rocks that make up our planet.
4. To give the students an understanding of earth processes and their interactions that are at play and that have shaped the earth and its landforms.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Explain the geological origin, development, and formation.
2. Understand rock formation process and compare common rock forming minerals, mineral structures and mineral properties.
3. Correlate structural geology as it pertains to crustal deformation.
4. Identify and use scientific processes and the scientific methods as used by geologists and with other related scientific disciplines.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3									✓
CLO4								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
The origin, scope and subdivisions of Geological Sciences; Geology as a subdivision of geography; Earth Structure- Internal layers (Crust, Mantle and Core), seismically defined layers; Geo-internal structures; Isostasy.	CLO1 CLO2		

Geologic Time: Study of Time scale, Dendrochronology; Fossils, Evolution, and Extinction- Definition and classification; Fossilization process; Causes of extinction; Correlation; Unconformities. Principles of relative dating, dating with radioactivity – Significance, Radioactivity, Half-life, Radiometric dating, Carbon-14 dating.	CLO1 CLO2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Elements of Structural Geology: Primary and Nontectonic Structures, Force and Stress, Deformation and Strain, Rheology.	CLO3		
Study of major Brittle and Ductile structures: Fault and Fold- Geometry and displacement, Characteristics, classification	CLO3 CLO4		
Mineralogy: Definition of mineral; Compositions; Nature and properties; Rock forming minerals; Mineral classification.	CLO2		
Petrology: Definition of rocks; Formation; Compositions; Nature and properties; Classification; Igneous, Metamorphic and Sedimentary Petrology	CLO2		
Geology of Bengal Basin: Basin History, Tectonic Setting, Seismic Background.	CLO1		

Books Recommended:

1. Lutgens, F.K. 2011. *Essentials of Geology.* Prentice Hall. New Jersey.
2. Thompson, G.R. 1997. *Introduction to Physical Geology.* Brooks Cole. New York.
3. Montgomery, Carla W. 1995. *Environmental Geology.* McGraw-Hill Higher Education.
4. Skinner, B.J. & Porter, S.C. 1995. *The Dynamic Earth*. John Wiley & Sons, Inc. New York.
5. Holmes, D.L.1978. *Principles of Physical Geology*. ELBS and Thomas Nelson & Sons Ltd.
6. Spencer, E.W.1983. *Physical Geology*, Addison-Wesley Publishing Co, Inc. California.

Course Code: **GE-2103**	**Course Title:** **Hydrology and Fluvial Morphology**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 2nd Year 1st Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

The course is designed to understand the concepts, and importance of the hydrological cycle, precipitation and water loss; runoff and hydrograph; hydrological environments, and fluvial processes.

Course Objective:

This course focuses on an introduction to hydrology and investigates the processes that determine the form and evolution of rivers and streams.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Familiarize with the hydrologic cycle and the variety of processes involved within it.
2. Outline the physical processes in the context of flood hydrology, including the hydrological cycle in general, and rainfall, loss, and groundwater transport mechanisms.
3. Apply a range of common techniques, such as flood frequency analysis, probabilistic Rationale, regional methods to estimate design peak flows in rural areas.
4. Describe and to use maps and air photographs to identify and illustrate the variety of landforms involved in the terrestrial stage of the cycle.
5. Develop understanding of how river systems develop within catchments and how the form of a river is controlled by processes operating over a catchment.
6. Understand of how hydrology and sediment transport combine to control erosion and deposition.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3									✓
CLO4			✓						
CLO5						✓			
CLO6	✓					✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to Hydrology and Fluvial Morphology: Definition, concept and importance; Hydrologic Cycle, Water Balance.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Precipitation and Water losses: Types and forms, causes and measurements of precipitation and its analysis; types of water loss Infiltration, methods determining Infiltration, Factors affecting evaporation, methods determining evaporation and evapotranspiration.	CLO1		
Runoff: Sources, Catchment characteristics, Factor affecting runoff and runoff estimation Hydrologic Instrumentation	CLO2		
Hydrograph: Definition, Hydrograph separation, Unit Hydrograph, Preposition and application of unit hydrograph, Catchment modelling.	CLO2		
Groundwater: Definition, origin and depth of GW, springs and wells, Aquifers and Aquifers properties, Water yield, Groundwater flow, Groundwater investigations, Well tests, Steady state well Hydraulics, Methods of Groundwater exploration.	CLO2		
Hydrological Environments: Hydrogeological environments of Bangladesh, Sea-water intrusion in coastal aquifers, Hydrogeological models and their use in resource assessments	CLO5		
Fluvial Morphology: Origin and evolution- river, rill, gullies, and stream flow; Channel pattern: Stream channel and their characteristics, discharge measurements, velocity, flow; Morphometric analysis.	CLO4 CLO6		

Books Recommended:

1. Kiely, G.1998. Environmental Engineering. McGraw-Hill Book Co., New York.
2. Raghunath, H.M. 2014. Hydrology: Principles, Analysis and Design.
3. Abdel-Aziz, I. K. 1986. Groundwater Engineering. McGraw-Hill Book Co., New York.
4. Lioyd, J.W. & Heathcote, J.A. 1985, Natural Inorganic Hydrochemistry in relation to Ground Water: An Introduction; Claredon Press.

Course Code: GE-2104	**Course Title: Meteorology**	**Course Type: Core Course**	**Total Marks: 100**
Level: 2nd Year 1st Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

The course is designed to understand the concepts, and importance of atmospheric condition, distribution of temperature, atmospheric pressure and motion, atmospheric circulation and motion and climatic classification.

Course Objectives-

1. Learn meteorological phenomena.
2. Acquire how to calculate weather elements and interpret the weather condition.
3. Gain practical knowledge about weather forecasting.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Explain meteorological phenomena at various scales in terms of the basic physical and dynamic processes including radiative forcing, thermodynamics, microphysics, electricity, and optics.
2. Derive and interpret equations that describe atmospheric motions and dynamic processes for various spatial and temporal scales.
3. Explain climate phenomena including global circulations, past and current climate, and basic physical mechanisms, responsible for climate change.
4. Integrate and use meteorological knowledge and techniques in real-world applications.

Mapping of CLOs with PLOs:

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2									✓
CLO3							✓		
CLO4			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
The Atmosphere: Origin of the atmosphere; Structure and chemistry of the atmosphere; Weather and Climate**;** Weather Forecasting.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Temperature: Insulation, heat transferring process of atmosphere, Heat balances, (annul and diurnal variation of temperature) heat budget; Horizontal and vertical distribution of temperature; Inversion of temperature.	CLO2		
Atmospheric Pressure and Motion: Thermal and dynamic causes of pressure; Pressure gradient and types; Global pressure system; Atmospheric motion- pressure gradient and air circulation, Coriolis force, wind direction and related laws, frictional force; Resultant air circulation (geostrophic wind, gradient wind); Wind direction and speed; Wind classification	CLO2		
Atmospheric Circulation and Motion: Meaning and types; General circulation; General circulation mechanism; Zonal circulation; Tricellular merdional circulation; Seasonal shifting; Jet streams; El Nino and La Nina, ENSO.	CLO3		
Atmospheric Humidity and Moisture: Specific humidity and relative humidity; Humidity-Moisture Variables; The Hydrologic Cycle; Evaporation and Condensation; Condensation Forms; Fogs; Precipitation- Formation and Types; Cloud Formation and classification.	CLO2		
Air Mass and Fronts: Concepts of Air Masses and Fronts; Classification; Fronts and Frontogenesis: Classification and Frontals Zones; Frontal Wave Theory of Cyclogenisis	CLO2		

Books Recommended:

1. Barry, R.G. and R.J. Chorley, 1990. *Atmosphere, Weather and Climate*, Routledge: New York.
2. Lal, D.S. 1996. *Climatology*, Allahbad: Chaitanya Publication House
3. Tarbuck. E.J and Lutgens. F.K. 1990. *The Atmosphere*, New York: Printice Hall
4. Trewartha, G.T. 1981: *An Introduction to Climate*, McGraw-Hill, New York

Course Code: GE-2105	**Course Title: Social and Cultural Geography**	**Course Type: Core Course**	**Total Marks: 100**
Level: 2nd Year 1st Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

Social and Cultural Geography considers why geography matters to the analysis and understanding of social relations as well as cultural identities and values from the geo-environmental perspective.

Course Objectives-

1. To explore a number of key themes which are central to the practice of contemporary social and cultural geography.
2. To reconnoiter the link between environmental factors and sociocultural landscape.
3. To develop understanding on inequality and difference, society, nature, and landscape, space and consumption, and mobility complexities.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Explain the major methods and concepts it used in the systematic study of society and culture from the geographical perspective.
2. Analyze geographical work on culture and environment interaction reflectively and critically.

3. Acquire knowledge on chronological study of culture and different cultural identities in different levels.
4. Demonstrate critical awareness of issues surrounding the collection of 'data' of various types relevant to the study of geography.

Mapping of CLOs with PLOs:

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓					✓		
CLO3						✓			
CLO4			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Social and Cultural geography: Meaning; Nature and scope; Ongoing evolution. Traditions in social geography; Importance; Basic sociological concepts; Society and space; Society and Culture; Methods of sociological research. Sociological thinkers.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Social Institution and Organization: Definition, structure and function; Economic and Political systems; Social groups; Social interactions and relationships; Social institutions; Social Control.	CLO1		
Social Change in Modern Society: Meaning; Factors; Globalization and Glocalization.	CLO1		
Social Pathology: Definition; Social deviance and Crime-causes, geospatial pattern analysis and remedy; Construction of geographical profile; Theories of deviance.	CLO2 CLO4		
Culture: Meaning, characteristics, functions; Civilization; Cultural change - Normal and forced cultural changes, Acculturation and assimilation, Innovation and diffusion, Cultural Gap.	CLO1		
Evolution of material culture: Stone Age (Palaeolithic, Mesolithic and Neolithic), Age of metals; Cultural hearths.	CLO3		
Geographical Dimensions: Religion; Racial and ethnic differentiation; Spatial segregation of minority groups; Colonies, enclaves, and "ghettos"; Geolinguistics; Cultural composition and changes in Bangladesh.	CLO2		
Politics of Culture: Culture and ideology; Cultural genocide; Resistance; Cultural rights and justice; Popular culture and class politics; Countercultures; Home and Identity.	CLO2 CLO4		
Cultural Ecology: Adaptive mechanism; World development and ecological footprint; Energy demand and Sustainable development; Commodification, marginalization and degradation; Resource, War and Violence; Cultural heritage and conservation.	CLO2		

Books Recommended:

1. Sen, J. A. 2016. *Textbook of Social and Cultural Geography.* Kalyani Publishers
2. Low, M. 2018. The Sociology of Space: Materiality, Social Structures, and Action. Palgrave Macmillan.
3. Mohanti, G.S. 2007. Social and Cultural Geography. Isha Books.
4. Jackson, P.A. and Smith, S.J., 2014. *Exploring Social Geography (Routledge Revivals)*. Routledge.
5. Anderson, J., 2021. *Understanding cultural geography: Places and traces*. Routledge.
6. Crang, M., 2013. *Cultural geography*. Routledge.
7. Wolch, J. and Dear, M. eds., 2014. *The power of geography (RLE social & cultural geography): How territory shapes social life*. Routledge.
8. Cresswell, T., Anderson, K., Domosh, M., Pile, S. and Thrift, N., 2003. Handbook of cultural geography.

Course Code: GE-2106	Course Title: World Regional Pattern	Course Type: Core Course	Total Marks: 100
Level: 2nd Year 1st Semester		Contact Hours: 39	Credit: 3

Course Rationale:
This course introduces students to regions of the world in geographical context which focuses not only on knowledge of geographical locations and patterns, but also on processes by which regions come to be, and concepts with which students can explain regional differences.

Course Objectives:
1. To summarize the key physical and human features of the world
2. To distinguish between different types of regions
3. To focus on processes through which regions take shape focusing national and regional identity formation, state formation, migration, environmental change, and trade and/or the production of value.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Understand the patterns of human-environment processes (demographics, migration, language, religion, ethnicity, political processes, development and economic activities) in distinctive world regions including.
2. Evaluate the geographic situation, problems and prospects for each world region.
3. Explain patterns of physical processes in distinctive world regions including climate and landform evolution.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓	✓							
CLO2			✓						
CLO3		✓							

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Concept of regional pattern: Region, Types, Characteristics, scope and importance; Brief historical development of regional geography; Objectives and tools; Regionalization, internationalization and globalization; World Regionalization dynamics.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Regionalization Analytics: Indices and indicators; Issues of people and land, Political Freedom, Economic Inequality, Global Economy, Natural Environment, Human Development and Human Rights; grouping of areas with distinctive character; purposes and objectives of regionalization; methods of delineating regions.	CLO1 CLO2		
World Regional Pattern (Physical): Physical processes that shape the world regions- Geologic processes and landforms; patterns of climate, Soil and vegetation, distribution of mineral resources; and the world's oceans. World Physical Region- Thermal, Physiographic, Climatic, Vegetation and Soil; Issues and problems.	CLO3		
World Regional Pattern (Human): Human processes that shape the world region; Geography of development; World urbanization; culture, race and religions. Human Regions- Economic (Agricultural, Industrial and trade), Urban, Population, Language, Ethnic and Geo-political or strategic; Cultural Realms; Issues and problems.	CLO2		
Regionalization and development: Methods and approaches; Rostow's model of economic growth; Concept and politics of regional development; Measures of development levels; Developed, developing and least developed world.	CLO1		

Regionalization on different perspectives: Regional alliance; Political and Economic regionalization (Intergovernmental organizations, Trade blocs, Economic Communities, Regional integration, Supranational union); Regionalization and sociopolitical system. Facets of Globalization and Localization.	CLO2		

Books Recommended:

1. Hobbs, J.J., 2021. *World regional geography*. Cengage Learning.
2. Roger, M., 2017. *Regional geography: Theory and practice*. Routledge.
3. Manku, D.S. 2017. *A Regional Geography of the World.* Kalyani Publisher.
4. Berglee, R., 2012. World regional geography: People, places and globalization.
5. Gautam, A. *Regional geography of the world.* Sharda Pustak Bhawan.
6. Johnston, R., Hauer, J. and Hoekveld, G. eds., 2014. *Regional Geography (RLE Social & Cultural Geography): Current Developments and Future Prospects*. Routledge.

Course Code: **GE-2107**	**Course Title:** **Rocks and Minerals Lab**	**Course Type:** **Lab**	**Total Marks:** **100**
Level: 2nd Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

The course intends to develop learning and expanding understanding about the scale of Earth and the forces that shape it from hands on experience.

Course Objectives

1. To familiarize students with the scientific methodology used in geological studies.
2. To foster an understanding of geological studies and methodologies those can be seen and understood in the field.
3. To gain knowledge of the rocks and minerals that make up the earth and the ability to identify the most important types of rocks and minerals and how they are formed.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Describe the basic chemistry involved in mineral formation and structures.
2. Identify and classify common rock forming minerals.
3. Identify rocks (Sedimentary, Metamorphic, and Igneous) and the steps of the rock cycle related to their formation.
4. Use tools and concepts commonly used by geoscientists.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3				✓					
CLO4				✓					

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Identification of Rocks and minerals on hand specimen.	CLO3	Lecture PPT, Video Demonstration, Lab Experiment, On-field Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Reading/interpretation of topographic and geologic maps.	CLO1 CLO2		
Practical collection of subsurface geologic data and interpretation.	CLO4		
Field visit.	CLO2 CLO3 CLO4		

Books Recommended:

1. Lutgens, F.K. 2011. *Essentials of Geology.* Prentice Hall. New Jersey.
2. Thompson, G.R. 1997. *Introduction to Physical Geology.* Brooks Cole. New York.
3. Montgomery, Carla W. 1995. *Environmental Geology.* McGraw-Hill Higher Education.
4. Skinner, B.J. & Porter, S.C. 1995. *The Dynamic Earth*. John Wiley & Sons, Inc. New York.

Course Code: GE-2108	**Course Title: Geographic Information Systems (GIS) Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 2nd Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

This course is designed to provide the students with an understanding of the methods and theories of spatial analysis that will allow students to apply GIS knowledge and skills to everyday life and their chosen careers and to prepare them for success in upper division courses in GIS at other institutions.

Course Objectives:

1. To introduce the student to the basic principles and techniques of GIS.
2. To compile, analyze, and present geospatial data while emphasizing the value of visual communication.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Understand the principles and operation of GIS software.
2. Learn to compile, analyze, and present geospatial data while emphasizing the value of visual communication.
3. Execute the basic geoprocessing functions and solve spatial problems utilizing GIS mapping and statistical methods.
4. Develop and print maps with industry standard and interpret output for finished maps, documents, and reports.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2			✓						
CLO3			✓						
CLO4									✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to GIS software: ArcGIS and QGIS.	CLO1	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Geodatabase creation and management	CLO2		
Creation of spatial data layer and editing: Georeferencing, digitizing, editing, topology creation and analysis, input non-spatial (attribute) data, editing and integration with spatial data.	CLO2		
Geoprocessing: Buffer, Clip, Intersect, Union, Merge, Dissolve.	CLO3		
Raster data analysis: Classification, Raster calculator, Terrain mapping (DTM, DSM, TIN), Boolean operations, Viewsheds/watershed analysis.	CLO3		
Spatial interpolation	CLO3		
Map symbolization and layout	CLO4		

Books Recommended:

1. Introduction to geographic information systems- Chang, Kang-Tsung
2. Introductory Readings in Geographic Information Systems – D.J. Peuquet, D.F. Marble.
3. Principles of geographical information systems. - Burrough, Peter A., et al.
4. Principles of Geographical Information Systems–Spatial Information Systems and Geostatistics- Burrough P. A. & McDonnell R. A.

Course Code: GE-2109	Course Title: Biophysical Environment Lab	Course Type: Lab	Total Marks: 100
Level: 2nd Year 1st Semester		Contract Hours: 39	Credit: 1.5

Course Rationale:

This course will deal with living forms, Phytoplankton, Zooplankton, Ecological survey of plant and animal population, and field survey on environmental biology.

Course Objectives:

1. Apply basic concepts in different environmental biology.
2. Discuss local and global issues based on the knowledge gained throughout the course.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to

1: Know biological diversity.
2: Develop the capacity of collaborative work on teams.
3: Know different phytoplankton, zooplankton.
4: Prepare laboratory report and have a communication skill

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Field survey on Environmental Biology;	CLO 1 CLO 2	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Collection and methods of study of biological specimens;	CLO 1		
Identification and characterization of Phytoplankton and Zooplankton;	CLO 3		
Study of plant population by Quadrate method.	CLO 3		
Study of ecosystem composition in IU Campus and surrounding areas.	CLO 4		

Books recommended:

1. Sharma, O.P. 1980. A Manual of Practical Botany. Pragoti Prakashana, Meerut, India.
2. Kenneth, L.G. 1971. Guide to Identification of Marine and Estuarine Invertebrates. John Wiley & Sons Inc.

SECOND YEAR SECOND SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-2201	Climatology	2	15	10	5	70	100
2	GE-2202	Geomorphology	3	15	10	5	70	100
3	GE-2203	Soil and Environment	2	15	10	5	70	100
4	GE-2204	Economic Geography	3	15	10	5	70	100
5	GE-2205	Resource Management and Planning	2	15	10	5	70	100
6	GE-2206	Settlement Geography	2	15	10	5	70	100
7	GE-2207	Soil and Environment Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
8	GE-2208	Geodetic Surveying Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
9	GE-2209	Observational Survey: Physical Environment Lab	2	50 (Field Report)	30 (Overall FW Performance)	20 Viva/Quiz/ Presentation	0	100
10	GE-2210	Viva-Voce	1	Nil	Nil	Nil	100	100
Total			20.0					1000

Course Code: GE-2201	**Course Title: Climatology**	**Course Type: Core Course**	**Total Marks: 100**
Level: 2nd Year 2nd Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

This course is designed to provide an overview of atmospheric processes and climatic elements, followed by a more detailed examination of the spatial distribution of climates.

Course Objectives-

1. To discuss central concepts in climate physics.
2. To discuss main features of the atmospheric and ocean general circulation and understand the energy transports associated with each.
3. To introduce the fundamental physical mechanisms for large scale climate variability and change.
4. To make understand the main feedback mechanisms in the climate system.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Critically analyze the interactions between the atmosphere and the surface and apply this understanding in an environmental decision-making context.
2. Analyze and interpret the relationships between large-scale ocean-atmosphere processes and regional-local climates, using simple statistical techniques.
3. Synthesize their understanding of climate processes at a range of scales to explain and analyze the applications of climate modelling in research and policy contexts.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2	✓	✓							
CLO3			✓					✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Definition; Scope; Subject matter; Historical Perspective; Subdivisions and professional scope	CLO 1		

Climate System: Atmospheric composition, Temperature, Hydrostatic Balance, Humidity, Cryosphere	CLO 2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Elements of the Climate: Factors of climate, Earth's energy balance, Surface energy balance, Hydrological Cycle.	CLO 1		
Application of Climate Science: Human Adjustment with Climate; Macro and Microclimate; Human Roles in Changing Climate Variables.	CLO 1		
Climatic Classification: Spatial scales for climatic regions, Approaches to climatic classification, Empirical Classification (Koppen, Thornwaite), Genetic Classification (Oliver-Hidore), Composite Classification of G.T. Trewarth	CLO 2		
Spatial Distribution of climate: Climatic Types and Biome	CLO 2		
History and evolution of Earth's Climate: Instrumental and historical record, Paleoclimatic Record, Uses of paleoclimatic data	CLO 1		
Global Climate Model: Mathematical modeling, Atmospheric, Land and Ocean Component, Validation of climate simulation models, Sensitivity estimates from climate models, Coupled atmosphere-ocean processes and thermohaline circulation	CLO 3		

Books Recommended:

1. Pelling (2011). Adaptation to Climate Change: from Resilience to Transformation. Oxford: Routledge.
2. Inderberg H and et al. (2014): Climate Change Adaptation and Development: Transforming Paradigms and Practices. Oxford: Routledge.
3. Goosse, H., Barriat, P.Y., Lefebvre, W., Loutre, M.F. and Zunz, V., 2008. *Introduction Climate Dynamics and Climate Modelling*. Université catholique de Louvain.

Course Code: GE-2202	**Course Title: Geomorphology**	**Course Type: Core Course**	**Total Marks: 100**
Level: 2nd Year 2nd Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

The course is designed to understand the fundamental concepts, and importance of geomorphology, geomorphic models, landform processes, and geographic cycle.

Course Objectives:

1. Develop a broad knowledge of the scope and main areas of Geomorphology.
2. Classify and describe landforms in a variety of environmental settings.
3. Explain the theories of Uniformitarianism and Catastrophism, and appreciation.
4. Analyse spatial and temporal scales in geomorphology and geomorphological systems in terms of resisting and driving forces.
5. Use and evaluate quantitative geomorphological data with numerical, statistical, and cartographical methods.
6. Synthesize and communicate mainstream scientific findings.
7. Ability to analyse relationships between physical and human aspects of environments and landscapes.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Describe the exogenous and endogenous processes in the landscape, their importance in landform development, and distinguish the mechanisms that control these processes.
2. Analyze how variations in climate, tectonics and environment affect the development of landforms.
3. Assess how different scales of time and space affect geomorphological processes.
4. Explain and apply geomorphological methods used in research today.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3			✓						
CLO4								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Concept of Geomorphology: Definition, nature, scope and development**;** Methods of explanations and fundamental concepts**;** Geomorphic models, Structural geomorphology	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Theories of landform development: significance and goals of geomorphic theories; historical perspective; bases and types of geomorphic theories; Major geomorphic theories.	CLO1 CLO2		
Isostasy: discovery of the concept; Concept of Airy, Pratt, Hayford and Bowie, Joly, Holmes, Global isostatic adjustment.	CLO1		
Gravitational Transfer: Mass movement- causes, classification, factors; Slow and rapid movement activity; Mass Wasting; Hill Slope studies – Slope classification, elements, slope development and theories, slope failure and erosion.	CLO1		
Geographic Cycle: Cycle of erosion – Origin and development, Theory of Davis; Model of Penck; Erosion surfaces and peneplains.	CLO2 CLO3		
Process and Form: Weathering and related Landscapes; Geomorphic process and landforms- Karst, Coastal, Arid and Semiarid, Glacial, Periglacial.	CLO1		
Anthropogenic Geomorphology: Meaning and concept; Human impact on environmental process. Man, and Environmental processes.	CLO4		

Books Recommended:

1. Knighton, D.; Fluvial Forms and Processes, Oxford University Press, New York, 1998.
2. Leopold, L.B., M.G. Wolman, and J.P. Miller. Fluvial Processes in Geomorphology, Dover Publications, Inc., New York, 1964.
3. Strahler, A.H. and Strahler; Modern Physical Geography, John Wiley and Sons (Asia) Pvt. Ltd. 1992.
4. Savindra Singh; Geomorphology, PrayagPustakBhavan, Allahabad, 2002.
4. Thornbury, W.D.; Principles of Geomorphology, Mathuen, London. 1960.
5. Chorley, R.J., et.al.; Geomorphology, John Wiley and Sons, New York, 1984.

Course Code: GE-2203	**Course Title: Soil and Environment**	**Course Type: Core course**	**Total Marks: 100**
Level: 2nd Year 2nd Semester		**Contract Hours: 26**	**Credit: 2**

Course Rationale:

This course will help the students to understand Soil Environment in relation to another sub-subject. It will explore the soil physical properties, soil chemistry, soil taxonomy, soil erosion and conservation and finally soil quality.

Course Objectives:

1. Identify, explain, and compare the main characteristics of soil-forming factors and processes across different environmental settings.
2. Explain and predict the effects of physical, chemical, and biological processes on soil properties across different environments.
3. Recognize and evaluate the roles of soil as a natural resource of a country, as well as the need for its protection.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Build up fundamental knowledge and skills in the different areas of soil science.
2. Identify appropriate ways and methods for sustainable soil use in connection with various activities.
3. Enhance professional skills in Soil Science examination.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Soil as an interface in the earth, as a component of ecosystem, importance of soil.	CLO 1 CLO 2	Lecture PPT, Video, Group discussion, Q/A, Discussion,	Class Test, Quiz, Assignment, Presentation, Final Examination
Formation: Process of soil formation; Control factors of soil formation (parent material, time, climate, plant and animals, topography); Profile development	CLO 1		
Properties of Soil: Physical, Chemical, Biological.	CLO 2		
Soil Taxonomy: Diagnosis of surface and subsurface horizon; Soil Moisture and temperature regimes; Taxonomy Category; Geographical distribution of Soil type; Generalized Classification of Soil.	CLO 3		
Soil Erosion and Management: Soil erosion, Soil degradation, Water Erosion- Soil-Loss equation, Tolerance value, Erosion on urban lands, Erosion costs; Wind Erosion-Type, Wind erosion Equation, Affecting factors, Wind erosion controls; Soil management concept and environment; Management practices and importance.	CLO 2 CLO 3		

Books recommended:

1. Weil, R. R. and Brady, N. C. 2016. Elements of the Nature and Properties of Soils. Pearson: Maryland.
2. Hillel, D. 2013. Fundamentals of Soil Physics. Academic Press: New York.
3. Wild, A. 1996. Soils and the Environment. Cambridge University Press.
4. Foth, H. D. 1990. Fundamentals of Soil Science. John Wiley and Sons.

Course Code: **GE-2204**	**Course Title:** **Economic Geography**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 2nd Year 2nd Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

This course is designed for study of spatial distributions of resources, production, and consumption, and of the processes influencing these distributions over time. It also provides an insight on a wide variety of research approaches, both theoretical and empirical, and both qualitative and quantitative techniques.

Course Objectives:

1. To develop an understanding and appreciation of the concerns of economic geographers.
2. To develop a strong comprehension of the theoretical aspects of economic geography.
3. To apply these theoretical concepts to the analysis of existing spatial patterns and recent changes.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Develop geographical mode of thinking in application to various economic phenomena.
2. Evaluate the applicability and importance of economic geography in analyzing the modes of societies and economies' operation.
3. Explain, synthesize, and apply key concepts, techniques, and theoretical approaches in economic geography.
4. Establish and analyze spatial patterns of economic and environmental development.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3		✓							
CLO4							✓	✓	✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Definition, scope and methodology of economic Geography. Fundamental Concepts of Space, Location and	CLO1 CLO3		

Interaction; Distribution, Processes and Patterns; Production, Consumption and Exchange; Major theories and models.		Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Economic Activities: Nature, Characteristics and Classification -Primary, Secondary, Tertiary & Quaternary	CLO1		
Distribution of Major Resources of the World: Spatial distribution, production, utilization and trade of mineral, agricultural and forest resources; Hydroelectricity and atomic energy; Growth and development of manufacturing industry, Major Industrial and Manufacturing regions of the world; Blue Economy; Environmental impact of resource extraction and utilization.	CLO2 CLO4		
Transportation and Economy: Basic principles and characteristics of Transportation, Means of transportation and their relative merits and demerits; Functional relation between economy, trade, and environment.	CLO2 CLO4		
International trade and trade routes: Trade and its effect on the economy of the region; Major Economic Blocks of the World; Nature of Changes in Economic Geography; Globalization and Its Impact; International Trade Politics.	CLO2 CLO4		
Economic Growth and Development: Concept of Distance Decay Function; Theories of Economic Growth and Development (e.g., Marx, Rostow); Determinants and measurement of Economic Development, Obstacles to Economic Development; Concept and development of E-economy.	CLO3 CLO4		

Books Recommended:

1. Coe, N.M., Kelly, P.F. and Yeung, H.W., 2019. *Economic geography: a contemporary introduction*. John Wiley & Sons.
2. Maurya, S.D. 2018. Economic Geography. Pravalika Publications.
3. Hodder, B.W. and Lee, R., 2015. *Economic geography*. Routledge.
4. Aoyama, Y., Murphy, J.T. and Hanson, S., 2010. Key concepts in economic geography. Sage.
5. Wood, A. and Roberts, S., 2012. *Economic geography: places, networks, and flows*. Routledge.
6. Anderson, W.P., 2012. *Economic geography*. Routledge.

Course Code: GE-2205	**Course Title: Resource Management and Planning**	**Course Type: Core Course**	**Total Marks: 100**
Level: 2nd Year 2nd Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

The course is designed to understand the fundamental concepts, and importance of natural resource management, resource allocation and classification, planning, different methods and techniques of resource management.

Course Objectives:

The course seeks to provide students with expert knowledge in approaches to effectively manage natural resources in the context of wider sustainability issues and environmental management.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Describe ecological processes, including human impacts that influence ecosystems change, natural succession and the future sustainability of natural resources.
2. Characterize natural resources and be able to quantify at least one of these resources.
3. Envision desired future conditions in an area to achieve a set of natural resource-related objectives, prescribe management actions needed to achieve those objectives, and evaluate success of these actions.
4. Describe how the use, management and allocation of natural resources are affected by laws, policies, economic factors of private and public resource owners and users.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							

CLO3									✓
CLO4								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Fundamentals of Resource and its Management: Definition and concepts, scope and approaches; The evolution of the field of resource management; Resource allocation.	CLO2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Resource Classification: Resource ecosystem; basic terms; Natural resource classification, Spatial distribution and concentration; Nature of resources; Resource profile of Bangladesh.	CLO2		
Resource Planning and Management: Concept and approaches; Planning process; Sustainable natural resource management- Renewable and Non-renewable; Natural resource governance.	CLO3		
NR Appraisal and Monitoring: Definition; Importance; Constraints; Methods; Evaluation; GI technologies and resource monitoring	CLO3		
Resource Conservation: Meaning; strategies and techniques, important resources and their conservation strategies with particular reference to Bangladesh.	CLO1		
Conflict and Cooperation: Global resource exploitation and conflicts; Institutional reforms; Policy instruments; International order and co-operation	CLO1		
Climate change and NRM: Adverse effects; Food security; Adaptation and mitigation strategies	CLO4		
NRM in South Asia: Regional overview; Political economy of natural resources; Pressure factors; Current policies and Responses	CLO1 CLO4		

Books Recommended:

1. Mitchell, B. 2002. *Resource and Environmental Management*. Pearson Education Ltd.: Harlow.
2. Mitchell, B. 1979. *Geography and resource analysis*. Longman Group Limited: New York.
3. Husain, M. 1994. *Resource Geography*. New Delhi: Anmol Publication Pvt. Ltd.
4. Omara-Ojungu, P. H. 1992. *Resource Management in Developing Countries*, Longman Scientific & Technical.
5. Zimmerman, E. W. 1951. *World Resources and Industries: A Functional Appraisal of Availability of Agricultural and Industrial Resources*. Harper & Collins.

Course Code: **GE-2206**	**Course Title:** **Settlement Geography**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 2nd Year 2nd Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

Comprehend the establishment and development of human settlements in addition to the process of urbanization, and other related issues of settlements in the developed and developing worlds.

Course Objectives:

This course will provide a comprehensive knowledge of the location, spatial pattern, and process of settlements formation and models of settlements development.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Understand the similarities and differences between rural and urban settlement morphology and planning perspective.
2. Explain settlement origins and how the earliest settlements developed independently in the various hearth areas.
3. Describe the models of rural and urban structure, comparing and contrasting urban patterns in different regions of the world.
4. Connect the nature and causes of the problems associated with over urbanization in developing countries.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3		✓					✓		
CLO4								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Nature, scope and evolution of settlements**;** Significance of settlement geography**;** Approaches and principles of settlement geography; Basic Terminology; Census, town, city, legal city, geographic city, desakota, dying city, edge town, corporate and incorporated area, metropolis, Megalopolis, cosmopolitan, acropolis.	CLO 1 CLO 2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Settlement Morphology: Lay-out, plan and internal structures; Components; Size and spacing; Spatio-Functional Organization of space; Transportation Linkage.	CLO 1		
Rural Settlements: Type, forms and patterns of settlements; house types and their evolution in Rural areas; Contrast between More Developed Countries (MDCs) and Less Developed Countries (LDCs); commercial functions of rural settlements and their role as a market town; Infrastructure and services in rural settlements.	CLO2 CLO 3		
Urban Settlements: Historical evolution of urban settlements, Urbanization, urbanism, counter- Urbanization, pseudo-urbanization, causes of development, stages and world pattern; Western and Non-western urbanization; Rural-urban fringe, suburbs and satellites; Commercial structures	CLO 2 CLO 3		
Factors influencing Human Settlements: Location; Landscape designs; Parks and reserves; Climate, Economic	CLO 1		
Conservation and Planning: Acquisition of territory; Land tenure; Patterns of ownership; Rural communities, Rural conservation and planning.	CLO 4		
Theories of Urban structures- Concentric Zone Theory, Sector Theory, Multiple Nuclei Theory, Herd's Land Value Theory; CBD: Delineation Methods; Intra-city Population Distribution- Colin Clarke's Model; City-size: Rank Size Rule	CLO 1 CLO 2		
Modeling Rural Settlement: Simulative structure model; Dynamic Central Place Model; Ecological Model; Diagrammatic Model; Expansion Model; Structural Model of Doxiadis; Model of Alpha and Beta technologies; Model of rural settlements in relation to land management- R.K. Udo's model, Prothero's model; Case studies- Model of Zande Settlement Scheme, Tanzanian Resettlement Scheme etc.	CLO 2		

Books Recommended:

1. Remote sensing and image interpretation -Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2004).
2. Remote sensing digital image analysis -Richards, J. A., & Richards, J. A. (1999).
3. Fundamentals of remote sensing and air photo interpretation. -Avery, T. E., & Berlin, G. L. (1992).
4. Remote Sensing of the Environment: An Earth Resource Perspective - Jensen, J. R. (2009).
5. Introduction to Remote Sensing- Campbell J. B. (2007).

Course Code: GE-2207	Course Title: Soil and Environment Lab	Course Type: Lab	Total Marks: 100
Level: 2nd Year 2nd Semester		Contract Hours: 39	Credit: 1.5

Course Rationale:
This course will deal with soil sampling, soil physical and chemical characteristics. The students will be exposed to various standard protocols used in soil monitoring.

Course Objectives:
1. Conduct basic soil sampling and selected soil analyses, as well as interpreting the obtained results.
2. Identify appropriate ways and methods for sustainable soil use in connection with various activities.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-
1. Know the soil sampling technique.
2. Analyze soil quality (physical and chemical parameters).
3. Collaborate and work in groups.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning and Assessment Strategies	Assessment Strategies
Soil Sampling Method: Collection to analysis	CLO 1 CLO 3	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Soil Physical Properties: Soil Texture; Soil Moisture; Soil Temperature.	CLO 1		
Soil Chemical Properties: Determination of soil pH; Alkalinity; Acidity.	CLO 2		

Books recommended-
1. Ryan, J., Estefan, G., and Rashid, A. 2001. *Soil and plant analysis laboratory manual*. ICARDA.
2. Jones Jr, J. B. (Ed.). 1999. *Soil analysis handbook of reference methods*. CRC press.

Course Code: GE-2208	Course Title: Geodetic Surveying Lab	Course Type: Lab	Total Marks: 100
Level: 2nd Year 2nd Semester		Contact Hours: 39	Credit: 1.5

Course Rationale:

This course is designed to provide a basic understanding of the theory and practice of geodetic engineering surveying techniques.

Course Objectives:

1. Develop an understanding of the basic principles of surveying including the Traditional measurements and representations as well as such modern techniques as Global positioning.
2. To obtain and use topographic information that can help their design projects, such as highway design and land development.
3. To gather field data and use them for preparing maps.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Conduct standard tests, measurements, and experiments and analyze and interpret the result.
2. Be technically adept in Surveying Technology as well as supporting math and science disciplines, allowing to assist professional land surveyors in various surveying and mapping projects.

3. Measure, collect, conduct testing data accuracy standards, and manage spatially referenced data from different sources into common surveying information and mapping systems.
4. Design solutions for well-defined technical problems and assist with engineering design of systems, components, or processes appropriate to the discipline.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1				✓					
CLO2		✓							
CLO3			✓						
CLO4				✓		✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Principles and Concepts of Geodetic Survey.	CLO1	Lecture PPT, Video Demonstration, On-field Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Levels and Leveling: Definition, classification, terminology, adjustment of level, procedure of leveling operation, effect of curvature & refraction on leveling, errors in leveling, types of leveling.	CLO2		
Triangulation Survey: Principle, Operations, Triangulation system - Triangles, Quadrilaterals, Polygons, Traversing.	CLO3		
Theodolite Surveying: Equipments, Data recording and plotting. Advantage and disadvantage of the process.	CLO3		
Introduction to Total Station Survey: Introduction to the machine, setting up the machine, methods of angle measurement, methods of coordinate measurement, principles of operation.	CLO4		
Introduction to GPS Survey: Working principles of GPS receiver, different features of GPS receiver, opeRationale processes related to GPS survey.	CLO5		

Books Recommended:

1. Advanced Surveying- Egr. Ismail Hossain & Md. Nazimuddin,
2. A Textbook of Surveying, -Egr. M. Shahjahan & Eng. M. A. Aziz.
3. Surveying for an engineer; - J. Uren and W. F. Prince
4. GPS satellite surveying- Leick, A. (2004)

Course Code: GE-2209	**Observational Survey: Physical Environment Lab**	**Course Type: Field Work**	**Total Marks: 100**
Level: 2nd Year 2nd Semester			**Credit: 2**

Course Rationale:

This course will deal with the on-field assessment of physical components of the environment.

Course Objectives:

1. To observe and understand the physical geography of a location.
2. To collect and identify various rocks and minerals samples available in the field.
3. To observe, survey and map the geologic and geomorphic variations.
4. To demonstrate various environmental sample (e.g., soil, water and air) collection techniques.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1: Develop the basic concepts of physical geographic survey.
2: Understand the techniques of geological sample collection and map mapping.
3: Learn environmental sample collection techniques.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓	✓				✓	
CLO2			✓	✓					
CLO3		✓		✓					

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Observation of the physical geographic features during the field work.	CLO 1	Lecture PPT, Group discussion, On-field demonstration.	FW Report, Presentation, Viva
Geologic sample (rocks and minerals) collection, identification, and mapping of geologic structures.	CLO 2		
Collection of various environmental samples (soil, air and water).	CLO 3		

Course Code: **GE-2210**	**Course Title:** **Viva-Voce**	**Total Marks:** **100**
Level: 2nd Year 2nd Semester		**Credit: 1**

Rationale:
The course aims to enable the students to attend placements and be better performers in their future.

Objective:
This viva aims to assess students' understanding based on course objectives covering all the courses of 2nd year 1st semester and 2nd semester.

Course Learning Outcomes (CLOs):

1. Prepare to face interview both in the academic and the service sectors.
2. Express themselves confidently with good communication skills.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1					✓	✓			
CLO2					✓	✓			

THIRD YEAR FIRST SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-3101	Geographical Concept and Methodology	3	15	10	5	70	100
2	GE-3102	Geography of Bangladesh: Physical and Human Environment	3	15	10	5	70	100
3	GE-3103	Agricultural Geography	3	15	10	5	70	100
4	GE-3104	Water Supply, Health and Sanitation	3	15	10	5	70	100
5	GE-3105	Remote Sensing	3	15	10	5	70	100
6	GE-3106	Quantitative Techniques in Geography & Environment	2	15	10	5	70	100
7	GE-3107	Statistical Tools and Techniques Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-3108	Remote Sensing Application Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-3109	Climate Modeling Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
Total			21.5					900

Course Code: GE-3101	**Course Title: Geographical Concept and Methodology**	**Course Type: Core Course**	**Total Marks: 100**
Level: 3rd Year 1st Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

The course is designed to develop the understanding of epistemological, scientific, and philosophical foundation of geography as well as geoscientific methodology to study the earth.

Course Objectives:

1. To establish knowledge base on how geography works, its central issues, concepts and arguments, its historical development, relevance, and function in modern society.
2. To provide an insight into geoscientific methods and objectives for gaining analytical skills.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Develop advanced knowledge about present debates, concepts, and philosophical perspectives in geography with a focus on the main lines of development and key concepts.
2. Identify and analyze key mechanisms underlying conceptual and philosophical developments in the discipline.
3. Learn about general strategies for knowledge production and overarching methodological alternatives.
4. Develop concepts and approaches in the methodology of geographical research with a high degree of precision and reflection.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3				✓					
CLO4			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: The nature of scientific knowledge; What is Geography; Geography as natural science and social science; Scope and its subject matters, Essential concepts	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Roots of Geography: Prehistoric and Medieval ideas – Greek, Roman, Indian, Chinese and Arab; The Renaissance – Varenius and Immanuel Kant; Age of exploration and its impact; Classical period – Humboldt and Ritter.	CLO2		
Modern geography: Emergence and foundation of scientific geography; Dualism and Dichotomies; Growth of Spatial science.	CLO2		
Paradigms and Revolutions: Paradigms; Quantitative revolution; Spatial and locational analysis; System analysis; Regional Concept; Critical Revolution; Neogeography; Geosophy; Applied geography.	CLO2		
Schools of Geography: German, French, American, British and Soviet School.	CLO3		
Major Approaches in Geography: Earth-Science approach; Regional and System approach; Ecological approach; Landscape approach; Spatial and locational approach; Behavioral approach.	CLO4		
Scientific methods in Geography: Significance and features; Key elements; Logic; Theory; Modelling; Critical Views; Status of geography.	CLO4		

Books Recommended:

1. Chorley, R. & Haggett, P. 2014. *Physical and Information Models in Geography*. Taylor & Francis Ltd.
2. Hussain, M. 2007. *Models in Geography*. New Delhi: Rawat Publications.
3. Siddhartha, K. 2013. *Models and Theories in Geography*. Kisalaya Publications Pvt. Ltd
4. Adhikari, S. 2011. *Fundamentals of Geographical Thought*. Chaitanya Publishing House, Allahabad, India.
5. Hussain, M. 2004. Evolution of Geographical Thought. Rawat Publications. India.
6. Castree, N., Rogers, A. and Sherman, D.J. eds., 2005. Questioning geography: fundamental debates. Oxford: Blackwell.
7. Harvey, D., 2002. *Spaces of capital: Towards a critical geography*. Routledge.

Course Code: GE-3102	Course Title: Geography of Bangladesh: Physical and Human Environment	Course Type: Core Course	Total Marks: 100
Level: 3rd Year 1st Semester		Contact Hours: 39	Credit: 3

Course Rationale:

This course is designed to make the students familiar with the physical and human environment of Bangladesh.

Course Objectives:

1. To enhance the skills and deep understanding about the formation of physiography and physiographic divisions of Bangladesh.
2. To familiarize the geographical setting of the Natural features such as the changes in topography, various compositions of soils, geomorphologic patterns, and basins of India, watershed, and tributaries.
3. To gain basic knowledge of climate systems, regional developments, irrigation systems, agricultural activities, rural-urban settlements, formation of demography and its migrations. Trades, Commodities, Industrial activities at various scales.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Gain solid knowledge of physiography, hydrography, climate, soils, land utilization, migration and settlement patterns, transportation infrastructure, and human and natural resources.
2. Develop understanding of urban, rural, and agricultural characteristics of the country.
3. Understand the socioeconomic and politico-environmental complexities.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1		✓							
CLO2						✓			
CLO3								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Locational characteristics and importance; evolution of boundary.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
The Geo-Environmental setting: Geological and tectonic aspects, relief and physiographic structure, river systems and wetlands, climate and climatic hazard, soils- classification, agro ecological zone.	CLO1		
Major issues of physical environment: Environmental pollution (soil, water & air), Land use change, Deforestation; Effect of climate change; Impact of major development (engineering) projects; Major regions of environmental concern; Hydro-metrological and tectonic hazards- Cyclone, Flood, Riverbank erosion, Water logging, Earthquakes, Drought, Heat wave, Cold Wave.	CLO1		
Cultural Background and Environment: Society and Culture; Administrative setup- Central and Local Government	CLO3		
Major Economic Activities: Primary- agriculture, fisheries. Secondary- industries. Tertiary- trade, transport and service; ICT; Formal and Informal economic sectors of Bangladesh.	CLO3		
Pattern of human settlement: Rural settlement: Pattern, Types, Market, Urban settlements: urbanization, urban development, urban centers.	CLO2		
Selected issues and challenges of development: Regional inequality and regional development; Use and misuse of land and water resources and their development; Human Resource development; Population pressure and its impacts; Gender disparity; Donor's Assistance and development.	CLO3		

Books Recommended:

1. Rashid, Haroun Er. Geography of Bangladesh. Routledge, 2019.
2. Brinkman, R., 2015. The physical geography of Bangladesh.
3. Dewan, A. and Corner, R. eds., 2013. Dhaka megacity: Geospatial perspectives on urbanisation, environment and health. Springer Science & Business Media.
4. Paul, B.K. and Rashid, H., 2017. Climatic hazards in coastal Bangladesh. Science Direct.

Course Code: **GE-3103**	**Course Title:** **Agricultural Geography**	**Course Type:** **Core course**	**Total Marks:** **100**
Level: 3rd Year 1st Semester		**Contract Hours: 39**	**Credit: 3**

Course Rationale:

Present module of agricultural geography provides a strong theoretical base, models and theories of agricultural land use which helps the students to analyze the spatial variations of land use, cropping patterns, crop concentration, crop combination, agricultural productivity and agricultural regionalization.

Course Objectives:

1. To know the agricultural variations over the world surface in terms of socioeconomic, demographic and physical indicators which determine the productivity rate of agriculture.
2. To know the diffusion of agricultural technology and crops over the period.
3. Analyze the crop region with reference to crop area crop combination.
4. Understand the concepts, techniques, and methods of agricultural regionalization.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1. To Introduce students Agricultural activities and their relation with Geography.
2. To Familiarize the students with new modern technical methods and their applications in agricultural activities around the world.
3. To enable students to apply previous knowledge in Problems and Prospects in agriculture.
4. To utilize the knowledge of agricultural regionalization in agricultural planning and management.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1		✓							
CLO2							✓		
CLO3								✓	
CLO4						✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Definition and Scope; Methods; Significance; Themes and Concepts; Approaches; Recent trends; Nature; Agricultural statistics and sampling	CLO 1	Lecture PPT, Video, Group discussion, Q/A, Discussion,	Class Test, Quiz, Presentation , Assignment, Final Examination
Origin and Dispersal of Agriculture: Major Genecenters; Domestication of Animals; Agricultural diffusion; Development and spread of agricultural technology; Agricultural Classification-Agricultural systems of the world, Types of Agriculture.	CLO 2		
Factors of Agriculture: Physical, Biological and Socio-economic factors; Land, Labor, Capital, and Scale of Production; Ownership, Tenancy, Farm Size, Intensification; Co-operation and Mechanization; Transportation and Marketing; Processing and storing.	CLO 3		
Theoretical Approaches and Modeling in Agriculture: Theoretical models- Input-Output, Decision making, Diffusion, Von Thunen's, Jonasson's model, Game Theory, Crop Combination Regions (Weaver Model); Significance and limitations of models.	CLO 4		
Agricultural Regionalization: Dimensions; Methodology; Crop diversification, Agricultural productivity and measurement, ranking coefficient method, Land classification and capability; World Agricultural regions, Whittlesey's classification of agricultural regions.	CLO 3 CLO 4		
Food, Nutrition and Health: Major food crops, Food from animals; Causes and spatial patterns of hunger, Eradication of hunger; Nutrition and health.	CLO 1		
Green Revolution: History; Advantages and disadvantages of HYV; Socioeconomic constraints in adoption HYV; Problems and prospects of green revolution; Farm size variation; Green revolution and social tension; Ecological implications; GMO Farming.	CLO 1		
Agriculture in Bangladesh: Characteristics, Types, Pattern, Land Use, Policies, Crop Diversification, Major crops, Agro-climatic regions, Problems and prospects.	CLO 1		

Books recommended:

1. George, T. and Stensel, H. D. 2002. Wastewater Engineering: Treatment and Reuse. New York, NY: McGraw-Hill.

2. Reynolds, T. D. and P. A.1996. Unit Operations and Processes in Environmental Engineering. 2nd ed. Boston, MA: PWS Publishing Company. ISBN: 0534948847.
3. Woodard and Curran, Inc. 2006. Industrial Waste Treatment Handbook; 2nd ed.; Elsevier Butterworth-Heinemann.

Course Code: GE-3104	**Course Title: Water Supply, Health, and Sanitation**	**Course Type: Core course**	**Total Marks: 100**
Level: 3rd Year 1st Semester		**Contract Hours: 39**	**Credit: 3**

Course Rationale:
The course provides theoretical background and practical expertise that should underline water, sanitation and hygiene (WASH) interventions, in order to maximize health and social benefits.

Course Objectives:
1. Understand the basic concept of water supply, health and sanitation.
2. Know the major technologies and processes of water/sanitation infrastructure in different countries.
3. Investigate the concept of community participation and its role in enabling project success and sustainability.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to

1: Know different technologies/methods for small-scale water abstraction and water treatment that can be used at household or small community level.
2: Know the wider scale of social, economic, institutional, and environmental contexts of water, hygiene and sanitation strategies.
3: Understanding of the principles of behavior change in the water, sanitation and hygiene sector and the pros/cons of alternative ways to measure behavior change outcomes.
4: Facilitate planning, financing, implementation and operation and maintenance of decentralized water supply and sanitation infrastructures based on stakeholder participation and community management.

Mapping of CLOs with PLOs:

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1		✓							
CLO2							✓		
CLO3								✓	
CLO4						✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Health and Development: health problems in Bangladesh and developing countries and developed countries; morbidity and mortality pattern in national, regional, and international perspectives.	CLO 1 CLO 2	Lecture PPT, Video, Group discussion, Q/A, Discussion,	Class Test, Quiz, Presentation, Assignment, Final Examination
Water Borne Disease: sources of safe water and supply in rural and urban areas; proper sanitation; disease due to poor sanitation, personal hygiene and cleanliness, housing pollution/causes and its clinical care and prevention.	CLO 1		
Water and Sanitation: definitions and objectives; environmental health; millennium development goals; global situation; urban challenges	CLO 3		
Environmental Health Aspects of Water and Sanitation: burden of disease; the environmental health impact of water and sanitation; the standardized disease measure; environmental classification of pathogen-related diseases; hygiene approaches	CLO 4		
Household Water Treatment and Safe Storage (HWTS): safe drinking water; global situation; contamination risks for drinking water; systems and technologies; non-technical aspects	CLO 1 CLO 3		
Sanitation Systems and Technologies: objectives of sanitation systems and technologies; global sanitation	CLO 4		

situation and the characteristics of the system; systems and technologies classified and described; non-technical aspects			
Faecal Sludge Management: the global situation of on-site sanitation; main characteristics; daily per capita quantities; hygienic quality; effluent standards of FST plants; systems and technologies; improvement FS management	CLO 1 CLO 3		
Planning for Environmental Sanitation: the challenges of improving urban environmental conditions; main planning approaches and their characteristics; integrated planning models; non-technical aspects.	CLO 1 CLO 4		

Books recommended-

1. George, T. and Stensel, H. D. 2002. Wastewater Engineering: Treatment and Reuse. New York, NY: McGraw-Hill.
2. Reynolds, T. D. and P. A.1996. Unit Operations and Processes in Environmental Engineering. 2nd ed. Boston, MA: PWS Publishing Company. ISBN: 0534948847.
3. Woodard and Curran, Inc. 2006. Industrial Waste Treatment Handbook; 2nd ed.; Elsevier Butterworth-Heinemann.

Course Code: **GE-3105**	**Course Title:** **Remote Sensing**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 3rd Year 1st Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

The course is designed to understand the fundamental concepts of remote sensing, the space earth relationship, satellite systems, sensor and satellite image classification and interpretation techniques.

Course Objectives-

This course provides students with the foundations of Remote Sensing (RS) theory, RS image processing techniques and applications.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Attain a foundational knowledge and comprehension of the physical, computational, and perceptual basis for remote sensing.
2. Gain familiarity with a variety of physical, biological, and human geographic applications of remote sensing.
3. Gain basic experience in the hands-on application of remote sensing data through visual interpretation and digital image processing exercises.
4. Students will be able to recognize and explain basic computational properties of remote sensing data acquisition, storage, and processing.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2			✓						
CLO3						✓			
CLO4					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: History and development of early remote sensing; The Space, Earth, and Atmosphere; Purpose	CLO1 CLO2		
Concept and Foundations: remote sensing process, electromagnetic spectrum, energy interaction with atmosphere and surface features, Data acquisition and digital image concepts; Properties of satellite imagery, Types of remote sensing-optical, thermal, microwave, lidar and hyper-spectral remote sensing.	CLO1 CLO2		
Satellite system architecture: platforms, types, orbits, navigation system,	CLO1 CLO4		

Sensors and satellite images: definition, characteristics, types, resolutions; Common satellite images; Set metadata	CLO1 CLO4	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Image Processing: visual image interpretation, digital image interpretation, radiometric calibration, image rectification/ corrections, image enhancement,	CLO3 CLO4		
Image classification: Unsupervised, Supervised and Object Based; Techniques and accuracy assessment,	CLO3 CLO4		
Remote Sensing and Bangladesh: History and development; Working and application sectors; Satellites of Bangladesh – Annesha, Bangabandhu –1	CLO2		

Books Recommended:

6. Remote sensing and image interpretation -Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2004).
7. Remote sensing digital image analysis -Richards, J. A., & Richards, J. A. (1999).
8. Fundamentals of remote sensing and air photo interpretation. -Avery, T. E., & Berlin, G. L. (1992).
9. Remote Sensing of the Environment: An Earth Resource Perspective - Jensen, J. R. (2009).
10. Introduction to Remote Sensing- Campbell J. B. (2007).

Course Code: **GE-3106**	**Course Title:** **Quantitative Techniques in Geography**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 3rd Year 1st Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:

This is an introduction to quantitative methods with a focus on, but not limited to, statistical techniques applied in geography. Through this course, students will develop an understanding of basic concepts, reasoning and procedures in quantitative methods used in geoscientific studies.

Course Objectives:

1. To develop "statistical literacy," a working understanding of statistics that can help in critically evaluating data-driven results in the discipline of geography.
2. To obtain a rich set of statistical tools for data analysis, with an understanding of how to choose appropriate tools and implement them in statistical software.
3. To develop skill in basic statistical and spatial analytic methods.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Demonstrate a broad, integrated knowledge and understanding of quantitative methods, their principles and appropriate application.
2. Demonstrate an understanding of basic descriptive statistics and regression methods as they apply to problem solving in Geography.
3. Evaluate the principles and application of hypothesis testing in geographical & environmental research.
4. Explain the role of quantitative information in geographic and environmental research and applications.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓	✓							
CLO2			✓						
CLO3						✓			
CLO4									✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Index number and analysis of time series	CLO1 CLO2		
Probability distribution: Probability concepts- terms, law of addition and multiplication. Sample space, binomial, Normal, Poisson, normal Distribution and properties of normal curve- Z scores.	CLO3		

Hypothesis testing: Null hypothesis, levels of significance, student's T test/F-test, chi-square test, the Mann- Whitney U test, the Wilcoxon test for paired samples, Type I and Type II error, ANOVA.	CLO3	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Correlation and Regression Analysis: Product Moment Correlation, Non-Parametric Correlation, Areal Association, Spatial Autocorrelation; Regression Analysis- simple linear regression model; goodness of fit; assumptions of linear regression; non-linear regression models; multiple regression analysis	CLO2		
Classification Model/Factor Analysis /Principal Component Analysis	CLO4		
Spatial measures: Point pattern analysis, mean and median centers, quadrant analysis, nearest neighbor analysis, line-network analysis, transport networks, connectivity and run-test.	CLO4		

Books Recommended:

1. Quantitative Geography – Techniques and Theories in Geography – J.P. Cole and C.A. M. King.
2. Statistics for Geoscientists- Saroj k Paul
3. Quantitative Methods in Geography – P.J. Taylor.
4. An Introduction to Quantitative Analysis – M. Yeates.

Course Code: GE-3107	**Course Title Statistical Tools and Techniques Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 3rd Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

This course provides an introduction to practical statistical thinking and understanding, including strengths and limitations of basic experimental designs, graphical and numerical summaries of data, inference, and regression as a descriptive tool using statistical software.

Course Objectives:

1. To use basic methods to conduct and analyze statistical studies using statistical software.
2. To interpret and communicate the outcomes of estimation and hypothesis tests in the context of given problems.
3. To gain an understanding of the Rationale behind statistical methods.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Perform basic data manipulation, statistical calculations, and graphical presentation by hand, and using computer spreadsheets or statistical software like SPSS, STATA and R.
2. Do an assessment of which statistical methods are most suitable for analyzing different types of data.
3. Acquire skills to inference output from statistical and spatial analysis Tools.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1				✓					
CLO2			✓						
CLO3				✓		✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to different statistical tools & techniques	CLO2	Lecture PPT, Video Demonstration, Lab Experiment, Single	Lab Report, Mini project, Lab performance,
SPSS: Overview of SPSS; Data management; Univariate analysis and graphical presentation; Bivariate Analysis (Crosstabulation, Chi-square test, ANOVA, t-test); Predictive modeling using SPSS (Linear, multiple, logistics and ordinal regression); Time Series and forecasting	CLO1 CLO3		

STATA: Interface overview; Data set handling and formatting; Basic statistical analysis	CLO1 CLO3	and Group Exercise, Q/A	Final Examination
Programming with R: Introduction; R Packages; Data Frame sorting; Programming structure and working with Strings; Data reading and plotting; Selected statistical analysis; Database Connectivity with R	CLO1 CLO3		

Books Recommended:

1. Statistics: The Art and Science of Learning from Data, Instructor's Edition- Agresti, Franklin
2. Introduction to Statistics: An Applications Approach, Student Workbook to Accompany Anderson Sweeney and Williams'- Ahmadi
3. Lab Manual for Statistical Analysis- Dawn M. McBride, J. Cooper Cutting

Course Code: **GE-3108**	**Course Title:** **Remote Sensing Application Lab**	**Course Type:** **Lab**	**Total Marks:** **100**
Level: 3rd Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

The course is designed to apply the fundamental concepts of remote sensing, image classification techniques with computer systems, image interpretation techniques.

Course Objectives:

1. Acquire knowledge about different software and learn how the software works.
2. Classification of satellite image for study purpose.
3. Interpretation of satellite image as well as aerial photo.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Interpret aerial and satellite images.
2. Create maps to communicate geographic information.
3. Apply mathematical relationships (at a pre-calculus level) describing fundamental physical, geometric, and computational principles relevant to remote sensing.

Mapping of CLOs with PLOs:

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2					✓				
CLO3				✓					

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Different RS software platform: Erdas Imagine, IDRISI, ENVI, ILWIS	CLO2 CLO3	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Class Test, Quiz, Assignment, Presentation, Final Examination
Identification of photo coordinates.	CLO1		
Correction of satellite data: geometric, radiometric, dark object subtraction	CLO1 CLO2		
Image enhancement.	CLO3		
Basic image operation: histogram equalization, layer stack, image subsetting,	CLO3		
Spectral signature development.	CLO2		
Resampling.	CLO2		
Image indices analysis: NDVI, NDWI, NDBI etc.	CLO3		
Classification of satellite data: unsupervised and supervised, object-based image classification.	CLO3		
Ground truth verification and accuracy assessment.	CLO3		

Books Recommended:

1. Remote sensing and image interpretation -Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2004).
2. Remote sensing digital image analysis -Richards, J. A., & Richards, J. A. (1999).

3. Fundamentals of remote sensing and airphoto interpretation. -Avery, T. E., & Berlin, G. L. (1992).
4. Principles of remote sensing. - Curran, P. J. (1985).
5. Remote Sensing of the Environment: An Earth Resource Perspective - Jensen, J. R. (2009).
6. Introduction to Remote Sensing- Campbell J. B. (2007).

Course Code: GE-3109	**Course Title: Climate Modelling Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 3rd Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:
This course organizes what we think we know about something in order to predict how it might behave in the present, future, or past as well as how it might respond to external influence regarding climate change in different scales.

Course Objectives:
1. To provide a deeper understanding of climate change inventory and modelling.
2. To introduce the students to the physical basis and the mathematical description of the different components of the climate system.
3. To use and apply geospatial software tool in climate modelling.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Explain why a range of models are necessary to solve different problems, demonstrating knowledge relating to multiple scenarios based on current literature.
2. Show how models and derived geospatial information are used to support decision making and climate science.
3. Synthesize mathematical and programming skills to develop a parameterization for simple climate models.
4. Create simple models, given a clear statement of the problem.
5. Apply the input–output principle to obtain a mathematical model, where appropriate.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3			✓						
CLO4		✓							
CLO5				✓					

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Climate Modeling Basics: Development of climate modelling; How climate modeling works; Climate modeling classification; Global Scale Coupled Climate Models; CMIP; Limitation;	CLO 1 CLO 3	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Class Test, Quiz, Assignment, Presentation, Final Examination
Climate Modeling: Conceptualization; Avoiding bias in models, Weighing the Influence of Variables, Uncertainty and Error Propagation in Models, Parameterization and Tuning; Model Calibration & Validation, Dynamic and Agent-Based modeling; Resolution in climate modeling.	CLO 2 CLO 4 CLO 5		
Modeling of Climate Change: Climate System; General Circulation Model, IPCC SRES Scenarios, Regional Climate Models	CLO 4 CLO 5		

Books Recommended:
1. Climate Change and Climate Modeling- J. David Neelin.
2. Stocker, T. (2011). Introduction to climate modelling. Springer Science & Business Media.
3. Laprise, R. (2008). Regional climate modelling. Journal of computational physics, 227(7), 3641-3666.

THIRD YEAR SECOND SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-3201	Environmental Impact Assessment (EIA)	2	15	10	5	70	100
2	GE-3202	Solid and Liquid Waste Management	3	15	10	5	70	100
3	GE-3203	Population Geography	2	15	10	5	70	100
4	GE-3204	Political Geography	3	15	10	5	70	100
5	GE-3205	Spatial Analysis	3	15	10	5	70	100
6	GE-3206	Research Methods and Techniques	3	15	10	5	70	100
7	GE-3207	EIA and Auditing Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
8	GE-3208	Waste Management Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
9	GE-3209	Photogrammetry Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	Viva on Experiment =10	70	100
10	GE-3210	EMS in Industries of BD: Industrial Lab	2	50 (Field Report)	30 (Overall FW Performance)	20 Viva/Quiz/ Presentation	0	100
11	GE-3211	Viva-Voce	1	nil	nil	nil	100	100
Total			23.5					1100

Course Code: GE-3201	**Course Title: Environmental Impact Assessment (EIA)**	**Course Type: Core course**	**Total Marks: 100**
Level: 3rd Year 2nd Semester		**Contract Hours: 26**	**Credit: 2**

Course Rationale:
To explore the knowledge and skills to identify/evaluate and present potential environmental impacts of an intended intervention.

Course Objectives:
1. Explain the major principles of environmental impact assessment from a national and global perspective.
2. Discuss the implications of current jurisdictional and institutional arrangements in relation to environmental impact assessment
3. Understand how to coordinate with and the importance of stakeholders in the EIA process.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1: Know the basic concept of EIA.
2: Learn different methods and techniques to investigate the likely impact of any proposed intervention.
3: Analyze the alternatives of the proposed interventions and formulate environment management plans in different sectors.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction and Principles: environmental assessment and its types; nature of EIA; purpose of EIA; outcomes of EIA; EIA's role and position in project life cycle; EIA Principles; participants of EIA; EIA process; factors crucial for EIA success.	CLO 1 CLO 2	Lecture PPT, Video, Group discussion, Q/A, Discussion,	Class Test, Quiz, Presentation, Assignment, Final Examination
Origins and Development and Legislative Context: evolution of EIA: global and Bangladesh perspective; changing perspectives on EIA.	CLO 1		
Scoping Methods and Baseline Studies: screening and scoping; purpose of scoping; factors influencing the scoping process; environmental baseline-its necessity and application.	CLO 3		
Impact Identification: aims and methods, factors affecting the selection of identification method; checklists; matrices; quantitative methods; networks and overlay maps.	CLO 2		
Impact Prediction: dimensions of prediction; methods of impact prediction; advantages and disadvantages of impact prediction approaches. Evaluation in the EIA process, environmental monetary valuation techniques, Mitigation measures, Mitigation in the EIA process.	CLO 1 CLO 3		
Mitigation/EMP: purpose and framework of mitigation; principles; essential components of mitigation plan.	CLO 3		
Participation, Presentation and Review: public consultation and participation; elements of EIA report; EIA presentation; review of EISs; approaches of EIA review.	CLO 1 CLO 3		
Monitoring and Evaluation: importance of monitoring and auditing in the EIA process; monitoring and evaluation in practice, key component of monitoring and evaluation; issues to be considered during monitoring and evaluation.	CLO 1 CLO 2		

Books recommended:

1. Wathern, P. Ed. 2013: Environmental Impact Assessment: Theory and Practice. Routledge.
2. Center, L. Q. 1996. Environmental Impact Assessment. McGraw-Hill, Inc, New York.
3. Barrow, C. J. 1997. Environmental and Social Impact Assessment, John Wiley & Sons, New York.
4. Saha, S. K. 2000. Environmental Impact Assessment for Changing World. A. H. Development Publishing House, Dhaka.

Course Code: GE-3202	Course Title: Waste Management	Course Type: Core course	Total Marks: 100
Level: 3rd Year 2nd Semester		Contract Hours: 39	Credit: 3

Course Rationale:

To explore the basic phenomenon of waste and its management and demonstrate a better circumstance to reduce, reuse and recycle waste in advance level.

Course Objectives:

1. Understand the implications of the production, resource management and environmental impact of solid waste management.
2. Understand components of solid waste management infrastructure systems to minimize the above effects.
3. Be aware of the significance of recycling, reuse, and reclamation of solid wastes.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1: Evaluate waste management from the environmental, technical, legal and socio economical points.
2: Set up a municipal solid waste management system.
3: Familiar with eco-friendly waste treatment options.
4: Conceptualize how waste management can correlate with human health, environment, and safety.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3								✓	
CLO4						✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Waste Generation and Characteristics: waste and Integrated Solid Waste Management (ISWM); functional elements; types of solid waste; sources of solid waste; properties of SW; Composition of MSW and its variation; other properties of waste	CLO 1 CLO 2	Lecture PPT, Video, Group discussion, Q/A, Discussion,	Class Test, Quiz, Presentation, Assignment, Final Examination
Physical Aspects - Collection and Transport: methods of waste collection; storage systems; selection of waste collection vehicles; transfer; operation and maintenance of collection vehicles	CLO 1		
Resource Value: materials, segregation, reduce; reuse; recycling MSW: production process, recycling process, global facts, environmental aspects	CLO 3		
Thermal Treatment: thermal process**:** incineration, mechanical biological treatment (MBT), refuse-derived fuel (RDF); thermochemical conversion of biomass: pyrolysis, gasification, combustion	CLO 4		
Biological Treatment: composting; composting technologies; operating the composting process; case study composting–Dhaka, Bangladesh and Temesi, Bali, Indonesia; the basics of anaerobic digestion of bio-waste; anaerobic digestion technologies and operation; using the products of anaerobic digestion; calculating the size of an anaerobic reactor; vermicomposting of bio-waste; biodegradable waste; aerobic and anaerobic fermentation; composting; organic manure	CLO 1 CLO 3		
Waste Disposal and Landfill: landfill issues; dump site issues, landfill and dumpsite operations, landfill construction	CLO 4		
Hazardous Waste: types of hazardous waste, identification and characteristics of hazardous waste; risk perception and risk assessment, toxicity consideration, one-hit mode, reasonable maximum exposure, risk characterization and risk management, transport regulations, disposal protocols. medical waste, e-waste	CLO 1 CLO 3		
Government Aspects and Others: policies and legislation; the role of the public sector, private sectors and community members; public awareness campaigns; waste and climate change; waste and circular economy.	CLO 1 CLO 4		

Books recommended-

1. Davis, M. L., and Cornwell, D. A. 1998. *Introduction to Environmental Engineering*, 3rd ed., McGrawHill, 1998.
2. Peavy, H. S. and others. 1985. *Environmental Engineering*. McGraw-Hill Book Co.

Course Code: GE-3203	Course Title: Population Geography	Course Type: Core Course	Total Marks: 100
Level: 3rd Year 2nd Semester		Contact Hours: 26	Credit: 2

Course Rationale:
The course is designed to explain the arguments and assumptions of dominant theories of population change in time and space. This course will, therefore, also equip students with the basic quantitative, qualitative, and graphic tools and methods of population geographers to analyze and evaluate current population changes at different scales in relation to space and environment.

Course Objectives:
This course examines the link between people, places and environment from a spatial perspective on different scales.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Know the main phases of the evolution of the world population in historical and geographical perspective.
2. Understand how these changes can evolve in the future at different scales from multi-sectoral approach.
3. Use population geography tools to analyze demographic data and develop advanced quantitative, analytical, and methodological skills.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3		✓					✓		

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Population Geography: Definition, scope and methodology; Sources of population data; Demography and Population Geography; Practice and professional involvement.	CLO 1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Population Distribution and Structure: Density and distribution of population; Determinants and measures of spatial variation; Population structures.	CLO 3		
Population Dynamics: Fertility, mortality, migration and population growth; Population theories (Malthusian doctrine**,** Boserup's Theory, Demographic transition theory, theory of Optimum Population), policies and control measures; Population projection.	CLO 2		
Population Growth and Development: Geographical perspective of population growth; Population and resource; Population growth and urbanization (Urbanization, suburbanization, over urbanization, deurbanization and urban decay); Population policy.	CLO 2		
Population mobility: Residential mobility; Migration; Refugee and internally displaced population; Migration crisis management	CLO 2		
Urban and Rural Settlement: Origin and development; Classification and distribution; Location - central place, centrality and its measures, near neighbor index; Distribution pattern; Settlement Problems.	CLO 3		
Spatial dimension of Population and Environment: Approaches; Nature; Scale and Pattern; Perspectives: Linear, Multiplicative, Mediating, Development-dependency, Complex systems.	CLO 3		

Books Recommended:

1. Newbold, K B. 2021. Population Geography: Tools & Issues. Rowman & Littlefield Publishers.
2. Robert, L. 2013. *Population Geography: Problems, Concepts, and Prospects.* Kendall Hunt Publishing, Iowa, USA.
3. Clarke, J. I. 1966. *Population* Geography. Pergamon Press, London.
4. Raj, H. 1988 *Fundamentals of* demography. Surjeet Publications, Delhi.
5. Jones, S. 1990. *Population Geography*. The Guilford Press, USA.
6. Marquette, C. 1997. *Population and Environment Relationships in Developing Countries: A Select Review of Approaches and Methods.* Chr. Michelsen Institute. Bergen, Norway.

Course Code: GE-3204	**Course Title:** Political Geography	**Course Type:** Core Course	**Total Marks:** 100
Level: 3rd Year 2nd Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

This develops students' ability to critically evaluate basic concepts of geopolitics and political geography.

Course Objectives:

1. To gain fundamental knowledge of basic principles, process, formation, and key concepts of the interactions between geographical space and political process.
2. To familiarize students with the importance of contemporary geopolitical processes and issues.
3. To develop environmental diplomacy skills.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Describe the emergence of political geography and articulate its place within the broader field of human geography.
2. Think critically about key concepts such as space, power and governance from a geographical standpoint.
3. Conceptualise core ideas such as nation, governance and geopolitics with confidence and in a critical manner.
4. Critically assess contemporary political developments through an understanding of the ways in which politics and geographies intersect.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3		✓							
CLO4							✓	✓	✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Definition, nature and scope; Approaches; Political geography and geopolitics; World Political Region- Definition, Factors, Characteristics, Classification and Spatial Distribution.	CLO1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Development of geopolitical thoughts: Ancient and medieval thinkers; Modern thinkers; Global strategic models.	CLO1		
The state as a unit of politico-geographical study: Definition; Frontiers and Boundaries- Concepts, typology, geometry and morphology, delineation and demarcation, functions; Spatial factors of the State; Spatial and anatomical framework of state.	CLO2 CLO3		
Global political patterns: Colonialism and neo-colonialism; The capitalist and socialist world; The developed and the developing world; Military alliances; Balance of power and power conflicts and current affairs; Intelligence.	CLO4		
Contemporary Geopolitics: Power concepts and Geopolitics, geo-strategy and cold war, international migration crisis, transatlantic partnership; Arms trade and control, Militarization and weaponization; Resource control and	CLO4		

Middle East, Latin America and Africa; Political disputes and insurgency; Foreign policy and power projection; Dominance and change in the Arctic; Global environmental Protection; Environmental diplomacy; Cybersecurity.			
International Relations and peace: Interstate relations, Use of international canal, Use of nuclear reactor and explosion, Interstate claims, conflicts and international tensions; ICJ and UN- Formation, chief organs, intergovernmental organizations related to UNO, Conflict resolution and stability of peace.	CLO4		

Books Recommended:

1. Cox, R.K. 2002. Political Geography: Territory, State, and Society. UK: Blackwell
2. Short, R.J. 1993. Political Geography. USA: Routledge.
3. Gallaher, C. 2009. Key Concepts in Political Geography. Los Angeles: Sage.
4. Pounds, Norman J.G. 1972. *Political Geography*, USA: McGraw Hill
5. Adhikari, Sundeepta, 2002. Political geography, New Delhi: Rawat publication.
6. Taha, M.A, 1988, Political geography (in Bangla), Rajshahi: Rajshahi University.

Course Code: **GE-3205**	**Course Title:** **Spatial Analysis**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 3rd Year 2nd Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

This course intends to provide students with the knowledge and skills necessary to investigate the spatial patterns which result from social and physical processes operating on or near the Earth's surface.

Course Objectives:

1. To demonstrate knowledge of spatial analysis methods
2. To learn the applications of GIS software for spatial data analysis and management
3. To apply spatial analysis methods to solve problems in geography and related disciplines.
4. To pursue further advanced study in spatial analysis and modeling

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Understand GIS concepts and spatial analysis techniques in an interdisciplinary setting.
2. Develop understanding of the typical data analysis workflow.
3. Apply ArcGIS for spatial data preparation, analysis, and visualization with sophisticated skills of vector and raster processing.
4. Understand the basics of geostatistics and the associated terminology and mathematical principles.
5. Apprehend the principles of graph theory and network analysis.
6. Recognize the basic principles of spatio-temporal multivariate analysis.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓	✓							
CLO2	✓								
CLO3			✓	✓					
CLO4	✓								
CLO5	✓								
CLO6			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction to spatial analysis and conceptual frameworks: coordinate system, location, spatial data, spatial analysis, significance of spatial data analysis, spatial relationships, spatial statistics, spatial data structure, issues in spatial analysis.	CLO1		

Spatial analysis methodology: spatial analysis as a process, analytical methodologies, spatial statistical analysis, and model building.	CLO2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Spatial point pattern analysis: geometric measurements, quadrat, count analysis, Kernel density analysis, nearest neighbor analysis.	CLO2		
Spatial line pattern analysis: line length, line density, line direction, line orientation.	CLO2		
Network pattern analysis: routing, service area, closest facilities, shortest path, O-D cost matrix.	CLO5		
Areal pattern analysis: overlay analysis- Boolean algebra/logic, spatial autocorrelation, joint count.	CLO2		
Surface analysis: spatial interpolation, distance analysis, density analysis, DEM analysis, surface analysis operations.	CLO3		
3-D analysis: draping, extrusion, line-of-sight, viewshed, skylines, volumetric analysis, animation.	CLO3		
Spatial analysis and model building: spatial multi-criteria evaluation, spatial regression models, spatial analysis, and GIS	CLO3 CLO4		

Books Recommended:

1. The language of spatial analysis- ESRI.
2. Spatial Data Analysis- Robert Haining
3. Spatial Data Modelling for 3D GIS- Alias Abdul-Rahman. Morakot Pilouk
4. Spatial Analysis, Modelling and Planning- Jorge Rocha

Course Code: **GE-3206**	**Course Title:** **Research Methodology**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 3rd Year 2nd Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:

This course introduces students to the key approaches that researchers use to answer important questions and solve complex problems that relates to the discipline and addresses the philosophies, theories and methods associated research in geographical sciences.

Course Objectives:

1. To identify and discuss the role and importance of geo-environmental research.
2. To identify and discuss the issues and concepts salient to the research process.
3. To identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
4. To identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Develop knowledge of the range of research methods used in geography and environmental science.
2. Understand and account for the relationship between research design, objectivity, and a scientific approach.
3. Evaluate and justify information and ideas obtained from sources.
4. Articulate geographical research questions, structure a research proposal and design research projects in the line of geo-environmental studies.
5. Understand how to discuss and argue using academic texts.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3			✓						
CLO4				✓					
CL05								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Philosophy of Science: What is "Science"; Evolution and Theories of development of Science; Knowledge and its general features – Belief, Truth, Justification, Evidence; Politics of Science; Dimensions of scientific knowledge.	CLO 1 CLO 2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Basic concepts and issues: Theory, Proposition, Axiom, Theorem, Assumption, Concept, Opinion; Variables – Type, properties, relationships, indicators; Scales of measurement; Theoretical and conceptual framework, Research question, problems, objective, hypothesis, proposal, forms of inference; Research ethics; Grounded theory; Model; Logical positivism.	CLO 1 CLO 2		
The nature of geo-environmental research: Definitions and concepts of geographical research; the 'science' in geographical research; general principles of geographical inquiry; ideas, thinkers, and geography.	CLO 5		
Research process and strategies: Elements of the research process; theory and research; deductive and inductive theory; epistemological and ontological considerations; quantitative and qualitative research; mixed methods research.	CLO 4		
Research designs: Non-Experimental and Experimental design; Reliability and validity; Sampling and sample designing.	CLO 4		
Data collection and Analysis: Quantitative and qualitative data analysis, breaking down and combining quantitative and qualitative data.	CLO 3		
Data Science: Foundations; Geographical data science; Big data; Data mining; Artificial Intelligence and neural networking; Machine learning and deep learning.	CLO 3		
Research planning and Proposal Development.	CLO 4		

Books Recommended:

1. Kumar, R., 2018. *Research methodology: A step-by-step guide for beginners.* Sage.
2. Kothari, C R. and Garg, G. 2019. Research Methodology: Methods and Techniques. New Age International Publishers.
3. Walliman, N., 2010. Research methods: The basics. Routledge.
4. Bryman, A. 2012. *Social Research Methods*. New York: Oxford University Press.
5. Clifford, N., Cope, M., Gillespie, T., French, S. 2016. *Key Methods in Geography*. Sage, UK
6. Montello, D. & Sutton, P. 2013. *An Introduction to Scientific Research Methods in Geography and Environmental Studies*. Sage, USA.
7. Walter, M. 2010. *Social Research Methods*. Oxford University Press, Oxford, UK.

Course Code: **GE-3207**	**Course Title:** **EIA and Auditing Lab**	**Course Type:** **Lab**	**Total Marks:** **100**
Level: 3rd Year 2nd Semester		**Contract Hours: 39**	**Credit: 1.5**

Course Rationale:

To familiarize and hands on practical experience with real life impact assessment.

Course Objectives:

1. Know the basic concept of EIA in context of different problems.
2. Gather information from industrial visit.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to

1: Provide practical experience in the field of EIA.
2: Expand skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments.
3: Develop expertise relevant to the professional practice of Environmental Impact Assessment.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning and Assessment Strategies	Assessment Strategies
Reviewing environmental impact assessment report, summarizing the methods, and finding of the EIA reports, identifying the strengths and weakness of the EIA reports, propose improvement plans.	CLO 1 CLO 3	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion, Exercise both in lab and industry	Lab Report, Quiz, Presentation, Viva, Final Examination
Visiting a project area/developing a hypothetical intervention, backgrounds, and scenarios.	CLO 2		
Identify the relevant characteristics of the project, describe the baseline environmental conditions, advise a plan to obtain public input for the EIA study.	CLO 2		
Scoping and developing data collection plans, identify and predict likely impacts, design an appropriate mitigation. Write a clear explanation of the predicted impact.	CLO 3		

***Students will visit different industries to complete the EIA process. After completion these students will prepare their report, presentation and submit it to the respective course instructor.*

Books recommended:

1. Barrow, C. J. 1997. Environmental and Social Impact Assessment, John Wiley & Sons, New York.
2. Saha, S. K. 2000. Environmental Impact Assessment for Changing World. A. H. Development Publishing House, Dhaka.

Course Code: **GE-3208**	**Course Title:** **Waste Management Lab**	**Course Type:** **Lab**	**Total Marks:** **100**
Level: 3rd Year 2nd Semester		**Contract Hours: 39**	**Credit: 1.5**

Course Rationale:

This course will deal with waste and its management. The students will collect information through different process.

Course Objectives:

1. Know the major technologies and processes of waste management in different countries.
2. Gather information from industrial visit.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1: Understand engineering, financial and technical options for waste management.
2: Provide Knowledge of legal, institutional and financial aspects of management of solid wastes.
3: Provide practical experience in sampling and characterization of solid waste, analysis of hazardous waste constituents and other waste.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2			✓						
CLO3				✓					

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Methods of waste collection and collection techniques;	CLO 1 CLO 3	Lecture PPT, Video, Demonstration, Group	Lab Report, Quiz,
Analysis of hazardous constituents in waste;	CLO 1		

Treatment and disposal techniques for different waste;	CLO 2	discussion, Q/A, Discussion, Exercise both in lab and industry	Presentation, Viva, Final Examination
Develop waste minimization concept in different areas;	CLO 3		
Integrated waste management practices approach;	CLO 2		

***Students will visit different industries to complete the laboratory work. After completion these students will prepare their report and presentation and submit it to the respective course instructor*.

Books recommended:

1. World Health Organization. (2020). Decontamination and waste management.
2. Goheen, S. C., Fadeff, S. K., Sklarew, D. S., McCulloch, M., Mong, G. M., Riley, R. G., & Thomas, B. L. (1994). A DOE manual: DOE methods for evaluating environmental and waste management samples (No. PNL-SA-23411; CONF-940815-79). Pacific Northwest Lab., Richland, WA (United States).

Course Code: GE-3209	**Course Title: UAV Photogrammetry Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 3rd Year 2nd Semester		**Contract Hours: 39**	**Credit: 1.5**

Course Rationale:

This course will allow students to apply acquired knowledge and critical thinking skills to solve a real-world problem with appropriate UAV acquisition and data processing and analysis methods.

Course Objectives:

1. To produce geospatial products such as ortho-photos and digital terrain models.
2. To develop understanding about basic concepts of image geometry and measurement of aerial photograph.
3. To get acquainted with image interpretation and information extraction.
4. To understand the mapping standards and how it applies to UAVs-derived products.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to

1. Extract data from aerial photography
2. Understand fundamental concepts surrounding operating a UAV.
3. Understand the capabilities and limitations of the UAVs and data processing systems.
4. Understand the process of reconstructing three-dimensional model for the real world.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2				✓					
CLO3							✓		
CLO4							✓		

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Photogrammetry Basics: Classification; Elements of aerial photograph, Design; Computer control systems, Safety and security, Basic concepts of Perspective projection and Orthographic Projection, Planning Aerial Photography,	CLO 2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion, UAV flight demonstration	Lab Report, Quiz, Presentation, Viva, Final Examination
Principles of flight: Fundamentals of flight; Aerodynamics; Take-off, flight, and landing; Manoeuvres, turns, and circuit pattern; ATC procedures and Radio Telephony; Fixed-wing operations and aerodynamics; Multi-rotor introduction; Sensors calibration.	CLO 1 CLO 2 CLO 3		
Atmospheric Requirements: The standard atmosphere; Measuring air pressure; Heat and temperature; Wind; Moisture, cloud formation; Meteorological Terminal Aviation Routine Weather Report (METAR).	CLO 2 CLO 3		

UAV equipment maintenance: Maintenance of drone, flight control box, ground station; Maintenance of ground equipment, batteries, and payloads; Scheduled servicing; Repair of equipment; Fault finding and rectification	CLO 1		
UAV Handling Module: Skeletal Structures; Assembling of drone; De-assembling; Integration of subsections/modules; Integration of engine/propulsion system; Hazards and emergencies; Fault finding and rectification; Repair maintenance and documentation; Data processing; Current rules and regulations governing owning and operating UAVs.	CLO 2 CLO 4		
Emergency identification and handling: In-flight emergencies; Loss of link; Fly-aways (Straying); Loss of power; Control surface failures	CLO 3		

Course Code: **GE-3210**	**Course Title:** **EMS in Industries of BD: Industrial visit**	**Course Type:** **Field Work**	**Total Marks:** **100**
Level: 3rd Year 2nd Semester			**Credit: 2**

Course Rationale:
This course will deal with understanding the environmental Management System (EMS) (manufacturing, waste management, ETP management, health and safety issues) of any selected industries of Bangladesh.

Course Objectives:
1. Able to acquire basic information about specific industry.
2. Know the major environmental management system and technologies involved of the selected industry.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to
1: Understand the basic concept of environmental management through industry visits.
2: Provide practical experience in ETP.
3: Work in an interdisciplinary team in different sector.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
On field visit on any of the following industries-	CLO 1 CLO 2 CLO 3	Industrial visit, Questionnaire, On-field training, Group discussion, Q/A	FW Report, Presentation, Viva
Food and Chemical Industry /Textile Industry/ Pulp and Paper Industry/ Pharmaceutical Industry/ Shipbuilding and Ceramic Industry	CLO 1 CLO 2 CLO 2 CLO 1 CLO 3		

**Students will go to the industries, collect necessary data in designed method. Data processing and interpretation should be completed immediately after fieldwork.*
***After completion of fieldwork students will prepare their field report and presentation and submit to the respective course instructor.*

Course Code: **GE-3211**	**Course Title:** Viva Voce	**Course Type:** Viva	**Total Marks:** **100**
Level: 3rd Year 2nd Semester			**Credit: 1**

Rationale:

The course aims to enable the students to attend placements and be better performers in their future.

Objective:

This viva aims to assess students' understanding based on course objectives covering all the courses of 3rd year 1st semester and 2nd semester.

Course Learning Outcomes (CLOs):

1. Prepare to face interviews both in the academic and the service sectors.
2. Express themselves confidently with good communication skills.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1					✓	✓			
CLO2					✓	✓			

FOURTH YEAR FIRST SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-4101	Environmental Pollution and Control	2	15	10	5	70	100
2	GE-4102	Oceanography and Marine Environment	3	15	10	5	70	100
3	GE-4103	Climate Change and Mitigation	2	15	10	5	70	100
4	GE-4104	Transport Geography	2	15	10	5	70	100
5	GE-4105	Urban Geography and Planning	3	15	10	5	70	100
6	GE-4106	Research Methods and Techniques Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
7	GE-4107	Environmental Pollution Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
8	GE-4108	GIS Programming and Spatial Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
9	GE-4109	Field Work on Micro Region Survey Lab	2	50 (Field Report)	30 (Overall Performance)	20 Viva/ Presentation	0	100
Total			18.5					900

Course Code: GE-4101	**Course Title: Environmental Pollution and Control**	**Course Type: Core course**	**Total Marks: 100**
Level: 4th Year 1st Semester		**Contract Hours: 26**	**Credit: 2**

Course Rationale:

This course introduces pollution and degradation of environmental quality as an example of the interactions between natural and human systems. It will enable students to understand environmental problems, looking at causal linkages between pollution sources, exposure pathways and impacts to environmental quality and human health.

Course Objectives:

1. Characterization and classification of different types of waste are discussed along with existing norms for waste disposal.
2. Treatment methods of specific pollutant arising out of industrial process are explained.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1. Gain awareness of current forms of environmental pollution and an overview of both their causes and consequences to natural, economic and social systems.
2. Assess pollution sources, study exposure pathways and fate, and evaluate consequences of human exposure to pollution and its impacts to environmental quality.
3. Analyze, synthesize, and evaluate evidence to understand problems and accordingly select control measures and techniques concerning atmospheric, water or terrestrial challenges.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Environmental pollution: Definition; Types; Atmospheric Pollution; Soil Pollution; Water Pollution; Impacts of pollution.	CLO 1 CLO 2	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
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.	CLO 1 CLO 2		
Plastic and polymer pollution: Plastic debris- Micro and macro, Decomposition of plastics, Persistent organic pollutants, Effects on the biosphere, Reduction efforts-management and recycling etc.	CLO 1 CLO 2		
Environmental Toxicity: Sources- PCBs, Heavy metals, Pesticides, Cyanobacteria and cyanotoxins; Health effects of different environmental Toxins & Pollutants	CLO 1 CLO 2		
Pollution monitoring and analysis: Air, Soil and Water monitoring techniques; Monitoring parameters; Environmental monitoring data management systems-Sampling, method of sample preservation, methods of analysis, data interpretation; Monitoring programmes; Environmental quality indices.	CLO 3		
Industrial Pollution: Emissions and standards; Nature, Characters and Composition; Control.	CLO 1 CLO 2 CLO 3		
Pollution control and management: Technological aspects; existing pollution prevention act; policy instruments and strategic environmental assessment, environmental planning, mitigation strategies (technical and non-technical), Clean development mechanism, role of NGOs and Government.	CLO 3		

Books recommended:

1. Mara, D. 2004: Domestic Wastewater Treatment in Developing Countries. London, UK: Earthscan Publications Ltd, chapters 1, 4, 6, and 7. ISBN: 9781844070190.
2. World Health Organization and UNICEF 2004: Meeting the MDG Drinking Water and Sanitation Target: A Mid-term Assessment Report. New York, NY: World Health Organization and United Nations Children's Fund, 2004. ISBN: 9789241562782.
3. World Health Organization 2007. Combating Waterborne Disease at the Household Level. Geneva, Switzerland: World Health Organization, 2007, ISBN: 978921595223.
4. World Health Organization 2006: Preventing Disease through Healthy Environments. Geneva, Switzerland: World Health Organization, 2006. ISBN: 9789241593823.

Course Code: GE-4102	Course Title: Oceanography and Marine Environment	Course Type: Core Course	Total Marks: 100
Level: 4th Year 1st Semester		Contact Hours: 39	Credit: 3

Course Rationale:

This course is designed to introduce students to important concepts in the study of the oceans and basic oceanographic research.

Course Objectives:

1. To provide an overview of important oceanographic processes
2. To present major marine ecosystems, including trophic relationships of their inhabitants and adaptions for various environmental conditions
3. To increase awareness of anthropogenic impacts in the marine environment and potential solutions

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Know the basic principles of physical oceanography, including geology, formation, and topography of the sea floor; chemistry and physics of the ocean; and astronomical influences.

2. Demonstrate how the oceans are connected to and drive major Earth processes, such as atmospheric and oceanic circulation, climate and weather, plate tectonics, and sustainability of human and marine populations.
3. Analyze atmospheric and oceanic circulation systems as well as their interconnections and driving forces.
4. Describe the principals involved in the generation of waves and tides and evaluate their effects on coastal processes and marine ecosystems.
5. Discuss the importance of oceanography in local, global initiatives and political decisions for the present and future.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓	✓							
CLO2		✓							
CLO3				✓					
CLO4	✓								
CLO5							✓	✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Definition: Distribution of world land and water bodies; Era of oceanographic exploration; Theories of ocean origin	CLO 1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Physical Setting: Ocean and seas; Dimensions of the ocean; Depth measurement; Ocean floor topography, Sounds and ocean- speed and absorption.	CLO 1 CLO 2		
Environmental Factor and its Influence: Atmospheric Influences; Oceanic heat budget; Temperature, Salinity & Density; Pressure; Light absorption; Ekman Layer; Ocean weather and climate.	CLO 2		
Oceanic Circulation: Definition, importance, and theory of the Deep Circulation; Waves and Oceanic Currents- Causes, effects, types, geographical distribution.	CLO 3		
Tide: Origin and Theory of tides (Kepler, Newton, and Laplace); Definitions; Types; Tidal constituents, time and analysis; Tidal force and effect; Tidal acceleration; Tidal power; Intertidal ecology.	CLO 4		
Marine Resources: Nature, Type (Biological, Mineral and Energy resources) Characteristics, Formation & Management. Territorial and international water. Blue economy and its prospect in Bangladesh.	CLO 5		
Oceanographic characteristics of the Bay of Bengal: Extent; Plate tectonics; Marine and biology; Strategic importance; Environmental hazards; Transboundary issues and the marine ecosystem.	CLO 5		
Marine Conservation: Marine Ecosystem; Coral Reef- formation, types, zones, geographical distribution, importance, threats, protection and restoration; Marine conservation strategy, techniques and technology; Organizations and education; Extinct and endangered species; Laws and treaties; Blue Economy.	CLO 5		

Books Recommended:

1. Stewart, R.H. 2009. Introduction to Physical Oceanography. Florida: University of Florida.
2. Gross, M.G. 1987. Oceanography: A view of the Earth. New Jersey: Prentice Hall, USA.
3. Sharma, R. C. & Vatal, M. 1980. Oceanography for Geographers, India: Chaitanya Publishing House, Allahabad.
4. Singh S. 2008. Oceanography. India: Prayag Pustak Bhawan, Allahabad.
5. Doxbury and Doxbury. 2004. Introduction to World Ocean. New York: Wiley

Course Code: GE-4103	Course Title: Climate Change and Mitigation	Course Type: Core Course	Total Marks: 100
Level: 4th Year 1st Semester		Contact Hours: 26	Credit: 2

Course Rationale:
The course focuses on mitigation strategies applicable to different sectors for climate change.

Course Objectives:
1. Impart knowledge about different climate change mitigation strategies and options.
2. Provide an overview of GHG emission calculation methods and approaches.
3. Provide the knowledge and tools to devise effective strategies for climate mitigation on a global, sectoral and local scale.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Explain the fundamentals of climate change science.
2. Present the international climate change legal and policy framework and explain key issues under negotiation.
3. Analyze principal challenges and opportunities for climate change action.
4. Describe the expected consequences of climate change and the role of adaptation.
5. Provide a Rationale for climate change mitigation and propose actions in key sectors.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3								✓	
CLO4						✓			
CLO5							✓		

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Climate Change: Definition and Terminologies; Observed Temperature Rise; Attribution of recent temperature rise	CLO 1 CLO 3	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Evidence of Climate Change: Geological past, atmospheric composition, sea level fluctuation, ice age etc. Changes in recorded history.	CLO 2 CLO 4		
Causes and Consequences of Climatic Change: Natural causes, human activities. Predicting climate change, Flora and fauna, glaciers and sea level, historical impact, agriculture, spread of disease, economic impact, Global Warming.	CLO 2 CLO 4		
Adaption and Mitigation to Climate Change: Potentials for adaptation and mitigation, constrains on implementation, adaptive and mitigating capacity, indigenous knowledge in adaptation and mitigation.	CLO 2 CLO 4		
Climate Change and Impacts in Bangladesh: Climate overview, Temperature, Precipitation extremes, Storms, Climate and Climate Change (impact sectors e.g. crop yields, food security, water stress and draught, flooding and rainfall, tropical cyclones) in Bangladesh, Governmental and NGO roles and responsibilities	CLO 3 CLO 4		

Books Recommended:

1. Coe, N.M., Kelly, P.F. and Yeung, H.W., 2019. *Economic geography: a contemporary introduction*. John Wiley & Sons.
2. Maurya, S.D. 2018. Economic Geography. Pravalika Publications.
3. Hodder, B.W. and Lee, R., 2015. *Economic geography*. Routledge.
4. Knowles, R. and Wareing, J., 2014. Economic and social geography. Elsevier.
5. Aoyama, Y., Murphy, J.T. and Hanson, S., 2010. Key concepts in economic geography. Sage.
6. Anderson, W.P., 2012. *Economic geography*. Routledge.

Course Code: GE-4104	Course Title: Transport Geography	Course Type: Core course	Total Marks: 100
Level: 4th Year 1st Semester		Contract Hours: 26	Credit: 2

Course Rationale:
This course is designed to introduce the study of transportation systems from a geographic perspective.

Course Objectives:
1. Introduction to theoretical and practical concepts of transport geography
2. Current transportation issues and problems

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1. Apply concepts and methods in the field of transport geography.
2. Understand relevant factors and processes for the demand for and development of mobility.
3. Describe, apply and critically discuss policies to change mobility and mobility related policy issues.
4. Be able to solve various transportation problems using analytical methods.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3							✓		
CLO4			✓						

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Transportation and the Spatial Structure: The Geography of Transportation Networks; Transport and Spatial Organization; Transport and Location; Information Technologies and Mobility	CLO 1	Lecture PPT, Video, Group discussion, Q/A, Discussion	Class Test, Quiz, Presentation, Assignment, Final Examination
Transportation, Economy and Society: Transportation and Economic Development; Transportation and Society; Transport Costs; The Provision and Demand of Transportation Services	CLO 2 CLO 3		
Transportation Modes and Terminals: Transportation Modes, Modal Competition and Modal Shift; Road Transportation; Rail Transportation; Maritime Transportation; Air Transport; Intermodal Transportation and Containerization; Terminals-Function and Types.	CLO 1 CLO 2		
Trade, Logistics and Freight Distribution: Transborder and Crossborder Transportation; Globalization and International Trade; Freight Transportation and Value Chains; Logistics and Freight Distribution	CLO 1 CLO 3		
Urban Transportation: Transportation and the Urban Form; Urban Land Use and Transportation; Urban Mobility; Urban Transport Challenges	CLO 1 CLO 2		
Transport, Energy and Environment: Transportation and Energy; Transportation and the Environment; Environmental Footprint of Transportation; Transportation, Sustainability and Decarbonization	CLO 3		
Transport Planning and Policy: The Nature of Transport Policy; Transport Planning and Governance; Transport Safety and Security; Transportation, Disruptions and Resilience	CLO 3 CLO 4		
Challenges for Transport Geography: Transport Resilience; Governance, Management and Digitalization; Social and Environmental Responsibility; Future Transportation Systems	CLO 3 CLO 4		

Books recommended:

1. Rodrigue, Jean-Paul. *The geography of transport systems*. Routledge, 2020.
2. Comtois, Claude, and Brian Slack. *The geography of transport systems*. Routledge, 2009.

3. Tolley, Rodney, and Brian John Turton. Transport systems, policy and planning: a geographical approach. Routledge, 2014.
4. Shaw, Jon, Richard D. Knowles, and Iain Docherty. "Introducing transport geographies." (2008).

Course Code: **GE-4105**	**Course Title:** **Urban Geography and Planning**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 4th Year 1st Semester		**Contact Hours: 39**	**Credit: 3**

Course Rationale:
The course provides an integrated curriculum with focus on the growth and development of cities that complement and build upon each other in developing a full range of planning knowledge and skills covering urban development from several different perspectives and scales.

Course Objectives:
1. To relate knowledge and action through critical study of urban and regional planning theories.
2. To organize courses on functional bases and subsume a spatial dimension under these functions.
3. To focus on the exploration and resolution of planning issues from the point of view of community interests, emphasizing the promotion of equitable and economical use of natural and human resources to improve the quality of life in human settlements.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Acquire knowledge of, understand, and critique key paradigms and approaches in urban geography.
2. Critically evaluate the contribution of planning and design concepts to the development of contemporary urban planning and the urban landscape.
3. Develop skills in the critical analysis of urban theory, urbanization, and urban problems and apply in an analysis of urban social or public policy.
4. Apply a range of key urban design, research, and problem-solving skills to complex real-world situations.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2									✓
CLO3		✓							
CLO4	✓								

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Development, Scope, Methodology of Urban Geography; The nature of urban geography and paradigm shifts; Definition of urban centers/cities.	CLO 1	Lecture, PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Origin and Evolution of Cities: Early (Ancient and Classical); Medieval and baroque (including colonial variations); Industrial and Modern urban forms; Post-industrial and emerging cities	CLO 1		
Urban systems: The Urban Structure and System; Central Place Theory and other models; Growth and Transition in an Urban System; Cities and globalization.	CLO 2		
Urbanization: Concept and nature of urbanization; Factors and impact of urbanization; Rural-Urban Migration**;** Urban Spaces-Cities as social and physical space.	CLO 3		
Internal structure and system in cities: Classic and contemporary models of urban spatial structure; The inner city; Suburbanization and land use conflicts; Gentrification and Environmental justice, environmental racism; neighborhood change; Implosion, explosion, and sprawl.	CLO 2		
Social aspects of urbanization: Gender; Ethnicity; Race, class, gender, and other forms of urban social difference	CLO 3		

Urban Transport and Land use: Nature of urban traffics, flow and volume; Urban traffic dynamics and movement pattern; land use and transport interaction; Real estate and housing; Industrialism and post-industrialism; Political economy of urban development; Cities, nature, and sustainability.	CLO 4		

Books Recommended:

1. Kaplan, D.H., Wheeler, J.O. and Holloway, S., 2014. Urban geography. John Wiley & Sons Incorporated.
2. Michael, P., 2005. Urban geography–a global perspective. Routledge.
3. Latham, A., McCormack, D., McNamara, K. and McNeill, D., 2009. Key concepts in urban geography. Sage.
4. Verma, L.N., 2006. Urban geography. Rawat Publications.
5. Hall, P. 2019. Urban and Regional Planning. Routledge.

Course Code: **GE-4106**	**Course Title:** **Research Methods and Techniques Lab**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 4th Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

The course offers practical skills required to plan, implement, analyze and report a scientific finding in geo-environmental research design.

Course Objectives:

1. To Explain and apply techniques for scientific writing and research methodology to prepare the writing of a scientific report.
2. To perform investigation using methods, explain and take position on the results as well as summarize related work.
3. To apply the knowledge in scientific writing and research methodology and use the knowledge to write a scientific report.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Use language appropriately and effectively in written academic work.
2. Use computer applications to develop your academic research.
3. Develop skills in qualitative and quantitative data analysis and presentation.
4. Develop advanced critical thinking skills.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1		✓							
CLO2				✓					
CLO3			✓						
CLO4						✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Segment 1: 1. Initiation of project and research work: Understanding research areas and problem statement 2. Literature Review and research designing 3. Learning research applications 4. Proposal Development 5. Presentation 6. Submission of a mini project paper following complete research process	CLO 1 CLO 4	Lecture PPT, Video Demonstration, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Segment 2: **1.** Data transcription and individual presentation **2.** Content analysis and coding **3.** Software application: MaxQDA and Zotero	CLO 2 CLO 3		

Books Recommended:

1. Tan, W. 2008. Practical Research Methods. Pearson Education
2. Kumar, R., 2018. *Research methodology: A step-by-step guide for beginners*. Sage.
3. Kothari, C R. and Garg, G. 2019. Research Methodology: Methods and Techniques. New Age International Publishers.

Course Code: GE-4107	**Course Title: Environmental Pollution Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 4th Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

This course focuses on the laboratory exercise of pollution analysis.

Course Objectives:

1. To provide a deeper understanding of environmental pollution, pollutants and their analysis

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Understand the influence of air pollution on fine particulate matter of both rural and urban areas.
2. To learn technical device operation, applications and options are used to identify and remediate pollution of the environment.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2					✓				

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Particle Pollution: Dust falls per unit area; Particulate matter per unit volume of air of in Urban & Rural area; Organic & Inorganic Components of airborne particulate matter; SO2 / CO2 in air of an Urban & Rural area; Total acid in air of an Urban & Rural area; Microscopic examination of particulate matter (Morphological Studies); Point and Non-Point pollution source modeling; Aerosol modeling using RS.	CLO 1 CLO 2	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Ground water pollution: Arsenic in groundwater (using low-cost kit); ammonium, nitrate, and phosphate ions by strip.	CLO 1		
Chemical identification: Inorganic Components of particulate matter (Pb, Fe, Ni, Cu).	CLO 2		

Books Recommended:

1. Understanding Environmental Pollution- Marquita K. Hill
2. Impact, Monitoring and Management of Environmental Pollution- Ahmed El-Nemr

Course Code: GE-4108	**Course Title: GIS Programming and Spatial Analysis Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 4th Year 1st Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:

This course will focus on the advanced tools and analysis techniques of GIS which will help students in gaining and understanding knowledge in advanced GIS analysis; network analysis; spatial modelling; spatial statistics; advanced Geo-processing; customizing GIS and web mapping.

Course Objectives:

1. To develop skills on advanced level spatial programming.
2. To explain the theoretical and practical considerations required for conducting a GIS-based planning analysis for decision support in a professional manner.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Use both simple and complex variables to store and retrieve GIS related data.
2. Develop solutions using the programming problem solving process.
3. Perform programming for GIS customizations.
4. Automate geospatial analysis methods such as transformations, raster analysis, and geometric operations.
5. Use scripting languages such as Python and others to automate repetitive tasks in desktop geospatial software.
6. Recognize GIS tasks that are amenable to automation, such as route generation, incident response, and land use change analysis.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2			✓	✓					
CLO3		✓							
CLO4				✓					
CLO5				✓					
CLO6						✓			

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Theory of spatial representation and modeling in GIS	CLO1	Lecture PPT, Video Demonstration, Lab Experiment, Single and Group Exercise, Q/A	Lab Report, Mini project, Lab performance, Final Examination
Introduction to Python Scripting: Variables and Numerical Data Types, Conditionals, Loops, Functions	CLO2 CLO3 CLO5		
Modules and Data Structures: String Data Types, Modules and Methods, Lists and Data Structures	CLO1		
File Processing: Reading and Writing Files, Operating System Commands, Debugging Computer Code; Modular Programming	CLO2		
Object-oriented Programming: Classes and Objects, Program Flow Control; Exception Handling	CLO5		
ArcPy Module: Creating Custom Tools in ArcGIS, GIS Workflows - ArcPy and Model Builder, ArcPy Classes and Objects, ArcPy Geoprocessing Tools and Functions, ArcPy Messages	CLO5		
Cursor Objects: Managing Tabular Data and Cursor Objects, Geoprocessing Outputs and Result Objects, Listing GIS Data	CLO6		
Geometry Objects: Working with Geometry Objects, Getting Information with Describe Objects	CLO4		
Raster Objects and others: Spatial Analyst and Raster Objects, Computer Algorithms, Creating Custom Tools in ArcGIS	CLO4		
Google Earth Engine (GEE)- Geospatial data analysis in GEE	CLO4 CLO6		

Books Recommended:

1. Zandbergen, Paul A. 2013. Python Scripting for ArcGIS. Redlands, Esri Press, 368 pp
2. Miller, Harvey J., and Michael F. Goodchild. 2015. "Data-driven geography." GeoJournal 80(4): 449-461.
3. Lutz, M. and Ascher, D. (1999) Learning Python, O'Reilly Media.
4. Zelle, J. M. (2003) Python Programming: An Introduction to Computer Science, Franklin Beedle.
5. Tucker (2004) Writing Geoprocessing Scripts in ArcGIS, ESRI Press (available online).

Course Code: GE-4208	Course Title: Field Work on Micro Region Survey Lab	Total Marks: 100
Level: 4th Year 2nd Semester	Course Type: Field Work	Credit: 2

Course Rationale:
The course trains students to prepare for fieldwork in a particular region appropriately.

Course Objectives:
To assist students in developing both the practical skills and the professional knowledge required for field research in a specific region.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1. To work in depth with a specific focus in a region
2. Reflect on various practical skills required to undertake research in different environments, including cross-cultural communication, language competency and budgeting.
3. Identify issues relating to human research ethics and consider how to address them in the context of geographical study.
4. Critically reflect on methodological choices and practices relevant to the regional context

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1		✓				✓			
CLO2			✓						
CLO3					✓				
CLO4				✓					
CLO5									

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Socio-Economic context observation	1,2,3	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion, Visit a specific microregion	Presentation, FW Report, Viva
Tourism potentiality assessment	1,3		
Biodiversity identification assessment	1		
Physical environment analysis	1,4		
Land use identification and mapping	1,4		

FOURTH YEAR SECOND SEMESTER

Sl. No.	Course code	Course	Credit	Marks				
				CIE			SEE	Total
				Incourse/Tutorial/ Assignment (15)	Class Attendance (10	Presentation/ Quiz (5)		
1	GE-4201	Hazard and Disaster Management	3	15	10	5	70	100
2	GE-4202	Environmental Law, Protocol and Ethics	3	15	10	5	70	100
3	GE-4203	Health Geography	2	15	10	5	70	100
4	GE-4204	Land Use Planning and Development	2	15	10	5	70	100
5	GE-4205	Spatial Data Analysis in Health Geography Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
6	GE-4206	LULC Analysis Lab	1.5	05 (Lab Notebook)	10+5=15 (Attendance +Performance)	10 Viva on Experiment	70	100
7	GE-4207	Research Project (Report + Defense= 3+1)	4	nil	nil	nil	100	100
8	GE-4208	Viva-Voce	1	nil	nil	nil	100	100
Total			18.0					800

Course Code: GE-4201	**Course Title: Hazard and Disaster Management**	**Course Type: Core course**	**Total Marks: 100**
Level: 4th Year 2nd Semester		**Contract Hours: 39**	**Credit: 3**

Course Rationale:
The course is designed to apply the fundamental concepts of hazard and disaster; typology of hazard and disaster; discuss risk and vulnerability; show disaster management strategies and management approaches.

Course Objectives:
1. Understand foundations of hazards, disasters and associated natural/social phenomena.
2. Familiar with disaster management theory (cycle, phases)
3. Develop knowledge about existing global frameworks and agreements.
4. Acquire knowledge on technological innovations in Disaster Risk Reduction
5. Experience in conducting independent disaster management study including data search, analysis and presentation of disaster case study.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to

1. Develop understanding of foundations of hazards, disasters and associated natural/social phenomena.
2. Develop a critical capacity to evaluate the principles and practices of disaster risk reduction and management.
3. Develop a deep understanding of disaster resilience, risk mitigation, and recovery policies as they arise from natural hazards around the globe.
4. Familiarize with disaster management theory and methods of community involvement as an essential part of successful DRR
5. Gain knowledge about existing global frameworks, agreements, and technological innovations in Disaster Risk Reduction

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2			✓						
CLO3									✓
CLO4						✓			
CLO5								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Hazard and Disaster Management: Definition; History and development; Modern DM; International Disaster Management; Disaster, poverty and development	CLO 1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Hazards and disasters: Definitions of hazard and disaster, distinctions, physical dimensions; Causes; Historical perspective; Typology or classification of hazards and disasters.	CLO 1 CLO 3		
Risk and Vulnerability: Components, Trends, Likelihood and consequence value calculation, Risk evaluation, acceptability; Concept of vulnerability, exposure and resiliency	CLO 2		
Disaster Management Strategies: Conceptual framework; Tools and techniques, prevention and mitigation (structural and non-structural); Disaster management cycle (mitigation, preparedness, response, recovery and rehabilitation); Disaster relief, providers and distributors of disaster aid.	CLO 3 CLO 4		
Disaster Management Approaches: Governmental, Non-governmental (including the private sector, and academia) multilateral organizations and international financial institutions.	CLO 4 CLO 5		

Books Recommended:

1. Abbott, PL, 2013 *Natural Disasters*, London: McGrawhill.
3. Bangladesh Open University 2004, ELEC 3619 Disaster Management, the Commonwealth of Learning, Vancouver.
4. Coppola, DP, 2011. *Introduction to International Disaster Management* (2nd edition), Burlington: Elsevier.
5. Nizamuddin, K. (ed.), (2000), *Disaster in Bangladesh: Selected Readings*, Disaster Research Training and Management Centre, University of Dhaka.

Course Code: GE-4202	Course Title: Environmental Law, Ethics and Protocol	Course Type: Core course	Total Marks: 100
Level: 4th Year 2nd Semester		Contract Hours: 39	Credit: 3

Course Rationale:

To explore the knowledge about environmental ethics, protocols, and laws both Bangladesh and world perspective. The students need to know about the history of the development of laws and its enforcement. Moral ethics also need to be developed for the development of humanity.

Course Objectives:

1. To learn about the history and development of laws protocol and ethics and their interrelation.
2. To learn the norms and values, laws.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1: Identify and explain the philosophical and historical foundations of environmental law.
2: Understand the frameworks within which environmental legislation operates at the Local, State, National and International levels.
3: Understand the operation of Environmental Law and the legal obligations of citizens in regard to different sectors of environmental regulations.
4: Demonstrate a comprehensive knowledge of the key principles of environmental law and awareness of the main ethical perspectives of environmental law and policy.
5: Apply to any given factual problem the existing legal framework, which deals with planning, development, pollution, conservation, heritage and environmental impact assessment.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							

CLO3					✓				
CLO4							✓		
CLO5								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Definition of law, protocols, treaties and convention, classification of laws, environmental law, environmental rights, environmental justice, historical evolution of environmental legislation.	CLO 1 CLO 2	Lecture PPT, Video, Group discussion, Q/A, Discussion	Class Test, Quiz, Presentation, Assignment, Final Examination
Major UN conferences regarding environment: Stockholm declaration 1972, Agenda 21, Rio-declaration, Kyoto protocol, CDM and Carbon credit, Convention of biological diversity, Ramser convention, Basel convention, UN convention on the laws of the sea; and other recent conventions.	CLO 1 CLO 3		
Environmental law regime in Bangladesh: History and background, constitutional provision, role of BELA in the legal activism in Bangladesh, Bangladesh position on ICTPs; ECA 1995, ECR 1997, EC 2000 and other recent laws, Environmental policy- National and international.	CLO 3		
Sectoral environmental legislations in Bangladesh: laws regarding Biodiversity conservation, Forestry, Fishery, Mineral exploration, Groundwater management etc.	CLO 4		
Ethical Issues: Relation of Environmental Laws to Ethics and ethical issues in environment. Role of classical and contemporary ethical theories.	CLO 4		
A Comparative Study: Environmental laws in developed and developing countries and its enforcement	CLO 5		

Books recommended:

1. Mohanty, S. K. 1999. Universal's Environment and Pollution Law Manual. Universal Law Publishing Co. Pvt. Ltd., New Delhi.
2. Farooque, M. and Hassan, R.1996. Laws Regulating the Environment in Bangladesh. BELA, Dhaka.
3. Rahman A. A., Haq S., Haither R. and Jansen E. G. 1994. Environment and Development in Bangladesh. UPL, Dhaka.
4. Pojman, P. L. 2000. Global Environmental Ethics. McGraw-Hill, Mayfield Publishing Company, USA.
5. Rolston, H. 1998. Environmental Ethics. Temple University press, USA.

Course Code: **GE-4203**	**Course Title:** **Health Geography**	**Course Type:** **Core course**	**Total Marks: 100**
Level: 4th Year 2nd Semester		**Contract Hours: 26**	**Credit: 2**

Course Rationale:

The aim of this course is to outline current theoretical and practice-based issues in the area of health and to understand the developing role geographers play in these areas.

Course Objectives:

1. To focus on major themes in the geography of health and health care.
2. To introduce students to reading health research critically, and the changing concepts of health.
3. To explain and illustrate through case studies and examples, the geographical aspects chronic and mental health, health inequalities, health care provision and planning.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to

1. Develop the concepts of health geography and the geographical aspects of disease diffusion.
2. Know and understand how the social context and other geographical determinants affect health.
3. Understand the changing global context of public health.
4. Know and understand the reasons for differences in health access and outcomes across social groups and classes.
5. Understand the process of health care delivery and health care planning.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓							
CLO3			✓						
CLO4							✓		
CLO5								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: The historical context, Origins, Recent development, Definition, scope, and application, Geography and public health, Causation of disease, Natural history of disease, Challenges in Health geography.	CLO 1 CLO 2	Lecture PPT, Video, Group discussion, Q/A, Discussion	Class Test, Quiz, Presentation, Assignment, Final Examination
Measuring Health and Disease: Defining health and disease, measuring disease frequency, using available information to measure health and disease.	CLO 1		
Human Ecology of Diseases: Health; Triangles of Human Ecology; Transmission and creation of infectious disease; Nutrition and Health	CLO 3		
Landscape Epidemiology: Regions and transmissible disease systems; Landscape epidemiology approach; Cultural dimension and ecology of diseases; Regionalization; Ecological complications; Approaches and theories- Biomedical disease model	CLO 1 CLO 3		
Climate and Weather: Influences on health; Seasonality of death and birth; Climate change, health and diseases; Physical zonation of climate and biomes.	CLO 2		
Pollution Syndrome: Toxic hazards of natural and economic origins; Indoor and outdoor air pollution; Water Pollution; Radioactive pollution; Risk assessment and Prevention; Globalization and perception of health hazards; The geometry of hazards, power and policy.	CLO 4		
Political ecology of Noncommunicable Diseases: Dimensions of mortality over space; Poverty and epidemiology; Disease ecology- cancer and cardiovascular diseases; Health inequalities; Environmental justice and health; Theorizing health inequalities; Globalization and health	CLO 2		
Neighborhoods and Health: Concept of Neighbourhood health; Definitions and units; Analyzing neighbourhood effects on health; Effects of the built environment on health.	CLO 2		
GIS and Health Geography: Disease diffusion in space; Geographic approaches to the pandemic and epidemics; Cartography of diseases; Spatial data sources and types; Scale of analysis and units of observation; Spatial analysis and statistics; Visualization and summarization of disease distribution.	CLO 4		
Healthcare and Planning: Gender and health; Globalization and health; Process of health care delivery and health care planning.	CLO 5		

Books recommended:

1. Curtis, S. (2004). Health and Inequality: Geographical Perspectives London: Sage Publications Chapter 1 'Introducing geographical perspectives on health and inequality.
2. Gatrell, A. (2002). Geographies of Health: An Introduction Oxford: Blackwells.

3. Smith, S. J. and D. Easterlow (2005). "The strange geography of health inequalities." Transactions of the Institute of British Geographers 30(2): 173-190.
4. Cummins, S., S. Curtis, et al. (2007). "Understanding and representing 'place' in health research: A relational approach." Social Science & Medicine 65(9): 1825-1838

Course Code: **GE-4204**	**Course Title:** **Land Use Planning and Development**	**Course Type:** **Core Course**	**Total Marks:** **100**
Level: 4th Year 2nd Semester		**Contact Hours: 26**	**Credit: 2**

Course Rationale:
The course is designed to apply the fundamental concepts of land use and land cover; discuss land use planning; explain land use theories and mod and show the relationship between urban and rural land use; and land use policies in stressful conditions.

Course Objectives:
1. Develop an understanding of a broad spectrum of natural factors and processes and their relationships to land use and development patterns.
2. Utilize methodologies and techniques central to land analysis.
3. Demonstrate the ability to integrate principles of environmentally sensitive land use, design, development and decision making within the land use planning process.
4. Demonstrate an understanding of the institutional and legal frameworks and policies guiding planning and development.
5. Illustrate spatial planning from broad scale metro planning to local planning and understanding of the challenges, legalities and technicalities of land use management.

Course Learning Outcomes (CLOs): After Successful completion of the course the students will be able to-

1. Understand the importance of land use planning.
2. Utilize policies and tools for effective land use planning.
3. Integrate land use planning and infrastructure.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2									✓
CLO3		✓							

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Introduction: Concept of Land, Land Use and Land Cover; Issues and theme in Geographical perspective; Theoretical underpinnings and approaches to land use studies; Classification of urban and rural LU, Land Capability Classification	CLO 1	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion	Class Test, Quiz, Assignment, Presentation, Final Examination
Concept of Land Use planning: Planning; Elements to be considered during planning; data, conceptual problems and the users of land use data; Approaches to land use planning and development, Land Use zoning, Land-use planning in Bangladesh; Principles of land use and land evaluation	CLO 1		
Land Use Theories and Models: The central place system, spatial organization of land uses, central place hierarchy, theoretical extension of the Christaller model by August Losch, theories of urban structure (Ernest W. Burgess, Homer Hoyt, Chauncy D. Harris and Edward L. Ullman).	CLO 1 CLO 2		
Urban and Rural land use: Factor influencing urban and rural land use; Major issues in urban land use; Urban land use classification; Urban land use planning in Bangladesh	CLO 2		

Natural Hazard and Land use Planning: Climate Change and Adaptation through Land use Planning; Principles, Risk sensitive planning, Planning and LU adjustment.	CLO 3		
Land use Planning and Environment: Energy & LUP, Anthropogenic interference and Land, LUP and Sustainability			
Land use policies and related Planning issues in Bangladesh: Land use policy; National Water Policy; Environment Policy and Act; Agriculture Policy/crop production policy/Agriculture Extension Policy; Forest and Nature Conservation Act; Bio-Diversity Act; Coastal Zone Policy	CLO 3		

Books Recommended:

1. Pacione, M. (2009) Urban Geography: A Global Perspective. Routledge: UK
2. Evans, A.W. (2004) Economics & Land Use planning. Blackwell Publishing: UK
3. Koomen, E et al. (2011) Land-Use Modelling in Planning Practice. Springer: Germany
4. Lindgren, D.T. (1985) Land use planning and remote sensing. Springer: Netherlands

Course Code: GE-4205	**Course Title: Spatial data analysis in Health Geography Lab**	**Course Type: Lab**	**Total Marks: 100**
Level: 4th Year 2nd Semester		**Contract Hours: 39**	**Credit: 1.5**

Course Rationale:

This course is to equip students to conduct epidemiological analysis and to interpret and present the results of analyses.

Course Objectives:

1. To know the basic practical concept of Health Geography
2. Able to acquire knowledge about epidemiological data.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1. Understanding basic data analytic procedures used in health research.
2. Develop proficiency in data analysis using geospatial and statistical software package.
3. Develop skills in geospatial healthcare analysis.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1			✓						
CLO2				✓					
CLO3								✓	

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Disease diffusion in space	CLO 1 CLO 3	Lecture PPT, Video, Demonstration, Group discussion, Q/A, Discussion, Exercise in lab	Class Test, Quiz, Presentation, Final Examination
Identify key sources of spatial data for health	CLO 1		
Cartography of diseases	CLO 2		
Scale of analysis and units of observation	CLO 1		
Spatial analysis and statistics	CLO 3		
Visualization and summarization of disease distribution	CLO 2		
Use statistical software to analyze health-related data	CLO 2		

Books recommended:

5. Curtis, S. (2004). Health and Inequality: Geographical Perspectives London: Sage Publications Chapter 1 'Introducing geographical perspectives on health and inequality.
6. Gatrell, A. (2002). Geographies of Health: An Introduction Oxford: Blackwells.
7. Smith, S. J. and D. Easterlow (2005). "The strange geography of health inequalities." Transactions of the Institute of British Geographers 30(2): 173-190.

8. Cummins, S., S. Curtis, et al. (2007). "Understanding and representing 'place' in health research: A relational approach." Social Science & Medicine 65(9): 1825-1838

Course Code: **GE-4206**	**Course Title:** **Land Use Land Cover Analysis Lab**	**Course Type:** **Lab**	**Total Marks:** **100**
Level: 4th Year 2nd Semester		**Contact Hours: 39**	**Credit: 1.5**

Course Rationale:
This course is designed to make students adept in LU/LC mapping.

Course Objectives:
The overall objective of this course is to enable a student to make proper land use planning decisions based on principles in the planning process of land resources.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1. Develop understanding of terminology and concepts in land use evaluation.
2. Use of soil survey information for the assessment of land quality.
3. Apply the various methods available for land suitability assessment.
4. Use of land quality assessment as an input to decision making on optimization of sustainable land use and management.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2			✓						
CLO3				✓					
CLO4									✓

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	**CLO**	**Teaching-Learning Strategies**	**Assessment Strategies**
Change detection	CLO1 CLO3	Lecture PPT, Group discussion, On-field demonstration.	FW Report, Presentation, Viva
Determining Change in Specific Land Cover Types	CLO1 CLO2 CLO4		
Multi-criteria analysis for land use suitability site selection	CLO3 CLO4		

Books Recommended:

1. Giri, C.P (2020) Remote Sensing of Land Use and Land Cover. Routledge.
2. Pereira, P., Brevik, E., Munoz-Rojas, M. and Miller, B., 2017. Soil mapping and process modeling for sustainable land use management. Elsevier
3. Ahlqvist, O *et al.* (2016) Land Use and Land Cover Semantics: Principles, Best Practices, and Prospects. Routledge.
4. Manakos, I and Braun, M. (2014). Land Use and Land Cover Mapping in Europe: Practices & Trends. Springer.
5. Lyle, J., 1999. Design for human ecosystems: landscape, land use, and natural resources. Island Press.
6. Burby, R.J. ed., 1998. Cooperating with nature: confronting natural hazards with land-use planning for sustainable communities. Joseph Henry Press.

Course Code: **GE-4207**	**Course Title:** **Research Project**	**Total Marks:** **100**
Level: 4th Year 2nd Semester		**Credit: (Report + Defense= 3+1)**

Course Rationale:
This course aims to enable the student to develop deeper knowledge, understanding, capabilities and attitudes in the geo-environmental context. It will offer the opportunity to delve more deeply into and synthesize knowledge acquired in previous studies. This will facilitate quality undergraduate research between students and mentors and to bring students into a community of scholars within their field as well.

Course Objectives:

1. To develop the ability to give an independent, systematic, and clear treatment of a certain topic in the field of geographical and environmental sciences
2. To train the ability to independently identify and analyze relevant problems
3. To solve a practical problem by a systematic use of an appropriate choice of theory and methodologies.
4. To train the ability to independently acquire and handle academic knowledge through independent studies of relevant literature, and to cultivate the ability to evaluate and briefly account for the central elements in a large literature base.

Course Learning Outcomes (CLOs): After the successful completion of the course, students will be able to-

1. To work in depth with a specific subject area.
2. To independently demonstrate their ability to formulate a geography and environmental science related topic, select relevant literature, process data, conduct analyses, apply methodologies, make critical assessments, and present answers to questions raised in the problem statement.
3. To use a holistic view to identify, formulate and deal with complex environmental issues critically, independently, and creatively.
4. To articulate the relevance of their research to their coursework and professional future, synthesizing their research, academic, and professional interests, and goals.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	✓								
CLO2		✓	✓						
CLO3			✓						
CLO4					✓	✓			
CLO5									

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategies

Content	CLO	Teaching-Learning Strategies	Assessment Strategies
Research topic selection.	CLO1 CLO2	Students will complete the tasks under the supervision of their selective supervisor.	Project Report, Final Defense
Literature review	CLO2 CLO3		
Data collection and Analysis	CLO2 CLO3		
Project report writing.	CLO3 CLO4		

Course Code: **GE-4208**	**Course Title:** **Viva Voce**	**Total Marks: 100**
Level: 4th Year 2nd Semester		**Credit: 1**

Rationale:

The course aims to enable the students to attend placements and be better performers in their future.

Objective:

This viva aims to assess students' understanding based on course objectives covering all the courses of 4th year 1st semester and 2nd semester.

Course Learning Outcomes (CLOs):

1. Prepare to face interviews both in the academic and the service sectors.
2. Express themselves confidently with good communication skills.

Mapping of CLOs with PLOs-

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1					✓	✓			
CLO2					✓	✓			