Outcome Based Education (OBE) Curriculum

BS Session: 2024-2025 & 2025-2026

Four-Year Integrated

Bachelor of Science (Honours)

Degree in Disaster Science and Climate Resilience

Department of Disaster Science and Climate Resilience

Faculty of Earth and Environmental Sciences

University of Dhaka

Department of Disaster Science and Climate Resilience
Faculty of Earth and Environmental Sciences
University of Dhaka (DU)
OBE Curriculum for B.S. (Honours) in Disaster Science and Climate Resilience

Part A

1. Title of the Academic Program: Bachelor of Science (Honours) in Disaster Science and Climate Resilience

2. Name of the University: University of Dhaka

3. Vision of the University

The University of Dhaka (DU) aims to create a world-class educational ecosystem that enables individuals to act as dynamic human capital and ethical leaders for a sustainable future.

4. Mission of the University

The university's missions for the students are to:

- **UM1:** Provide transformative education by enabling students to embrace lifelong learning and fostering a sustainable knowledge-based society through the continuous pursuit of scholarship, humanistic values, and technological innovation.
- **UM2:** Pursue collaborative research and innovation, leveraging partnerships to expand the boundaries of knowledge.
- **UM3:** Develop an educational ecosystem that fosters excellence, transparency, inclusivity, and accountability.
- **UM4:** Engage with stakeholders and communities to build a just, fair, diverse, and sustainable world.
- **UM5:** Encourage students to become ethically responsible global citizens with a positive societal impact.
- **UM6:** Install a deep sense of national heritage and pride in students, upholding historical roots and global connectivity.

5. Name of the Degree: Bachelor of Science (Honours) in Disaster Science and Climate Resilience

6. Name of the Faculty Offering the Program: Faculty of Earth and Environmental Sciences

7. Name of the Department Offering the Program: Department of Disaster Science and Climate Resilience

8. Vision of the Program

To develop skilled professionals and researchers in disaster science and climate resilience, equipping them with the knowledge and expertise to create innovative solutions, strengthen community resilience, and contribute to a sustainable future.

9. Mission of the Program

The missions of the program are to:

M1	Equip students with multidisciplinary knowledge to understand, assess, and manage disaster risks and climate resilience challenges.
M2	Promote practical, field-based learning and research to develop effective disaster response and climate adaptation strategies.
M3	Foster a commitment to sustainable development, ethical practices, and innovation in addressing complex disaster and climate issues.

10. Description of the Program

The Department of Disaster Science and Climate Resilience was renamed on December 29, 2021, from the Department of Disaster Science and Management, which started its journey in 2012. In the department, earth science, social science, and engineering are integrated to generate multidisciplinary and comprehensive knowledge and skills, understand and address complex risk and emergency scenarios, and eventually create a resilient society. The evolution of the department's name reflects the importance given to climate change studies, hazard science, and disaster management. Students were first admitted to BS (Honours) program from the academic session of 2012-2013. Under the Semester System, the four-year B.S. Honours (integrated) Degree in Disaster Science and Climate Resilience (DSCR) at the University of Dhaka is a program comprised of eight semesters.

11. Program Educational Objectives (PEOs)

Disasters are now seen as development challenges rather than purely natural or human-made events, with climate change intensifying risks. The shift from response to disaster risk management emphasizes holistic approaches, integrating science, technology, and innovation for resilience and sustainability. Recognizing this paradigm shift, the Bachelor of Science (Hons.) curriculum is designed to advance knowledge in disaster management and climate resilience as a discipline, ensuring graduates achieve the Program Educational Objectives (PEOs) and contribute effectively to the field. The PEOs are as follows:

PEO1	Graduates will demonstrate a thorough understanding of disaster science principles and climate resilience, emphasizing local and global disaster contexts.
PEO2	Graduates will apply their knowledge in practical, field-based settings to address and mitigate risks in diverse geographic and socio-political contexts, including community engagement and resilience-building initiatives.
PEO3	Graduates will integrate scientific and technological tools, such as GIS, remote sensing, and climate modeling, to analyze and solve problems related to disaster risk reduction and climate adaptation.
PEO4	Graduates will be committed to sustainable development, ethical practices, and continuous learning in professional and academic pursuits related to disaster management and resilience.
PEO5	Graduates will develop leadership and collaboration skills to effectively work with interdisciplinary teams in disaster management's planning, response, and recovery phases.

12. Program Learning Outcomes (PLOs)

After completing the Program, the students will be able to:

PLO1	Demonstrate foundational knowledge in earth systems, climate science, and environmental science as they relate to disaster and resilience contexts.
PLO2	Utilize mathematical and computational skills to analyze data, model disaster scenarios, and interpret the impact of hazards.
PLO3	Apply principles of vulnerability assessment and risk analysis to evaluate and manage disaster risks in various settings.
PLO4	Demonstrate proficiency in using tools, such as GIS, remote sensing, and hydrological models for disaster assessment and climate resilience.
PLO5	Design and implement disaster risk reduction strategies that consider socio-economic, cultural, and environmental factors.
PLO6	Communicate complex disaster-related issues effectively with diverse stakeholders, including policymakers, communities, and international organizations.
PLO7	Exhibit ethical reasoning and consideration for sustainable practices in decision-making processes related to disaster science and climate resilience.
PLO8	Demonstrate the ability to conduct independent research, critically analyze findings, and contribute to advancing knowledge in disaster science and climate resilience.

13. Graduate Attributes

The graduate attributes are as follows:

No.	Attribute	Description
1	Disciplinary Knowledge	Demonstrate comprehensive knowledge in disaster science, climate resilience, environmental science, and risk management.
2	Problem Solving	Apply appropriate methods to analyze and propose solutions for complex disaster-related problems.
3	Critical Thinking and Analysis	Evaluate information critically and apply evidence-based reasoning to understand and manage disaster scenarios.
4	Communication Skills	Communicate effectively in oral and written forms across academic, professional, and community settings.
5	Use of Modern Tools and Techniques	Utilize GIS, remote sensing, modeling software, simulation, and analytical tools in disaster risk assessment and resilience planning.
6	Research and Inquiry	Conduct independent research using scientific methodology to investigate disaster and climate science issues.
7	Teamwork and Leadership	Work collaboratively in multidisciplinary teams and demonstrate leadership in project and field activities.
8	Ethical, Legal, and Professional Understanding	Understand and uphold ethical, legal, and professional standards in disaster science and public service.
9	Lifelong Learning	Recognize the need for continuous learning to remain professionally relevant in the changing global context of disaster and climate risks.
10	Social and Environmental Responsibility	Appreciate the socio-environmental implications of disaster and climate issues and work for sustainable and inclusive solutions.

14. Mapping the mission of the university with PEOs

Correlation: 3- Strong correlation; 2- Medium, 1- Low

PEO\UM	UM1	UM2	UM3	UM4	UM5	UM6
PEO1	3	2	2	2	2	1
PEO2	2	3	2	3	2	2
PEO3	3	3	2	2	2	1
PEO4	3	3	3	3	3	2
PEO5	2	2	3	3	3	2

15. Mapping PLOs with the PEOs

Correlation: 3- Strong correlation; 2- Medium, 1- Low

PEO\ PLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
PEO 1	3	2	2	1	1			
PEO 2	1	3	3	2			2	
PEO 3		1	3	3	2	2		
PEO 4			1	1	3	2	3	1
PEO 5					1	3	3	2

Part B

16. Structure of the Curriculum

a) **Duration of the Program:** Under the Semester System, the four-year B.S. Honours (integrated) Degree in Disaster Science and Climate Resilience (DSCR) at the University of Dhaka is a program comprised of eight semesters. The duration of the BS Honours program is four years, where each semester consists of six months.

b) **Eligibility:** Student can apply for admission through KA-Unit admission test as per university rules. Students who have passed the admission test will become eligible for the program. In addition, a candidate must obtain minimum grade B in physics, mathematics and chemistry in their HSC or equivalent exam.

c) **Total minimum credit requirement to complete the program:** 140

d) **Total class weeks in a semester:** 15 weeks

e) **Minimum CGPA requirements for graduation:** 2.00

f) **Maximum academic years of completion:** 6 years

g) **Category of Courses:**

i. **General Education Courses (GED):** Total 19 courses, 42 credits.

Course Code	Course Name	Credit
DSCRHT 1005	Applied Calculus	2
DSCRHT 1009	Atmospheric Physics	2
DSCRHT 1011	Society and Disaster	3
DSCRHT 1012	Applied Linear Algebra	2
DSCRHT 1013	Basic Statistics and Probability	2

DSCRHT 2001	Applied Differential Equation	2
DSCRHT 2006	Numerical Analysis and Sampling Techniques	2
DSCRHL 2007	Introduction to Computer Programming	2
DSCRHL 2008	Environmental Chemistry and Pollution Lab	2
DSCRHT 2011	Bangladesh Studies: Resilience Perspective	2
DSCRHT 2012	Principles of Remote Sensing	2
DSCRHT 2013	Geographic Information System and Database Management	2
DSCRHL 2014	Remote Sensing Lab	2
DSCRHL 2015	GIS Lab	2
DSCRHT 3004	Built Environment	2
DSCRHL 3006	Disaster Statistics and Data Science Lab	3
DSCRHT 3007	Development and Resilience: Economic Concept	3
DSCRHL 4006	Numerical Simulation and Machine Learning Lab	2
DSCRHT 4009	Project Planning, Monitoring, and Evaluation	3

ii. **Core Courses (CC):** Total 31 courses, 82 credits.

Course Code	Course Name	Credit
DSCRHT 1001	Introduction to Disaster Science and Climate Resilience	2
DSCRHT 1002	Fundamentals of Earth Systems	3
DSCRHT 1003	Basics of Meteorology and Climatology	3
DSCRHT 1004	Introduction to Environment and Ecosystem	3
DSCRHL 1006	Surveying and Mapping Lab	2
DSCRHT 1008	Applied Earth Sciences	3
DSCRHT 1010	Hydrology and Water Resources	3
DSCRHL 1014	Earth Materials Lab	2
DSCRHT 2002	Geological and Hydro-meteorological Hazards	2
DSCRHT 2003	Climatic Hazards and Climate Change	2
DSCRHT 2004	Anthropogenic Hazards	2
DSCRHT 2005	Climate Resilience and Public Health	2
DSCRHT 2009	Seismology and Geodesy	3
DSCRHT 2010	Urban and Regional Planning: Concepts and Practices	3
DSCRHT 3001	Vulnerability and Risk Assessment	3
DSCRHT 3002	Applied Geophysics	3
DSCRHT 3003	Geotechnical Engineering	3
DSCRHL 3005	Geotechnical and Engineering Geophysics Lab	3
DSCRHT 3008	Geohazard Risk Reduction Approach	3

DSCRHT 3009	Hydro-meteorological Risk Reduction Approach	3
DSCRHT 3010	Population, Migration and Shelter Management	2
DSCRHL 3011	Hazard Analysis Lab	2
DSCRHL 3012	Geo-informatics and MIS in Disaster and Climate Change	2
DSCRHT 4001	Disaster Risk and Crisis Management	3
DSCRHT 4002	Mainstreaming Disaster Management and Climate Resilience	3
DSCRHT 4003	Climate Science and Modelling	3
DSCRHT 4004	Research Methodology and Knowledge Management	3
DSCRHL 4005	Multi-Hazard Risk Management Lab	3
DSCRHT 4007	Damage, Loss, and Need Assessment	3
DSCRHT 4008	Disaster in Agriculture and Food Security	2
DSCRHT 4010	Climate Change Mitigation and Adaptation	3

iii. Capstone Course/Project/Thesis/Comprehensive:

The program includes 4 viva voce (one per year), 3 fieldworks (in even semesters of the 1st, 2nd, and 3rd year), and a Thesis in the last semester, totaling 16 credits of capstone experiences. The viva sessions (1 credit each) assess students' comprehensive understanding of semester-wise courses, ensuring retention and integration of knowledge. The fieldworks (2 credits each) provide hands-on experience with tools and techniques relevant to the respective semesters. In the final semester, a 6-credit Thesis allows students to apply their cumulative learning, analytical skills, and methodological expertise to real-world disaster and climate resilience challenges.

17. Semester-wise distribution of courses

Course ID	1st Semester	Credit	Course ID	2nd Semester	Credit
DSCRHT 1001	Introduction to Disaster Science and Climate Resilience	2	DSCRHT 1008	Applied Earth Sciences	3
DSCRHT 1002	Fundamentals of Earth Systems	3	DSCRHT 1009	Atmospheric Physics	2
DSCRHT 1003	Basics of Climatology and Meteorology	3	DSCRHT 1010	Hydrology and Water Resources	3
DSCRHT 1004	Introduction to Environment and Ecosystem	3	DSCRHT 1011	Society and Disaster	3
DSCRHT 1005	Applied Calculus	2	DSCRHT 1012	Applied Linear Algebra	2
DSCRHL 1006	Surveying and Mapping Lab	2	DSCRHT 1013	Basic Statistics and Probability	2
DSCRHV 1007	Viva Vocé	1	DSCRHL 1014	Earth Materials Lab	2
			DSCRHF 1015	Field Work	2
Total Credit		**16**	**Total Credit**		**19**

Course ID	3rd Semester	Credit	Course ID	4th Semester	Credit
DSCRHT 2001	Applied Differential Equation	2	DSCRHT 2009	Seismology and Geodesy	3
DSCRHT 2002	Geological and Hydro-meteorological Hazards	2	DSCRHT 2010	Urban and Regional Planning: Concepts and Practices	3
DSCRHT 2003	Climatic Hazards and Climate Change	2	DSCRHT 2011	Bangladesh Studies: Resilience Perspectives	2
DSCRHT 2004	Anthropogenic Hazards	2	DSCRHT 2012	Principles of Remote Sensing	2
DSCRHT 2005	Climate Resilience and Public Health	2	DSCRHT 2013	Geographic Information System and Database Management	2
DSCRHT 2006	Numerical Analysis and Sampling Techniques	2	DSCRHL 2014	Remote Sensing Lab	2
DSCRHL 2007	Introduction to Computer Programming	2	DSCRHL 2015	GIS Lab	2
DSCRHL 2008	Environmental Pollution Lab	2	DSCRHL 2016	Field Work	2
			DSCRHF 2017	Viva Vocé	1
Total Credit		**16**	**Total Credit**		**19**

Course ID	5th Semester	Credit	Course ID	6th Semester	Credit
DSCRHT 3001	Vulnerability and Risk Assessment	3	DSCRHT 3007	Development and Resilience: Economic Concept	3
DSCRHT 3002	Applied Geophysics	3	DSCRHT 3008	Geohazard Risk Reduction Approach	3
DSCRHT 3003	Geotechnical Engineering	3	DSCRHT 3009	Hydro-meteorological Risk Reduction Approach	3
DSCRHT 3004	Built Environment	2	DSCRHT 3010	Population, Migration and Shelter Management	2
DSCRHL 3005	Geotechnical Engineering and Geophysics Lab	3	DSCRHL 3011	Hazard Analysis Lab	2
DSCRHL 3006	Disaster Statistics and Data Science Lab	3	DSCRHL 3012	Geo-informatics and MIS in Disaster and Climate Change	2
			DSCRHF 3013	Field Work	2
			DSCRHV 3014	Viva Vocé	1
Total Credit		**17**	**Total Credit**		**18**

Course ID	7th Semester	Credit	Course ID	8th Semester	Credit
DSCRHT 4001	Disaster Risk and Crisis Management	3	DSCRHT 4007	Damage, Loss, and Need Assessment	3
DSCRHT 4002	Mainstreaming Disaster Management and Climate Resilience	3	DSCRHT 4008	Disaster in Agriculture and Food Security	2
DSCRHT 4003	Climate Science and Modelling	3	DSCRHT 4009	Project Planning, Monitoring and Evaluation	3
DSCRHT 4004	Research Methodology and Knowledge Management	3	DSCRHT 4010	Climate Change Mitigation and Adaptation	3
DSCRHL 4005	Multi-Hazard Risk Management Lab	3	DSCRHP 4011	Thesis	6
DSCRHL 4006	Numerical Simulation and Machine Learning Lab	2	DSCRHV 4012	Viva Vocé	1
Total Credit		**17**	**Total Credit**		**18**

[Note: Of the DSCR Majors, each Theory course is denoted by six-letter code DSCRHT (i.e., DSCR Honours Theory), Laboratory/Lab course by the DSCRHL (i.e., DSCR Honours Lab), Field Works course by the DSCRHF (i.e., DSCR Honours Field), Thesis by the DSCRHR (i.e., DSCR Honours Thesis (Research)) and viva vocé by the DSCRHV (i.e., DSCR Honours Viva Vocé) followed by a four-digit number.]

Part C

18. Description of all courses of the Program including the required information for each course

Course Name: Introduction to Disaster Science and Climate Resilience

Course Code : DSCRHT 1001 **Credits : 02**

CIE Marks : 50

Exam Hours : 2.5 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Demonstrate understanding of disaster science, hazard assessment, and disaster risk management.
CLO2	Analyze different types of hazards and their characteristics.
CLO3	Evaluate risk components, vulnerability profiles, and their impact on disaster resilience.
CLO4	Assess disaster management frameworks, coping strategies, and adaptive capacities in Bangladesh.
CLO5	Examine the relationship between climate change, disaster risk, and nature-based solutions for resilience.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	2	2					
CLO2	2	3	3	2	2			
CLO3	2	3	3	3	3			
CLO4			3	2	3	3	2	2
CLO5							3	3

SL.	Course Contents	Hours	CLOs
1	Disaster: Definitions of Terminology; Sciences of Disaster; Meaning and Impact; a Four-Phase Approach of Disaster Management; Disaster Trends.	3	CLO1
2	Hazards: Natural Hazards (Meteorological, Hydrological, Hydro-meteorological, Climatic, Geological, and Biological); Technological and Man-made hazards; Hazard Identification and Hazard Profiling.	4	CLO2
3	Risk: Component of Risk (Likelihood, Consequence, and Trends); Risk Evaluation; Risk Acceptability and Alternatives.	3	CLO3
4	Vulnerability: Physical, Social, Environmental, and Economic Profiles; Risk Factors Influencing Vulnerability.	3	CLO3
5	Capacity: Definition, Relation with Other Disaster Terminologies.	2	CLO3 CLO4
6	Coping Capacity, Adaptation, Resilience: Definitions and Applications.	2	CLO4
7	Fundamental Approach to Disaster Management in Bangladesh: History, Paradigm Shift, Disaster Management Framework, and Institutions.	4	CLO4
8	Climate Resilience and Adaptive Strategies: Definition, Key Principles, and Approaches to Building Climate Resilience in Communities and Ecosystems.	3	CLO5
9	Climate Change Impacts on Disaster Risk: Influence on Hazard Frequency and Intensity, Sea-Level Rise, Extreme Weather Events, and Risk Patterns.	3	CLO5
10	Nature-Based Solutions for Climate Resilience: Role of Ecosystem-Based Adaptation, Sustainable Land Use, and Green Infrastructure in Disaster Risk Reduction.	3	CLO5

Textbooks:

1. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK.
2. Pinkowski J. (2008) Disaster Management Handbook. CRC Press. US.

3. Westen et al. (2011) Multi-hazard Risk Assessment Guidebook.

References:

1. United Nations International Strategy for Disaster Reduction (UNISDR) (2004) Living with Risk: A Global Review of Disaster Reduction Initiatives. Geneva: United Nations.
2. Paul B.K. (2011) Environmental Hazards and Disasters: Contexts, Perspectives and Management. Wiley-Blackwell. US.
3. Smith K. & Petley D.N. (2009) Environmental Hazards: Assessing Risk and Reducing Disaster. Routledge. New York.
4. Wisner B. (2004) At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge. US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Fundamentals of Earth Systems

Course Code : DSCRHT 1002 **Credits : 03**

CIE Marks : 50

Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the theory of the Earth's formation.
CLO2	Comprehend the Earth's major systems, i.e., geosphere, hydrosphere, atmosphere, and biosphere.
CLO3	Explain geological processes for the formation and changes of the Earth's surface through plate tectonics, erosion, weathering, and natural disasters.

CLO4	Appreciate the geological & atmospheric changes and explore the Earth's physical and biological features.
CLO5	Apply the principles of geological processes to analyze natural hazards and impacts of climate change.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3							
CLO2	3		2	2			1	2
CLO3	3		2	2	2		1	2
CLO4	3		2	2	2		1	2
CLO5	3	2	2	2	2		1	2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Earth Systems: Origin of the Earth and the Solar system; spheres of the Earth systems; interior of the Earth.	4	CLO1 CLO2
2	Global Tectonics: Continental drift, seafloor spreading, and plate tectonics.	6	CLO3
3	Earth's Materials: Definitions, types, and physical properties of rocks and minerals.	6	CLO5
4	Earth's Surface Processes: Weathering, erosion, denudation, and deposition.	4	CLO3
5	Natural Agents: Glacier, running water, wind and gravity.	4	CLO3 CLO5
6	Earth's History: Formation of the Earth's atmosphere, geological time scale, Earth's physical and biological features,	6	CLO4 CLO5
7	Mountain Building: Factors affecting deformation, types of stresses, rock deformation (fold, fault, joint), types of mountains, principles of isostasy	6	CLO3 CLO5
8	Volcanoes and Other Igneous Activities: Factors affecting eruptions, types of volcanoes, intrusive and extrusive igneous activities.	3	CLO3 CLO4
9	Sedimentary Environment: Continental, marginal marine, and marine.	3	CLO3 CLO5
10	Natural Hazards and Climate Change Impacts: Geological processes responsible for the occurrence of natural hazards and climate change impacts.	3	CLO3 CLO5

Textbooks:

1. Leet L.D. et al (1982) Physical Geology. Prentice-Hall. USA.

2. Turbuck E.J., Lutgens F. K. and Tasa D.S. (2013) An Introduction to Physical Geology. 13th Edition. Prentice Hall. US.
3. Plummer C., Carlson D. and Hammersley L. (2014) Physical Geology. 15th Edition. McGraw Hill. US.

References:

1. Berry L.G. and Mason B. (1968) Elements of Mineralogy. Greenwood Press. US.
2. Tyrrell G.W. (1952) The Principles of Petrology: An Introduction to the Science of Rocks. Dutton and Company Inc. New York.
3. Billings M.P. (1972) Structural Geology. 3rd Edition. Prentice Hall. US.
4. Philip Kearey et al (2009) Global Tectonics, Wiley-Blackwell Publication

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Basics of Meteorology and Climatology

Course Code : DSCRHT 1003 **Credits : 03**

CIE Marks : 50

Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Define fundamental concepts of meteorology and climatology, including atmospheric composition, weather elements, and climate systems.
CLO2	Explain atmospheric processes such as radiation balance, temperature variations, and wind circulation patterns.

CLO3	Apply meteorological principles to interpret weather maps and climate data.
CLO4	Analyze climate variability and extreme weather events in different geographical regions.
CLO5	Evaluate the impact of climate change on weather patterns and atmospheric systems.
CLO6	Develop climate resilience strategies using meteorological and climatological insights.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3							
CLO2	3							
CLO3	3	2						
CLO4	3	2	2					
CLO5	3	2	2		2		1	
CLO6	3	2	2		2	2	1	1

SL.	Course Contents	Hours	CLOs
1	**Introduction to Meteorology and Climatology** - Definition and scope of meteorology and climatology - Importance in disaster science and resilience	3	CLO1
2	**Composition and Structure of the Atmosphere** -Atmospheric layers and their characteristics - Composition and role of greenhouse gases	3	CLO1
3	**Atmospheric Thermodynamics and Heat Transfer** - Solar radiation and energy balance - Conduction, convection, and radiation - Role of latent heat in weather systems	5	CLO2
4	**Atmospheric Pressure and Wind Systems** - Pressure gradients, Coriolis effect, and geostrophic winds - Global wind patterns and jet streams	5	CLO3
5	**Moisture, Clouds, and Precipitation** - Humidity, dew point, and cloud formation - Types of precipitation and their formation	5	CLO4
6	**Weather Systems and Extreme Events** - Air masses and fronts - Cyclones, anticyclones, and monsoons - Thunderstorms, tornadoes, and hurricanes	6	CLO5
7	**Climate Classification and Global Climate Zones** - Köppen climate classification - Factors influencing regional climate variability	5	CLO6

8	**Climate Change and Variability** - Natural and anthropogenic climate change - Global warming, greenhouse effect, and feedback mechanisms	4	CLO6
9	**Weather Observation Methods** - Meteorological instruments and remote sensing	3	CLO4 CLO6
10	**Impact of Meteorological Hazards on Society** - Socio-economic impacts of extreme weather events - Disaster preparedness and mitigation strategies	3	CLO5 CLO6
11	**Case Studies and Applications in Disaster Science** - Regional case studies of major climate disasters - Policy and planning considerations for climate resilience	3	CLO5 CLO6

Textbooks:

1. Spiridonov, V., & Ćurić, M. (2021). Fundamentals of Meteorology (1st ed.). Springer. https://doi.org/10.1007/978-3-030-52655-9
2. Vallis, G. K. (2019). Essentials of Atmospheric and Oceanic Dynamics. Cambridge: Cambridge University Press.
3. Ahrens, C. D., & Henson, R. (2021). Meteorology Today: An Introduction to Weather, Climate, and the Environment (13th ed.). Cengage Learning.
4. Barry, R. G., & Chorley, R. J. (2010). Atmosphere, Weather and Climate (9th ed.). Routledge.
5. Lutgens, F. K., Tarbuck, E. J., & Tasa, D. G. (2019). The Atmosphere: An Introduction to Meteorology (14th ed.). Pearson.

References:

1. IPCC (2021). Sixth Assessment Report (AR6). Intergovernmental Panel on Climate Change.
2. American Meteorological Society (AMS) Glossary of Meteorology. https://glossary.ametsoc.org
3. World Meteorological Organization (WMO) Reports & Guidelines. https://public.wmo.int/en
4. NOAA National Weather Service Resources. https://www.weather.gov
5. Bangladesh Meteorological Department (BMD). https://www.bmd.gov.bd/

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	**Tests (30)**	**Assignments (05)**		**Oral Presentation/ Debate/ Poster/ Project Work (10)**	**Attendance (05)**
Remember	05	-		-	05
Understand	05	05		05	
Apply	10	-		05	
Analyze	10	-		-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Introduction to Environment and Ecosystem

Course Code : DSCRHT 1004 **Credits : 03**

CIE Marks : 50

Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Identify key components of ecosystems and environmental systems.
CLO2	Describe biogeochemical cycles and energy flow in different ecosystems.
CLO3	Demonstrate the relationships between biodiversity, ecosystem services, and human activities.
CLO4	Assess environmental challenges such as deforestation, pollution, and habitat destruction.
CLO5	Critique policies and strategies for sustainable environmental management.
CLO6	Design community-based environmental conservation strategies.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3							
CLO2	3							
CLO3	3		2		2			
CLO4	3	2	2		2			
CLO5	3	2	2		2	2	1	
CLO6	3	2	2	2	2	2	1	1

SL.	Course Contents	Hours	CLOs
1	**Introduction to Environment and Ecology** - Definition, scope, and importance of environmental science - Key ecological principles and interactions	5	CLO1

2	**Ecosystem Components and Functions** - Biotic and abiotic components - Energy flow, food chains, and food webs	5	CLO 1, CLO 2
3	**Biogeochemical Cycles** - Carbon, nitrogen, phosphorus, and water cycles - Human influences on natural cycles	5	CLO 2
4	**Biodiversity and Conservation Ecology** - Definition and levels of biodiversity - Ecosystem services and their role in resilience - Conservation strategies and protected areas	5	CLO 3
5	**Human Impact on the Environment** - Pollution: Air, water, soil, and noise - Deforestation, desertification, and habitat loss	5	CLO 4
6	**Climate Change and Environmental Challenges** - Greenhouse gases and global warming - Impacts on ecosystems and human societies	4	CLO 5
7	**Sustainable Development and Environmental Management** - Principles of sustainability - Strategies for sustainable resource use	4	CLO 5, CLO 6
8	**Environmental Policies and Governance** - International and national environmental laws - Role of institutions in environmental protection	4	CLO 5, CLO 6
9	**Community-Based Environmental Conservation** - Role of indigenous and local knowledge - Participatory approaches in environmental management	4	CLO 6
10	**Case Studies and Practical Applications** - Examples of ecosystem restoration projects - Climate adaptation and mitigation efforts	4	CLO 6

Textbooks:

1. Miller, G. T., & Spoolman, S. (2018). Living in the Environment (19th ed.). Cengage Learning.
2. Odum, E. P., & Barrett, G. W. (2004). Fundamentals of Ecology (5th ed.). Cengage Learning.
3. Raven, P. H., Berg, L. R., & Hassenzahl, D. M. (2017). Environment (10th ed.). Wiley.

4. Cunningham, W. P., & Cunningham, M. A. (2019). Environmental Science: A Global Concern (14th ed.). McGraw Hill.
5. Chapin III, F. S., Matson, P. A., & Vitousek, P. M. (2011). Principles of Terrestrial Ecosystem Ecology (2nd ed.). Springer.

References:

1. IPCC (2021). Sixth Assessment Report (AR6). Intergovernmental Panel on Climate Change.
2. World Bank (2022). World Development Report 2022: Managing Environmental Risks for Resilience.
3. United Nations Environment Programme (UNEP) Reports. https://www.unep.org
4. Millennium Ecosystem Assessment (MEA). (2005). Ecosystems and Human Well-being: Synthesis Report. https://www.millenniumassessment.org

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)		Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-		-	05
Understand	05	05		05	
Apply	10	-		05	
Analyze	10	-		-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Applied Calculus

Course Code : DSCRHT 1005 | **Credits : 02**
CIE Marks : 50
Exam Hours : 2.5 | **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the fundamental concepts of calculus, including functions, limits, derivatives, and integrals.
CLO2	Apply differentiation techniques to analyze and graph algebraic and transcendental functions.
CLO3	Use integration methods to compute areas, volumes, and averages in practical contexts.
CLO4	Solve basic differential equations and apply calculus to real-world problems in disaster and climate sciences.
CLO5	Develop analytical skills to model and solve technical problems using calculus tools.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1		3						
CLO2		3						
CLO3		3						
CLO4	2	3	1					
CLO5	2	3	1					3

SL.	Course Contents	Hours	CLOs
1	Functions and Their Graphs: Polynomial and rational functions; logarithmic and exponential functions; trigonometric functions and their inverses; hyperbolic functions and their inverses; combination of such functions.	5	CLO1
2	Limits of Functions: Definition; basic limit theorems (without proofs); limit at infinity and infinite limits; continuous functions; properties of continuous functions on closed and boundary intervals (no proofs required).	5	CLO1 CLO2
3	Differentiation: Tangent lines and rates of change; definition of derivative; one-sided derivatives; rules of differentiation (with applications); linear approximations and differentials; successive differentiation; Leibniz's theorem; Rolle's theorem; Lagrange's mean value theorems; extrema of functions; problems involving maxima and minima.	4	CLO1 CLO2

4	Integrals: Antiderivatives and indefinite integrals; techniques of integration; definite integration using antiderivatives.	4	CLO3
5	Definite integrals as the limit of a sum; the fundamental theorem of calculus; integration by reduction.	4	CLO3
6	Application of Integration: Plane areas; solids of revolution; volumes by cylindrical shells; volumes by cross-sections. Arc length and surface of revolution.	4	CLO4
7	Applications of calculus in disaster and climate-related problem solving.	4	CLO5

Textbooks:

1. Anton H. et al. (1988) Calculus with Analytic Geometry. Wiley-Blackwell. US.

References:

1. Bers L. and Karal F. (1976) Calculus. Holt, Rinehart and Winston. US.
2. Lang S. (1998) A First Course in Calculus. 5th Edition. Springer. Netherlands.
3. Swokowski E.W. (1992) Calculus with Analytic Geometry. Wadsworth Publishing Co Inc. California. US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Quizzes/ Assignments (15)	Attendance (05)
Remember	05	05	05
Understand	05	-	
Apply	06	05	
Analyze	07	-	
Create	07	05	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Surveying and Mapping Lab

Course Code	**: DSCRHL 1006**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 4.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the theory and basic principles of cartography, including map design, projections, and symbology.
CLO2	Apply surveying techniques such as traversing, chain and tape, plane table, and prismatic compass methods.
CLO3	Analyze topographical frameworks, principles of triangulation, and map scales to create and interpret large-scale maps.
CLO4	Perform angle and coordinate measurements using equipment like total stations and construct geological cross-sections.
CLO5	Interpret and utilize thematic, contour, and topographic maps for applications in disaster management and field studies.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	2	2		2				2
CLO2	2	2		2				
CLO3	1	2		2	1			2
CLO4	1	2		1				1
CLO5	3	3	1	3			1	2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Definition of Surveying: Type of survey: (geodetic and plane).	6	CLO1
2	Surveying as the Basis of Large-Scale Maps: The framework of topographical maps; principles of triangulation; types of triangulations.	6	CLO1 CLO2
3	Methods of Surveying: *Chain and tape:*- equipment; recording of field data; principles and uses; open and closed traverse surveying; measuring against obstacles; drawing procedures; advantages and disadvantages of chain and tape survey; *Plane table surveying:*- equipment, method of preparation; open and closed, traverse surveying; advantages and disadvantages of plane table survey; *Prismatic Compass:*- equipment, data recording and plotting;	12	CLO2

	advantages and disadvantages of the survey; *RTK and Total Station Survey:* Basics of the machine; setting up the machine; methods of angle measurement; methods of coordinate measurement.		
4	Maps: Definition, history, basic elements of maps, aesthetics of maps; map projections.	4	CLO1 CLO3
5	Scale: Definition, types, and use; construction of scale- linear, comparative and diagonal.	12	CLO3
6	Map Reading and Interpretations; Map Reproduction- Enlargement and Reduction at different scales; bearing, azimuth, distance, plotting of location and data.	5	CLO3
7	Map Design and Symbology: Principles of map design; cartographic design; international color scheme; theory; models and perception; typographic map production.	2	CLO1 CLO3
8	Thematic Map: Definition and concept; methods of thematic mapping- choropleth, isopleths, dot, flow, proportional symbol, isothermal and diagrammatic method; cartogram.	2	CLO3 CLO5
9	Contour maps construction; study of topographic maps, classification of maps and their applications (weather maps, geological maps, etc.).	3	CLO3 CLO5
10	Determination of dip and strike; plotting structural data on a map; construction of geological cross-sections of representative geological map exercise, interpretation of SOB topographic maps.	3	CLO4
11	Map reading and cross-section (topographic, geologic, and geomorphic).	5	CLO4

Textbooks:

1. Tiberius, C. C. J. M., Marel, H., Reudink, R., & Van Leijen, F. (2021). Surveying and mapping. https://doi.org/10.5074/T.2021.007
2. Blyth F.G.H. (1965) Geological Maps and their Interpretation. E. Arnold. UK.
3. Keats J.S. (1973) Cartographic Design and Production. Longman. UK.
4. Moseley F. (1979), Advanced Geological Map Interpretation. Edward Arnold. US.

References:

1. Monkhouse F.J. and Wilkinson H.R. (1971) Maps and Diagrams. 3rd Edition. Methuen. UK.
2. Robinson A.H. (1953) Elements of Cartography. Wiley-Blackwell. US.

3. Shingh R.L. and Dutt P.K. (1979) Elements of Practical Geography. Students' Friends. India.
4. Punmia B.C. Surveying Volume 1. India
5. Punmia B.C. Surveying Volume 2. India
6. Punmia B.C. Higher Surveying Volume 3. India
7. Aziz M.A. A Textbook of Surveying (1982) 3rd Edition, Bangladesh

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Applied Earth Sciences

Course Code : DSCRHT 1008 | **Credits : 03**

CIE Marks : 50

Exam Hours : 3.0 | **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the geological materials and processes that influence natural hazards and climate change.
CLO2	Apply knowledge of mineralogy, petrology, and structural geology to analyze natural disasters.

CLO3	Identify and analyze geomorphological processes, landforms, landscapes, and their relation to hazards and climate change.
CLO4	Understand the role of earth sciences in climate change studies and environmental impact assessments.
CLO5	Comprehend sedimentary rock formations and their impacts on hazard characteristics.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	2	2	3	2			2
CLO2	3	2	2	3	2			2
CLO3	3	3	3	3	2			2
CLO4	3	3	2	3	2			2
CLO5	3	2	3	3	2			2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Mineralogy: Physical and chemical properties, classification and occurrence.	6	CLO1 CLO2
2	Petrology: Igneous, sedimentary and metamorphic rocks (occurrence, structure, texture, classification, relation to different hazards).	6	CLO1 CLO2
3	Major geological structures and their association with different disasters: Fold, fault, unconformity, joint, landform controlled by folds, landform controlled by faults, criteria of faulting.	6	CLO2 CLO3
4	Geomorphology: Factors and agents; fluvial, glacial, aeolian, and coastal processes and their morphology.	6	CLO3
5	Stream and River Channel: Stream types and their relation to tectonics and lithology, types of river channels and their morphological units.	5	CLO3 CLO4
6	Stratigraphy: Principles, classification and their units, stratigraphic contacts, unconformities; vertical and lateral successions; sedimentary structures, facies association, and sequence.	6	CLO4
7	Physiography of Bangladesh: Physiographic regions, subregions, and units of Bangladesh.	4	CLO4

8	Tectonic Frameworks of Bangladesh: Precambrian stable platform and geosynclinal basin.	3	CLO3 CLO5
9	Stratigraphic Succession of Bangladesh: Precambrian stable platform and geosynclinal basin.	3	CLO4 CLO5

Textbooks:

1. Berry L.G. and Mason B. (1968) Elements of Mineralogy. Greenwood Press. US.
2. Tyrrell G.W. (1952) The Principles of Petrology: An Introduction to the Science of Rocks. Dutton and Company Inc. New York.
3. Billings M.P. (1972) Structural Geology. 3rd Edition. Prentice Hall. US.

References:

1. Boggs S. (2012) Principles of Sedimentology and Stratigraphy. Prentice Hall. US.
2. Pettijohn F.J. (1975) Sedimentary Rocks. Harper and Row. US.
3. Leet L.D. et al (1982) Physical Geology. Prentice-Hall. USA.
4. Hugget R.J. (2007) Fundamentals of Geomorphology. Routledge Publication
5. Khan F.L. (1991) Geology of Bangladesh. The University Press Limited. Dhaka. Bangladesh.
6. Reimann K-U (1993) Geology of Bangladesh. Gebruder Borntraeger Verlagsbuchhandlung, Science Publishers, Berlin
7. Imam B. (2005) Energy Resources of Bangladesh. University Grants Commission. Dhaka. Bangladesh

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Atmospheric Physics

Course Code : DSCRHT 1009 | **Credits : 02**
CIE Marks : 50
Exam Hours : 2.5 | **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the physical processes in the atmosphere, including composition, structure, and radiative equilibrium.
CLO2	Apply atmospheric thermodynamics and fluid dynamics principles to analyze atmospheric behavior.
CLO3	Analyze atmospheric radiation and spectral measurements, including transmittance and the greenhouse effect.
CLO4	Evaluate the impacts of atmospheric aerosols and stratospheric chemistry, including pollution dispersion and ozone depletion.
CLO5	Design remedial measures to address pollution in the atmospheric environment.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3							
CLO2	3	3						
CLO3	3	3	2					
CLO4	3	2	3					
CLO5	3			3	3			

SL.	Course Contents	Hours	CLOs
1	Introduction to the Atmosphere: Atmospheric Behavior, Mechanisms Influencing Atmospheric Behavior, Composition and Structure, Radiative Equilibrium, The Global Energy Budget, Atmospheric Layers, Variation of Pressure with height in the Atmosphere, Spatial and Temporal Scales of Atmospheric Processes.	4	CLO1
2	Atmospheric Thermodynamics: The Ideal Gas Law, Atmospheric Composition, Hydrostatic Balance, Entropy and Potential Temperature, Parcel Concepts, The Available Potential Energy, Moisture in the Atmosphere, The Saturated Adiabatic Lapse Rate, The Tephigram, Cloud Formation.	4	CLO2
3	Atmospheric Radiation: Basic Physical Concepts, The Radiative-Transfer Equation, Basic Spectroscopy of Molecules, Transmittance, Absorption by Atmospheric Gases, Heating Rates, The Greenhouse Effect.	4	CLO3

4	Basic Fluid Dynamics: Mass Conservation, The Material Derivative, Continuity Equation, The Equation of State for the Atmosphere, The Navier–Stoke's Equation, Rotating Frames of Reference, Geostrophic and Hydrostatic Approximations, Pressure Coordinates and Geopotential, The Thermodynamic Energy Equation.	4	CLO2
5	Stratospheric Chemistry: Thermodynamics of Chemical Reactions, Chemical Kinetics, Bimolecular Reactions, Photo-Dissociation, Stratospheric Ozone, The Transport of Chemicals, The Antarctic Ozone Hole.	4	CLO4
6	Properties of Atmospheric Aerosol: The size distribution function, aerosol chemical composition, vertical variation.	3	CLO4
7	Atmospheric Stability and Pollution Dispersion: Atmospheric Diffusion Theories, Dry and Wet Deposition.	3	CLO4
8	Spectral Measurements of Atmospheric Radiation: Polarization Effects; Monochromators, Detectors and Standards; General Characterization of Spectroradiometers; Measurement Errors.	2	CLO3
9	Remedial Measures: Remedial Measures Against the Pollution of Atmospheric Environment.	2	CLO5

Textbooks:

1. Holton, J.R., & Hakim, G.J. (2012). Introduction to Dynamic Meteorology (5th Ed.). Academic Press.
2. Hess, L.S. (2012). Introduction to Theoretical Meteorology. Wiley Online Library.
3. Roisin, B.C., & Beckers, J.M. (2009). Introduction to Geophysical Fluid Dynamics. Academic Press.
4. Wallace, J.M., & Hobbs, P.V. (2006). Atmospheric Science: An Introductory Survey (2nd Ed.). Elsevier.

References:

1. Stull, R.B. (1988). An Introduction to Boundary Layer Meteorology. Springer.
2. Seinfeld, J.H., & Pandis, S.N. (2016). Atmospheric Chemistry and Physics: From Air Pollution to Climate Change. Wiley.
3. Andrews, D.G. (2010). An Introduction to Atmospheric Physics. Cambridge University Press.
4. Salby, M. (2012). Physics of the Atmosphere and Climate. Cambridge University Press.
5. Petty, G.W. (2006). A First Course in Atmospheric Radiation. Sundog Publishing.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	

Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Hydrology and Water Resources

Course Code : DSCRHT 1010 **Credits : 03**

CIE Marks : 50

Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Explain water movement and its quantification in natural and human-influenced environments.
CLO2	Analyze river system responses, flow variations, and key water movement indicators.
CLO3	Apply statistical techniques to assess patterns, trends, and uncertainties in hydrological data.
CLO4	Evaluate underground water behavior, influencing factors, and contamination challenges.
CLO5	Assess sustainable strategies for freshwater management and long-term water security.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	3	1	3		1		1
CLO2	2	3		1				
CLO3	2	3	1					2
CLO4	3	3	2	2		2	1	2
CLO5				2	2	2	2	2

SL.	Course Contents	Hours	CLOs
1	Introduction; Scope; Hydrologic Cycle and its Components	3	CLO1
2	Precipitation, Runoff, Evaporation, Evapotranspiration, and Infiltration Processes and their Measurements	12	CLO1

3	Hydrograph: Unit Hydrograph; Terminology of Drainage Basin: Quantitative Evaluation, Stream Flow Types, and Velocity; River-Stage and Discharge	6	CLO2
4	Statistical Methods in Hydrology	3	CLO3
5	Groundwater: Origin, Occurrence, and Distribution of Groundwater	3	CLO4
6	Rock and Sediment Properties affecting groundwater (physical and hydraulic properties); Geologic Formations as Aquifers, Groundwater Movement: Darcy's Law; Types of Aquifers and Aquifer Vulnerabilities; Isotope Hydrology, Groundwater Contamination and Pollution	15	CLO4
7	Groundwater and Surface Water Resources of Bangladesh: IWRM Approach	3	CLO5

Textbooks:

1. Chow V.T. (1964) Handbook of Applied Hydrology. McGraw Hill. US.
2. K. Subramanya. (2014) Engineering Hydrology. McGraw Hill. US.
3. Todd D.K. (1980) Groundwater Hydrology. 2nd Edition. Wiley-Blackwell. US.

References:

1. Kazmann R.G. (1972) Modern Hydrology. Joana Cotler Books. New York. US.
2. United Nations Development Program (UNDP) (1982) Ground Water Survey: The Hydrogeological Conditions of Bangladesh. UNDP Technical Report. US.
3. CEM: Coastal Engineering Manual. Contributor, United States. Army. Corps of Engineers. Publisher, U.S. Army Corps of Engineers, 2002.
4. Matthess G. (1982) The Properties of Groundwater. Wiley-Blackwell. US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10

Evaluate	05
Create	05

Course Name: Society and Disaster

Course Code : DSCRHT 1011 **Credits : 03**

CIE Marks : 50

Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand and critically evaluate the interface between natural disasters and society.
CLO2	Evaluate the role of social justice, human rights, and ethical considerations in disaster management and response.
CLO3	Apply social theories, including stratification and intersectionality, to assess how different social groups experience and recover from disasters.
CLO4	Assess the effectiveness of social protection mechanisms, governance structures, and policy interventions in reducing disaster related inequalities.
CLO5	Critically examine community responses, media influence, and demographic factors in shaping disaster resilience and recovery.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		3				2	2
CLO2			3		2	2	3	
CLO3	3		3		2	2	3	
CLO4			3		3	3	2	3
CLO5	3		2		3	3		2

SL.	Course Contents	Hours	CLOs
1	Evolution of Human Society: Civilization and Disaster, Agricultural and Industrial Revolutions, Urbanization, and Environmental Change.	4	CLO1
2	Social Theories and Disaster Linkage: Social Structure, Institutions, Change, Stratification, and Inequality in Disaster Impact	4	CLO1 CLO3
3	Social Philosophy of Disaster Management: Human Rights, Social Justice, Ethical Considerations, and Policy Frameworks	4	CLO2

4	Social Protection and Community Resilience: Safety Nets, Resource Mobilization, Role of Local Government, NGOs, and Voluntarism	4	CLO4
5	Media and Disasters: Role in Information Dissemination, Public Perception, and Crisis Communication	4	CLO5
6	Community Responses to Disaster: Disaster Recovery, Social Capital, and Post-Disaster Social Change	4	CLO5
7	Disaster and Social Inequalities: Gender, Disability, Class, Ethnicity, Age, and Intersectionality in Disaster Vulnerability	5	CLO3 CLO4
8	Disaster Mythology: Sources and Impact of Disaster Myths on Society (Bangladesh Perspective)	4	CLO5
9	Political and Socio: Economic Context of Disasters: Poverty, Governance, Climate Change, Urbanization, and Stakeholder Interests	4	CLO2 CLO4
10	Measuring Social Inequality in Disasters: Methods, Indicators, and Applications in Disaster Studies.	4	CLO4
11	Framing Disasters and Resilience: Social and Political Perspectives, Policy Integration, and Future Directions.	4	CLO5

Textbooks:

1. Anthony G. & Philip W. S. (2017) Sociology, Polity Press, UK
2. Platt, L. (2019). Understanding Inequalities: Stratification and Difference. Polity.

References:

1. Anthony G. (2013) Sociology, Polity Press, UK
2. Grusky, D. B., & Weisshaar, K. R. (2008). Social Stratification: Class, Race, and Gender in Sociological Perspective. Westview Press.
3. Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). At Risk: Natural Hazards.
4. Bankoff G. (2004) Cultures of Disaster: Society and Natural Hazard in the Philippines. Routledge. US.
5. Moran E.F. (2010) Environmental Social Science: Human Environment Interactions and Sustainability. Wiley-Blackwell. US.
6. Sapir D.G. and Santos I. (2013) The Economic Impacts of Natural Disasters. Oxford University Press. UK.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Applied Linear Algebra

Course Code : DSCRHT 1012 **Credits : 02**

CIE Marks : 50

Exam Hours : 2.5 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Perform matrix operations, row reductions, and compute determinants and inverses.
CLO2	Solve homogeneous and non-homogeneous linear systems using matrix methods and elimination techniques.
CLO3	Analyze vector spaces, subspaces, basis, dimension, and fundamental subspaces of a matrix.
CLO4	Apply linear transformations and their matrix representations in different vector spaces.
CLO5	Compute eigenvalues, and eigenvectors, and apply diagonalization and the Cayley-Hamilton theorem.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

CLOs/PLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1		3						1
CLO2		3	1					
CLO3		3						
CLO4		3	1					1
CLO5		3	2				1	

SL.	Course Contents	Hours	CLOs
1	Matrices and Determinants: Review of Matrix and Determinants, Different types of Matrices, Elementary Row and Column Operations, and Row-Reduced Echelon Matrices, The Method for Finding the Inverse of the Matrix.	6	CLO1

2	System of Linear Equations: System of Linear Equations (homogeneous and nonhomogeneous) and their Solutions, Application of Matrices and Determinants for Solving System of Linear Equations, Gaussian and Gauss-Jordan Eliminations, Applications of Linear Systems: Network analysis (traffic flow), Electrical Circuits.	6	CLO2
3	Vector Spaces: Real Vector Space, Subspace, Sum and Direct Sum of Subspaces, Linear Independence and Dependence, Basis, Dimension, Solution Space and Null Space, Row Space, Column Space, Null Space, Rank, and Nullity.	6	CLO3
4	Linear Transformations: Linear Transformation from Rn to Rm, Properties of Linear Transformations, Matrix Representation of Linear Transformations.	6	CLO4
5	Eigenvalues and Eigenvectors: Definition of Eigenvalues and Eigenvectors, Diagonalization. Cayley- Hamilton Theorem, Applications of Eigenvalues and Eigenvectors.	6	CLO5

Textbooks:

1. Anton H. and Rorres C. (2000) Linear Algebra with Applications. 8th Edition. Wiley Blackwell. US.
2. G. and Strang, G. (1993) Introduction to linear algebra (Vol. 3). Wellesley, MA: Wellesley-Cambridge Press.

References:

1. Greub W.H. (1967) Linear Algebra. Springer. Netherlands.
2. Singh, K. (2013) Linear algebra: step by step. OUP Oxford.
3. Ron Larson (2015), Elementary Linear Algebra, 8th Edition, CENGAGE Learning.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Quizzes/ Assignments (15)	Attendance (05)
Remember	05	05	05
Understand	05	-	
Apply	06	05	
Analyze	07	-	
Create	07	05	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Basic Statistics and Probability

Course Code : DSCRHT 1013 | **Credits : 02**
CIE Marks : 50
Exam Hours : 2.5 | **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Calculate and apply measures of location and dispersion for both grouped and ungrouped data.
CLO2	Analyze and apply discrete and continuous probability distributions to real-world problems.
CLO3	Perform hypothesis testing, calculate confidence intervals, and interpret p-values.
CLO4	Conduct correlation and regression analyses, including computation and interpretation of results.
CLO5	Understand and utilize non-parametric tests such as the Chi-Square test for independence and goodness of fit.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	2						
CLO2	3	3	2					
CLO3	3	3	2					
CLO4	3	3	3	2				
CLO5	3	2	3					

SL.	Course Contents	Hours	CLOs
1	Statistics-Definition and Scope: Definitions of Statistics - Past and Present, It's Nature and Characteristics, Population and Sample, Descriptive and Inferential Statistics, Scope and Applications of Statistics, Abuse of Statistics, Sources of Statistical Data, Primary and Secondary Sources.	5	CLO1
2	Processing of Data: Measurement Scales, Variables, Attributes, Tabulation, Frequency Distribution, Graphical Presentation of Data, Details of Different Types of Graphs and Charts with their Relative Merits and Demerits, Stem-and-Leaf Plot.	5	CLO1
3	Characteristics of Statistical Data: Measures of Location, Central Tendency and their Types, Dispersion, Skewness, Kurtosis and their Properties, Moments, Box and Whiskers Plots.	6	CLO1
4	Basic Concepts of Probability: Different Approaches of Defining Probability – Classical, Axiomatic, Empirical and Subjective, Laws and Theorems of Probability, Conditional Probability, Bayes' Theorem and its Uses and Importance in Statistics.	5	CLO2

5	Random Variable and its Probability Distribution: Discrete and Continuous Random Variables, Probability Mass Function, Probability Density Function, Distribution Function, Function of Random Variable and its Distribution, Joint Distribution, Marginal and Conditional Distributions, Independence of Random Variables, Detailed Study of Binomial, Poisson and Normal Distribution.	5	CLO2 CLO3
6	Correlation and Regression Analysis: Bivariate Data Scatter Diagram, Simple Correlation, Pearson's Correlation Coefficient, Basic Concept of Regression, Regression Model, Estimation of Parameters (OLS Method) in Regression Model.	4	CLO3 CLO4 CLO5

Textbooks:

1. Islam, M.N. (2010). An Introduction to Statistics and Probability. Book World, Bangladesh.
2. Davis, C.J. (2002). Statistics and Data Analysis in Geology. Wiley and Sons.
3. Newbold, P., Carlson, W., and Thorne, B. (2012). Statistics for Business and Economics. 8th Edition. Prentice-Hall, US.

References:

1. Ross, S.M. (2008). A First Course in Probability. 8th Edition. Pearson, US.
2. Roy, M.K. (2004). Fundamentals of Probability and Probability Distribution. Romax Publications, Bangladesh.
3. Roy, M.K. and Paul, J.C. (2012). Business Statistics. First Edition, Dhaka.
4. Walpole, R.E., Myers, R.H., Myers, S.L., and Ye, K. (2012). Probability and Statistics for Engineers and Scientists. 9th Edition. Pearson.
5. Casella, G. and Berger, R.L. (2001). Statistical Inference. 2nd Edition. Duxbury Press.
6. Mood, A.M., Graybill, F.A., and Boes, D.C. (1974). Introduction to the Theory of Statistics. 3rd Edition. McGraw-Hill.
7. Freedman, D., Pisani, R., and Purves, R. (2007). Statistics. 4th Edition. W.W. Norton & Company.
8. Larsen, R.J. and Marx, M.L. (2011). An Introduction to Mathematical Statistics and Its Applications. 5th Edition. Pearson.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Quizzes/ Assignments (15)	Attendance (05)
Remember	05	05	05
Understand	05	-	
Apply	06	05	
Analyze	07	-	
Create	07	05	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Earth Materials Lab

Course Code	**: DSCRHL 1014**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 4.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Recognize different types of minerals, rocks, and soils based on their physical and chemical properties.
CLO2	Classify minerals and rocks using standard geological techniques.
CLO3	Demonstrate laboratory methods for testing and analyzing earth materials.
CLO4	Interpret data from mineral and rock analysis to understand geological processes.
CLO5	Assess the suitability of earth materials for various environmental and construction applications.
CLO6	Prepare detailed laboratory reports summarizing experimental findings and interpretations.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3							
CLO2	3							
CLO3	3	2		2				
CLO4	3	2	2	2				
CLO5	3	2	2	2	2		1	
CLO6	3	2	2	2	2	2	1	1

SL.	Course Contents	Hours	CLOs
1	Introduction to Earth Materials: Overview of minerals, rocks, and soils, Laboratory safety procedures	9	CLO 1

2	Mineral Identification Techniques: Physical properties of minerals (color, luster, hardness, streak), Use of hand lenses and microscopes	6	CLO 1, CLO 2
3	Crystallography and Optical Properties: Crystal systems and mineral structures, Optical mineralogy under a petrographic microscope	6	CLO 2
4	Igneous Rocks: Classification and Properties: Identification of common igneous rocks, Textures and mineral composition	6	CLO 2
5	Sedimentary Rocks: Classification and Properties, Identification of clastic and chemical sedimentary rocks, Processes of formation and depositional environments	6	CLO 2
6	Metamorphic Rocks: Classification and Properties, Identification of foliated and non-foliated metamorphic rocks, Metamorphic facies and processes	6	CLO 2, CLO 3
7	Soil Properties and Classification: Soil texture and composition, Standard soil classification methods	6	CLO 3
8	Porosity and Permeability Testing: Laboratory methods for measuring porosity and permeability, Applications in hydrogeology	6	CLO 3, CLO 4
9	Mechanical Properties of Rocks and Soils: Strength and deformation testing, Implications for geotechnical applications	5	CLO 4
10	Environmental and Engineering Applications: Earth materials in construction and disaster risk management, Case studies on landslides and erosion	4	CLO 4, CLO 5

Textbooks:

1. Berry L.G. and Mason B. (1968) Elements of Mineralogy. W.F. Freeman. US.
2. Berry L.G., Mason B. and Dietrich R. V. (1983) Mineralogy: Concepts, Descriptions and Determinations. W.F. Freeman. US.
3. Pettijohn F.J. (1983) Sedimentary Rocks. 3rd Edition. Harpercollins. UK.
4. Read H.H. (1962) Rutley's Elements of Mineralogy. Thomas Murby and Co. UK.
5. Tyrrell G.W. (1973). The Principles of Petrology. Wiley-Blackwell. US.

References:

1. Perkins, D. (2022). Petrology: An Introduction to Igneous and Metamorphic Rocks and Processes. University of North Dakota (April 2022). https://opengeology.org/petrology/
2. Philpotts, A. R., & Ague, J. J. (2022). Principles of Igneous and Metamorphic Petrology (3rd ed.). Cambridge: Cambridge University Press.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Applied Differential Equation

Course Code	**: DSCRHT 2001**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 2.5**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Classify and solve ordinary differential equations using appropriate analytical methods.
CLO2	Solve first-order differential equations using separation, substitution, and integrating factor techniques.
CLO3	Apply methods like undetermined coefficients and variation of parameters to solve higher-order equations.
CLO4	Analyze homogeneous and non-homogeneous systems of linear differential equations with constant coefficients.
CLO5	Formulate and solve real-world problems using differential equations and interpret their solutions.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1		3						1
CLO2		3						
CLO3		3	1					
CLO4		3	1					1
CLO5		3	1				1	

SL.	Course Contents	Hours	CLOs
1	Ordinary Differential Equations and Their Solutions: Order and degree of an ordinary differential equation, Classification of differential equations, Solutions of differential equations, Formation of differential equations, Initial value problems,	10	CLO1

	Boundary value problems (definitions and examples), Basic existence and uniqueness theorems (statement and illustration).		
2	Solution of First Order Equations: Separable equations, Homogenous equations, Exact differential equations, Linear and Bernoulli equations, Special integrating factors, Substitutions, and transformations, Modeling with 1st order differential equations.	8	CLO2
3	Solution of Higher Order Linear Differential Equations: Basic theory of linear differential equations, Reduction of order, homogeneous linear equations with constant coefficients, Non-homogeneous equations (method of undetermined coefficients, variation of parameters, Cauchy-Euler differential equations).	8	CLO3 CLO4
4	Systems of Linear Differential Equations: Homogeneous and non-homogeneous systems of linear differential equations with constant coefficients.	4	CLO4 CLO5

Textbooks:

1. Zill D.G. (2009) A First Course in Differential Equations with Applications. 9th Edition. Cengage Learning. India.
2. S.L. Ross. (1974) Differential Equation. Wiley-Blackwell. US.

References:

1. Brauer F. and Nohel J.A. 1986. Introduction to Differential Equations with Applications. Harper and Row. US.
2. Boyce W.E. Elementary Differential Equations and Boundary Value Problems, 9th Edition, Willey and Sons.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Quizzes/ Assignments (15)	Attendance (05)
Remember	05	05	05
Understand	05	-	
Apply	06	05	
Analyze	07	-	
Create	07	05	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Geological and Hydro-meteorological Hazards

Course Code	**: DSCRHT 2002**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 2.5**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the basics of specific geological and hydrometeorological hazards.
CLO2	Understand the types, mechanisms, and temporal and spatial variability of these hazards.
CLO3	Determine hazard characterization and profiling, process, procedures, and assumptions used for hazard analysis.
CLO4	Understand, analyze, evaluate, and create connections between the hazards in terms of magnitude, intensity, and frequency to better understand the disaster risk framework.
CLO5	Correlate between hazards and tectonics, petrology, and other branches of earth sciences.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	2	1	1			1	1
CLO2	2			2				
CLO3	2	1	2	2			1	2
CLO4	3	2	1	2	1	2	2	2
CLO5	1		1	2	2	1		2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction to Geological and Hydro-meteorological Hazards.	1	CLO1
2	Earthquakes: Concept, Causes, Characteristics, Relation To Geology, Types and effects of Earthquake.	5	CLO1 CLO2 CLO5
3	Volcanoes: Concept, Origin, Types of volcanoes, Volcanic eruption types and products, Different volcanic hazards	2	CLO2 CLO3
4	Tsunami: Concept, Tsunami generation, Characteristics, Seiches, Coastal effects, and Vulnerability.	2	CLO2 CLO3
5	Landslide and Avalanche: Causes, Mechanism, Classification, Measurement, and Effects.	4	CLO2 CLO5
6	Land subsidence and sinkholes	2	CLO2
7	Flood: Definition, Hazard characteristics, Causes, Types, Mitigation measures (structural and non-structural), Flood Action Plan (FAP).	5	CLO2 CLO3 CLO4

8	Riverbank erosion: Causes and effects, Mechanism, Types and relation to lithology, and Mitigation measures.	3	CLO2 CLO3
9	Coastal erosion and storm surge: Coastal geomorphic features, Beach erosion, Beach replenishment, Storm surge characteristics.	2	CLO3
10	Salinity intrusion: Cause, Mechanism, and Mitigation measures.	2	CLO2
11	Arsenic contamination: Concept, Mechanism, and Mitigation Measures.	2	CLO2

Textbooks:

1. Hyndman D. and Hyndman D. 2010. Natural Hazards and Disasters. 3rd Edition. Cengage Learning. India.
2. Charlton, Ro. Fundamentals of fluvial geomorphology. Routledge, 2007.

References:

1. Plummer C., Carlson D. and Hammersley L. (2014) Physical Geology. 15th Edition. McGraw Hill. US.
2. Bell F.G. (1999) Geological Hazards. CRC Press. US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Climatic Hazards and Climate Change

Course Code : DSCRHT 2003 | **Credits : 02**
CIE Marks : 50
Exam Hours : 2.5 | **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Explain the origin, life cycle, and impacts of various climatic and meteorological hazards.
CLO2	Analyze global atmospheric and oceanic circulation systems and their influence on climate variability.
CLO3	Evaluate the scientific basis of climate change, including greenhouse gases, feedback mechanisms, and evidence from past, present, and future perspectives.
CLO4	Assess the regional and global impacts of climate change, particularly on agriculture, human health, migration, and ecosystems.
CLO5	Examine national and international climate policies, treaties, and financial mechanisms, along with ethical and political aspects of climate governance.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		3					
CLO2	3	2	3					
CLO3	3		3	2				
CLO4		2	3	3	2			
CLO5			3		3	3	2	3

SL.	Course Contents	Hours	CLOs
1	Climatic and Meteorological Hazards: Origin, Life cycle, Types, Effects, and Measurement, Extreme temperature (Heatwaves and Cold Waves), Drought, Fog, Polar Vortex, Wildfire, Tropical Cyclone, Extra-tropical Cyclone, Thunderstorms, Nor'westers, Tornadoes, Sudden Stratospheric Warming (SSW), and Microclimate (Urban Heat Island Effect).	10	CLO1
2	Climatic and Meteorological Data Sources: Bangladesh Meteorological Department (BMD), SPARRSO, WMO, etc.	2	CLO1
3	Introduction to Climate Change: Definition, Scope, Multidisciplinary Approaches.	2	CLO3
4	Science of Climate Change: Milankovitch Cycle, Natural and Anthropogenic Factors, Greenhouse Gases (GHG) and Greenhouse Effects, Role of Clouds and Aerosols in Climate Regulation.	2	CLO3

5	Evidence of Climate Change: Past (Proxy Data), Present (Human Perception, Marker Species, Instrumental Data), Future (Climate Modeling).	2	CLO3
6	Global Atmospheric & Oceanic Circulation: General Circulation Model, El Niño and La Niña, and Climate Change.	2	CLO2
7	Impact of Climate Change: Sector Issues in Regional and International Contexts (Agriculture, Energy, Society, Indigenous People, Disease, Extreme Events, Sea-level Change, Ocean Acidification, Climate-Induced Migration).	4	CLO4
8	Response to Climate Change: Adaptation and Mitigation Measures, Loss and Damage in Global Climate Change Dialogue.	1	CLO5
9	National, Regional and International Response to Climate Change: International Treaties, Protocols, IPCC, UNFCCC (COP: Historical Development, Success & Failure).	2	CLO5
10	Climate Change and Climate Politics: Grouping among Countries (Annex I, Annex II, Non-Annex, OECD, EIT, AOSIS, LDC), Clean Development Mechanism (CDM), Carbon Trading, National & Individual Interests, Climate Ethics & Justice, Role of Non-State Actors (NGOs, Private Sector, Civil Society).	2	CLO5
11	Climate Change in the Context of Bangladesh: Bangladesh Climate Change Strategy and Action Plan, National Adaptation Program of Action (NAPA), Climate Fund Use & Misuse (BCCTF, BCCRF), Emerging Climate Finance Mechanisms (Green Climate Fund, Global Environment Facility).	1	CLO5

Textbooks:

1. C. Donald Ahrens, Robert Henson. (2019). Meteorology Today: An Introduction to Weather, Climate, and the Environment
2. Cook, K.H. (2013) Climate Dynamics. Princeton University Press.
3. Farmer G.T. & Cook J. (2013). Climate Change Science: A Modern Synthesis. Volume - 1. Springer. Netherlands.
4. Pittock A. 2009. Climate Change: The Science, Impacts and Solution. 2nd Edition. Routledge. US.

References

1. Donner L., Schubert W. & Somerville R. 2011. The Development of Atmospheric General Circulation Models: Complexity, Synthesis and Computation. Cambridge University Press. UK.
2. Erda L., Bolhofer W.C., et al. (1996) Climate Change Vulnerability and Adaptation in Asia and the Pacific. Springer. Netherlands.

3. Savindra Singh (2005). Climatology. Prayag Pustak Bhawan, Allahabad, India
4. Willium James Burroughs (2007) Climate Change-A Multi-disciplinary Approach, Cambridge University Press

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Anthropogenic Hazards

Course Code : DSCRHT 2004 | **Credits : 02**
CIE Marks : 50
Exam Hours : 2.5 | **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	To understand the concept, causes, and impacts of anthropogenic hazards.
CLO2	To study various types of anthropogenic hazards and their disaster potential.
CLO3	To assess the socio-environmental impacts of anthropogenic hazards.
CLO4	Understand risk associated with human activities and the need for safety.
CLO5	To evaluate impact of policies on anthropogenic hazards.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	2	2	1	2			
CLO2	2	3	2	3	2	1		
CLO3	1	2	3	2	3	2	2	3
CLO4	2	3	1	3	2		2	

CLO5	2	3	3	2	3	3	3	3

SL.	Course Contents	Hours	CLOs
1	Anthropogenic hazards: Concept, Characteristics, Hybrid nature, Hazard classification, FEMA and UNDRR definitions	2	CLO1
2	Engineering failure: Cause and Effect.	2	CLO2
3	Fire hazard: Concept and Terminologies, Fire triangle, Classification, Control measures, Fire extinguishment- Detection, Types and Fire safety	2	CLO4
4	Chemicals, General principles for storage and transport, Chemical processing, Reaction, Combustion and Explosion	2	CLO2
5	Nuclear hazard: Risk vs payoff concept, Radioactive chemicals, sources of radiation, Health effects, Mitigation and Control measures	2	CLO2
6	Mining hazard: Cause, Type, and Effects	2	CLO2
7	Transportation accident: Types, Causes and Effects.	3	CLO5
8	Environmental Pollution, Hazardous Wastes, E-waste management and environmental challenges, Heavy metal contamination and Associated health risks	2	CLO5
9	Industrial hazards, Work place health and safety, Impact of climate change on industrial and urban hazards	2	CLO5
10	Cyberattack	2	CLO5
11	Case studies.	7	CLO1 CLO2 CLO3 CLO4 CLO5
12	Policy and Governance: Role of government, private and non-governmental organizations along with communities. Lessons learned and best practices, compensation mechanisms	2	CLO1 CLO5

Textbooks:

1. Jeremy Stranks (2012) Health and Safety at Work, Kogan Page
2. Pathak, P., Srivastava, R. R., & Ilyas, S. (2023). Anthropogenic Environmental Hazards.
3. Côté, R. P., & Wells, P. G. (2012). Controlling chemical hazards: Fundamentals of the management of toxic chemicals. Springer Science & Business Media.

References:

1. Macaulay T. (2008) Critical Infrastructure: Understanding its Component Parts, Vulnerabilities, Operating Risks, and Interdependencies. CRC Press. US.
2. Paul B.K. (2011) Environmental Hazards and Disasters. Wiley-Blackwell. US.
3. Schlager N. (1995) Breakdown: Deadly Technological Disasters. McGraw-Hill. US.

4. King, R. W., and Magid, J. (2013). Industrial Hazard and Safety Handbook: (Revised Impression). Elsevier

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Climate Resilience and Public Health

Course Code : DSCRHT 2005 **Credits : 02**
CIE Marks : 50
Exam Hours : 2.5 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Outline the biological agent risk groups.
CLO2	Identify ways in which community people are exposed to biological agents leading to epidemics in different environments.
CLO3	Recognize the types of health effects of climate change.
CLO4	Describe how to carry out risk assessment in the public health and climate resilience context.
CLO5	Analyze the measures used to safeguard public health practices during emergencies in large populations.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3							

CLO2		3	2					
CLO3	2		3	2				
CLO4	2	3	3	3		2		
CLO5	2	3		3	3	3	2	

SL.	Course Contents	Hours	CLOs
1	Biological hazards and their impact on climate and health.	2	CLO1
2	Public health and climate change.	3	CLO3
3	Epidemiology and climate resilience.	3	CLO4
4	Environmental Epidemiology and the Impact of Climate Change on Health	3	CLO3 CLO4
5	Public health and its role in disaster management: an integrated approach (COVID-19 situation as case study).	2	CLO5
6	Epidemiological approach of public health.	4	CLO4
7	Psychosocial needs and stress management in mass emergency and disaster management.	2	CLO5
8	Management of water-borne and vector-borne diseases.	3	CLO2
9	Health policy and management: public health surveillance, public health emergencies.	3	CLO4
10	Child-Centered health adaptation for climate resilience.	3	CLO3 CLO5
11	One World, One Health Approach: Concept, Components, and its Importance	2	CLO1, CLO5

Textbooks:

1. Schneider, M. J. (2020). Introduction to Public Health. Jones and Bartlett Learning.
2. Seabert, D., McKenzie, J., and Pinger, R. (2021). McKenzie's An Introduction to Community and Public Health. Jones and Bartlett Learning.
3. Somerville, M., Kumaran, K., and Anderson, R. (2016). Public Health and Epidemiology at a Glance. Wiley-Blackwell.

References:

1. Fallon, L., Fleming, J. F., and Zgodzinski, E. (2012). Essentials of Public Health Management. Jones and Bartlett Learning.
2. Filho, W. L., Azeiteiro, U., and Alves, F. (2016). Climate Change and Health. Springer International Publishing.
3. Levy, B., and Patz, J. (2015). Climate Change and Public Health. Oxford University Press.
4. Noji E.K. (1996) The Public Health Consequences of Disasters. Oxford University Press.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Numerical Analysis and Sampling Techniques

Course Code : DSCRHT 2006 **Credits : 02**

CIE Marks : 50

Exam Hours : 2.5 **SEE Marks : 50**

Course Learning Outcomes: At the end of the course, the student will be able to:

CLO1	Implement complex sampling designs beyond simple random sampling.
CLO2	Analyze the impact of sampling design on data visualization, parameter estimation, and uncertainty quantification.
CLO3	Choose and apply appropriate numerical techniques for solving mathematical problems.
CLO4	Interpret numerical results, assess their accuracy, and understand the stability and conditioning of the methods.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	2	2	3	2	2	2	3
CLO2	2	2	3	2	3	2	2	2
CLO3	3	3	2	2	3	1	1	2
CLO4	3	2	3	2	2	3	2	3

SL.	Course Contents	Hours	CLOs
1	Introduction: Basic concepts of sampling, Sampling Frame, Sample vs Census, Requirements of a good sample	3	CLO1 CLO2

2	Simple Random Sampling: Estimates of population characteristics, Standard Errors, Confidence Intervals	4	CLO1 CLO2
3	Systematic Sampling: Estimating population characteristics, Special Populations	3	CLO1 CLO2
4	Stratified Sampling: Definition, Theory, and Allocation to Strata	4	CLO1 CLO2
5	Cluster Sampling: One-stage, Two-Stage Cluster Sampling, Designing a Cluster Sample	3	CLO1 CLO2
6	Numerical Mathematics: Difference Table, Finite Difference Operators, Interpolation, and Extrapolation	3	CLO3 CLO4
7	Interpolation: Newton's forward and backward interpolation formulas, Lagrange's formula	3	CLO3 CLO4
8	Numerical Integration: Simpson's Rule, Weddle's Rule, Trapezoidal Rule, Gauss's Quadrature Formulae	4	CLO3 CLO4
9	Solution of Transcendental Equations: Interpolation, False Position, Newton-Raphson Method, Iteration	3	CLO3 CLO4

Textbooks

Sampling Techniques

1. Cochran, W.G. (1977). Sampling Techniques. 3rd Edition, Wiley-Blackwell, US.
2. Islam, M.N. (2008). An Introduction to Sampling Methods. BookWorlds, Bangladesh.
3. Levy, P.S., & Lemeshow, S. (2008). Sampling of Populations: Methods and Applications. 4th Edition, Wiley-Blackwell, US.
4. Singh, D., & Chaudhury, F.S. (1987). Theory and Analysis of Sample Survey Design. Wiley-Blackwell, US.

Numerical Analysis

1. Scarborough, J.B. (1955). Numerical Mathematical Analysis. Johns Hopkins Press, USA.
2. Mallick, S.A., & Uddin, M.A. (2007). Numerical Mathematics.
3. Hildebrand, F.B. (1987). Introduction to Numerical Analysis. Dover Publications, USA.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Quizzes/ Assignments (15)	Attendance (05)
Remember	05	05	05
Understand	05	-	
Apply	06	05	
Analyze	07	-	
Create	07	05	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Introduction to Computer Programming

Course Code : DSCRHL 2007 **Credits : 02**
CIE Marks : 50
Exam Hours : 4.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the course, the students will be able to:

CLO1	Solve fundamental programming problems using structured programming principles in R and Python.
CLO2	Develop algorithms, flowcharts, and pseudo-codes to design efficient solutions for computational problems.
CLO3	Implement programming constructs such as loops, functions, and data structures in R and Python.
CLO4	Apply appropriate techniques for data acquisition, analysis, and visualization in scientific computing using R and Python.

Mapping of Course Learning Outcomes to Program Learning Outcomes (PLOs)

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	3		3				2
CLO2	2	3	3	2				
CLO3	3	2		2		1		
CLO4	3	3	2	3				1

SL.	Course Contents	Hours	CLOs
1	Introduction to Programming Concepts: Basic Syntax, Variables, Operators, Conditional Statements, Loops, Functions in R And Python.	9	CLO1 CLO2
2	Algorithm Design and Pseudo-Code: Writing Structured Pseudo-Code, Creating Flowcharts, and Implementing Problem-Solving Techniques.	9	CLO2

3	Data Structures in R & Python: Arrays, Lists, Data Frames, Dictionaries, and Object-Oriented Programming Concepts.	9	CLO3
4	Scientific Computing with R: Data Manipulation, Mathematical Computation, and Statistical Analysis using R Libraries.	9	CLO3 CLO4
5	Python for Scientific Computing: Scripting, Numerical Computation using NumPy, Pandas, and SciPy.	9	CLO3 CLO4
6	Data Acquisition and Processing: Importing/Exporting Datasets, Handling Missing Data, Exploratory Data Analysis (EDA).	9	CLO4
7	Data Visualization in R & Python: Creating static and interactive plots, heatmaps, and geospatial visualizations using ggplot2, Matplotlib, and Seaborn.	6	CLO4

Textbooks:

1. Hadley Wickham & Garrett Grolemund (2017). R for Data Science. O'Reilly Media.
2. Jake VanderPlas (2016). Python Data Science Handbook. O'Reilly Media.

References:

1. Zed Shaw (2019). Learn Python the Hard Way. Pearson.
2. Wickham, H. (2019). Advanced R. CRC Press.
3. Wes McKinney (2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter. O'Reilly Media.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Quizzes/ Assignments (15)	Attendance (05)
Remember	04	05	10
Understand	06	-	
Apply	05	05	
Analyze	05	-	
Create	05	05	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Environmental Chemistry and Pollution Lab

Course Code	**: DSCRHL 2008**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 4.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to-

CLO1	Identify key pollutants and their chemical properties.
CLO2	Explain the chemical reactions and transformations of pollutants in different environmental media (air, water, and soil).
CLO3	Conduct standard laboratory procedures for measuring environmental pollutants.
CLO4	Analyze environmental pollution data using laboratory techniques.
CLO5	Develop a report with recommendations for reducing environmental pollution.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3							
CLO2	3							
CLO3	3	2		2				
CLO4	3	2	2	2				
CLO5	3	2	2	2	2	2	1	1

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction to Environmental Chemistry and Laboratory Safety - Principles of environmental chemistry - Lab Safety Protocols, Handling Chemicals, and Waste Disposal	6	CLO1
2	Sample Collection and Preservation Techniques- Different tools and techniques to collect and preserve the samples	6	CLO2
3	Water Chemistry Analysis I - pH, electrical conductivity (EC), and turbidity measurement - Sampling and preservation techniques for water quality assessment	6	CLO1 CLO2
4	Water Chemistry Analysis II - Determination of Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD), Different Anions and Cations	10	CLO2
5	Heavy Metal Detection in Water and Soil - Atomic absorption spectrometry (AAS) and ICP-MS techniques - Analysis of Lead (Pb), Arsenic (As), and Cadmium (Cd) contamination	6	CLO2 CLO3
6	Air Quality Monitoring and Analysis I - Measurement of particulate matter (PM2.5 and PM10) using gravimetric methods - Detection of gaseous pollutants (SO_2, NOx, CO) using gas analyzers	6	CLO3
7	Air Quality Monitoring and Analysis II - Calculation of Air Quality Index (AQI) and its interpretation - Comparative analysis of urban and rural air pollution	6	CLO3 CLO4

8	Soil Chemistry and Contaminant Analysis - Measurement of soil pH, organic matter content, and salinity - Detection of pesticide residues and hydrocarbon contamination	6	CLO3 CLO4
9	Data Interpretation and Report Writing in Environmental Chemistry - Statistical analysis of experimental data - Writing scientific lab reports	4	CLO5
10	Final Lab Assessment and Project Presentation - Individual/group presentations on selected environmental pollution cases - Discussion on future research trends and applications	4	CLO5

Textbooks:

1. Manahan, S. E. (2022). Environmental chemistry. CRC press.
2. Dara, S. S., & Mishra, D. D. (2006). A textbook of environmental chemistry and pollution control. S. Chand Publishing.
3. Sharma, B. K. (2014). Environmental chemistry. Krishna Prakashan Media.
4. Manahan, S. E. (2011). Fundamentals of environmental chemistry. CRC press.

References:

1. Daughton, C. G. (2001). Emerging pollutants, and communicating the science of environmental chemistry and mass spectrometry: pharmaceuticals in the environment. Journal of the American Society for Mass Spectrometry, 12(10), 1067-1076.
2. Fellenberg, G. (2000). The chemistry of pollution. John Wiley & Sons.
3. Xu, H., Jia, Y., Sun, Z., Su, J., Liu, Q. S., Zhou, Q., & Jiang, G. (2022). Environmental pollution, a hidden culprit for health issues. Eco-Environment & Health, 1(1), 31-45.
4. Morin-Crini, N., Lichtfouse, E., Liu, G., Balaram, V., Ribeiro, A. R. L., Lu, Z., ... & Crini, G. (2022). Worldwide cases of water pollution by emerging contaminants: a review. Environmental Chemistry Letters, *20*(4), 2311-2338.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Seismology and Geodesy

Course Code	**: DSCRHT 2009**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 3.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Demonstrate foundational knowledge of seismicity, earthquake theory, and geodesy.
CLO2	Analyze wave propagation, seismic sources, and earthquake mechanisms using scientific principles.
CLO3	Apply earthquake measurement techniques and predict seismic activity using geodesy and seismological tools.
CLO4	Integrate seismic and geodetic datasets for comprehensive earthquake analysis and risk mitigation.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	1	2	1	1	1	1	1
CLO2	3	3	3	3	2	1	2	2
CLO3	2	2	3	2	3	2	2	3
CLO4	1	1	2	1	2	3	3	3

SL.	**Course Contents**	**Hours**	**CLOs**
1	Seismicity and Earthquake: Brief history of seismology, Historical and Instrumental seismicity	6	CLO1 CLO2
2	Basic Seismological Theory: Waves on a string, Stress and strain, Seismic waves, Snell's law	5	CLO1 CLO2
3	Wave Propagation: Waves in unbounded areas, Semi-infinite bodies, and Layered bodies	5	CLO1 CLO2
4	Seismogram and Seismographs: Introduction, Earthquake Depth Calculation	5	CLO2
5	Seismic Sources: Isotropic, Double Couple, and CLVD	4	CLO2 CLO3
6	Focal Mechanism: Moment tensor and Inversion	4	CLO2
7	Attenuation: Geometrical spreading, Scattering, Multi-Pathing, and Anisotropy	4	CLO2
8	Earthquake Prediction: Electromagnetic fields, Paleo-Seismicity, Seismicity in Bangladesh	4	CLO3
9	Seismic Sensors: Seismometers, Accelerometers, Calibration, Seismic Networks	4	CLO3
10	Geodesy: Concepts, GPS (DGPS/cGPS), InSAR, Error Sources, Integration of seismology and geodesy	4	CLO3 CLO4

Textbooks:

1. Stein, S., & Wysession, M. (2009). An Introduction to Seismology, Earthquakes, and Earth Structure. John Wiley & Sons.
2. Smith, J.R. (1997). Introduction to Geodesy: The History and Concepts of Modern Geodesy. Petersfield, UK.

References:

1. Shearer, P.M., 2019. Introduction to seismology. Cambridge university press.
2. Kramer, S.L. (1996). Geotechnical Earthquake Engineering. Prentice Hall, UK.
3. Lee, W.H.K., et al. (2002). International Handbook of Earthquake and Engineering Seismology. Academic Press, UK.
4. Reitter, L. (1991). Earthquake Hazard Analysis: Issues and Insights. Columbia University Press, NY.
5. Müller, J., & Torge, W. (2012). *Geodesy*. De Gruyter, Germany.
6. Borman, P. (2002). New Manual on Seismological Observatory Practice. GFZ Publications.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Urban and Regional Planning: Concepts and Practices

Course Code	**: DSCRHT 2010**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 3.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Describe fundamental principles of urban and regional planning.
CLO2	Explain planning frameworks and policies for sustainable urban and regional development.
CLO3	Apply urban planning tools and techniques to analyze city growth and land-use patterns.
CLO4	Assess the challenges of urbanization, infrastructure development, and environmental sustainability.
CLO5	Critique urban planning models and their effectiveness in disaster resilience.
CLO6	Propose innovative planning solutions for climate-resilient and sustainable cities.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3							
CLO2	3		2					
CLO3	3	2	2	2	2			
CLO4	3	2	2	2	2			
CLO5	3	2	2	2	2	2	1	
CLO6	3	2	2	2	2	2	1	1

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction to Urban and Regional Planning**:** Definition, scope, and Significance of urban and regional planning, Historical evolution of planning theories	5	CLO1
2	Urbanization and Growth Dynamics: Urbanization trends and global perspectives, Drivers of urban growth and migration	5	CLO1 CLO2
3	Land Use Planning and Zoning: Land use classifications and zoning laws, Mixed land-use planning, and smart growth strategies	4	CLO2 CLO3
4	Infrastructure and Transportation Planning: Urban infrastructure systems (water, energy, waste management), Sustainable transportation planning	4	CLO2 CLO3
5	Housing and Shelter Management: Affordable housing and informal settlements, Slum rehabilitation and urban resilience	4	CLO3 CLO4
6	Regional Development and Economic Planning: Regional disparities and planning strategies, Industrialization and economic corridors	5	CLO4
7	Sustainable Urban Development and Smart Cities: Principles of sustainable cities, Role of technology in smart urban planning	4	CLO5

8	Disaster Risk Reduction and Climate Resilience in Urban Planning: Climate-adaptive infrastructure planning, Risk-sensitive land-use planning	4	CLO5
9	Urban Governance and Policy Frameworks: Role of local governments and institutions, Planning regulations and policy frameworks	4	CLO6
10	Case Studies and Future Trends in Urban and Regional Planning: Smart city initiatives and resilient urban planning, and International case studies on sustainable urban development	6	CLO6

Textbooks:

1. Hall, P., & Tewdwr-Jones, M. (2019). Urban and regional planning. Routledge.
2. Levy, J. M., Hirt, S., & Dawkins, C. J. (2009). Contemporary urban planning. Upper Saddle River, NJ, USA: Pearson/Prentice Hall.
3. Carmona, M. (2021). Public places urban spaces: The dimensions of urban design. Routledge.
4. Chadwick, G. (2013). A systems view of planning: towards a theory of the urban and regional planning process. Elsevier.
5. Wang, X., & Hofe, R. (2008). Research methods in urban and regional planning. Springer Science & Business Media.

References:

1. Citaristi, I. (2022). United Nations human settlements programme. UN-habitat. In The Europa Directory of International Organizations 2022 (pp. 240-243). Routledge.
2. Hofmann, S. Z. (2021). 100 Resilient Cities program and the role of the Sendai framework and disaster risk reduction for resilient cities. Progress in Disaster Science, 11, 100189.
3. Field, B., & MacGregor, B. (2018). Forecasting techniques for urban and regional planning. Routledge.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Bangladesh Studies: Resilience Perspectives

Course Code	**: DSCRHT 2011**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 2.5**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the social system and cultural heritage of Bangladesh.
CLO2	Understand the evolution of disaster management practices in the country.
CLO3	Understand the challenges of colonial, postcolonial, and post-liberation periods for disaster management.
CLO4	Understand the administrative structure and working modalities of the government.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	1				2	2	1	
CLO2	1				2			2
CLO3			1		3	1	1	1
CLO4			2		2	2	2	1

SL.	**Course Contents**	**Hours**	**CLOs**
1	History of disaster management in different periods: Early Bengal (AD 600–c.1538), The Mughal Empire (c.1550–1764), Bengal under British rule (1764–1911).	7	CLO1 CLO2
2	Dynamics of agrarian prosperity or decline, communal conflicts, poverty, and famine from an ecological perspective as well as discussions of state's coercion and popular resistance in colonial Bengal: Ecology and Agrarian Relations in the Nineteenth Century; Economy and Society: the Myth and Reality of 'Sonar Bangla'; The Political Ecology of the Peasant: the Faraizi Movement between Revolution and Passive Resistance; Return of the Bhadralok: the Agrarian Environment and the Nation; The Railways and the Water Regime: Fighting with a Weed: the Water Hyacinth, the State and the Public Square; Between Food Availability Decline and Entitlement Exchange: an Ecological Prehistory of the Great Bengal Famine of 1943	16	CLO1 CLO2 CLO3 CLO4
3	Evolution of Disaster Management in post-colonial period Bangladesh: Post Colonial Nationalist Resistance: Pakistan Period and the Growth of Nationalism, Relation of Disaster Management with the historical evolution of Bangladesh (from a specific focus on 1970s Cyclone)	3	CLO2 CLO3

4	The emergence of Bangladesh: Liberation War of 1971; the role of Bangladesh in world affairs; political development and democratic transitions in the country, the evolution of disaster management approaches during the period.	2	CLO2 CLO3
5	Constitution of Bangladesh: Draft, Basic Features and Amendments, aspects of disaster management in the constitution, guidelines of the constitution for the national development and resilience	2	CLO4

Textbooks:

1. Iqbal I. (2010). The Bengal Delta: Ecology, State and Social Change, 1840–1943. Cambridge Imperial and Post-Colonial Studies (CIPCSS).
2. Mohammad Mozahidul Islam, Niladri Chatterjee & Muhammad Asiful Basar (2023) The final straw? Bhola cyclone, 1970 election, disaster politics, and the making of Bangladesh, Contemporary South Asia, 31:2, 236-250, DOI: 10.1080/09584935.2023.2203901.

References:

1. Choudhury G. W. (1993) The Last Days of United Pakistan. University Press Limited. Dhaka.
2. Novak J.J. (1993) Bangladesh: Reflection on the Water. University Press Limited. Dhaka.
3. Rasheed K.B.S. (2008) Bangladesh: Resource and Environmental Profile. A. H. Development Publishing House. Dhaka.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Principles of Remote Sensing

Course Code	**: DSCRHT 2012**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 2.5**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the course, the students will be able to:

CLO1	Understand the principles of remote sensing and different types of remote sensing technologies.
CLO2	Comprehend the mechanism of sensors and their various characteristics.
CLO3	Learn the preprocessing, processing, and post-processing techniques for remote sensing data.
CLO4	Develop skills in image interpretation and analysis.
CLO5	Apply remote sensing techniques to disaster risk management scenarios for improved decision-making.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	2	3	3	3	3	3	2
CLO2	3	3	3	2	2	3	3	2
CLO3	3	2	3	3	3	3	2	2
CLO4	2	3	3	2	3	2	3	2
CLO5	3	3	3	3	3	2	3	3

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction: Scope, Concepts and Principles of Remote Sensing, Air- and Space-borne.	6	CLO1 CLO5
2	Electromagnetic Radiation: Interactions with the Atmosphere and Earth's Surface	3	CLO1 CLO3
3	Sensors: Sensor Types and Sensor Characteristics.	3	CLO2 CLO4
4	Pre-processing: Visualization and Radiometric Operation; Image Enhancement, Correction of Data for Sensor Imperfections, Atmospheric Correction.	3	CLO3 CLO4
5	Image: Visual Image Interpretation and Digital Image Classification.	10	CLO4
6	Rectification, Terrain Analysis, and Geospatial Techniques: Georeferencing, Geocoding, and DEM.	3	CLO4 CLO5
7	Application: Remote sensing application in Disaster Science and Climate Resilience.	2	CLO1 CLO5

Textbooks:

1. ITC (2010). A Core Book of Geo-information Science and Earth Observation: A System-Based Approach.
2. Lillesand, T.M., Kiefer, R.W., & Chipman, J.W. (2004). Remote Sensing and Image Interpretation, 5th edition. Wiley-Blackwell, US.

References:

1. Rashed, T., & Jurgens, C. (2010). Remote Sensing of Urban and Suburban Areas. Springer, Netherlands.
2. Weng, Q. (2009). Remote Sensing & GIS Integration: Theories, Methods, and Applications. McGraw Hill, US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments/ Presentation (05)	Software-Based Work/ Projects (10)	Attendance (05)
Remember	02	-	-	05
Understand	03	-	-	
Apply	08	-	05	
Analyze	09	-	-	
Create	08	05	05	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Geographic Information System and Database Management

Course Code	**: DSCRHT 2013**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 2.5**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the course, the students will be able to:

CLO1	Understand Geographic Information Systems (GIS), geospatial data, projections, and cartography.
CLO2	Work with commercial and open-source GIS software for spatial analysis and data manipulation.

CLO3	Learn georeferencing of spatial datasets and change coordinate systems.
CLO4	Create vector data through digitizing from hardcopy maps, satellite images, and GPS surveys.
CLO5	Understand data editing, topology building, data processing, and linking spatial data with non-spatial data.
CLO6	Analyze spatial data for extracting new information and supporting decision-making.
CLO7	Apply Structured Query Language (SQL) to fetch, insert, and manipulate spatial and non-spatial data.
CLO8	Apply GIS tools for pre- and post-disaster management.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	2	3	3	3	2	3	3
CLO2	3	3	3	2	3	3	3	3
CLO3	3	3	3	2	3	2	3	3
CLO4	2	3	2	3	3	2	3	2
CLO5	3	3	3	3	3	3	2	3
CLO6	3	3	3	3	2	2	3	3
CLO7	3	2	3	2	3	3	2	2
CLO8	3	2	3	2	3	3	3	3

SL.	Course Contents	Hours	CLOs
1	Introduction: Development of GIS and Scope.	2	CLO1 CLO5
2	Data and Information: Data Type, Typology, and Spatial Relationships.	2	CLO1 CLO5
3	Map Projection and Coordinate Systems: Reference Surface for Mapping, Map Projections, and Coordinate Transformations.	2	CLO1 CLO2
4	Data Entry and Preparation: Data Acquisition, Digitizing from Existing Documents, Data Preparation, Map Standards and Design.	2	CLO4 CLO5
5	Data Quality: Accuracy and Precision.	2	CLO5
6	Database Management: Introduction to Database Management and Database Management Systems.	2	CLO2 CLO6
7	Data: Data Types, Tables, Relational Data Model.	2	CLO2 CLO7
8	Query with SQL: Data fetching, inserting, and manipulating.	2	CLO7
9	Entity Relationship Diagrams: Data Models and Problem Solving.	2	CLO6 CLO8
10	Schema: Conversion and Normalization.	2	CLO6
11	Network: Network and Network Analysis.	2	CLO2 CLO6
12	Vector Analysis: Overlay, Intersect, Clip, Overwrite; Neighborhood Operation: Buffer and Thiessen Polygon.	2	CLO5 CLO8

13	Raster Analysis: Measurement, Location, Distance, Area Size, Classification, Overlay: Arithmetic Operations, Comparison, Logical Operators, Conditional Expressions, Decision Tables.	2	CLO5 CLO8
14	Visualization: The art and science of Visualization.	2	CLO5 CLO8
15	Application: Application of GIS in Disaster Risk Management.	2	CLO8

Textbooks:

1. ITC (2010). A Core Book of Geo-information Science and Earth Observation: A System-Based Approach.
2. Bonham-Carter, G.F. (1991). Geographic Information Systems for Geoscientists: Modeling with GIS. Elsevier, UK.

References:

1. Decker, D. (2001). GIS Data Sources. Wiley-Blackwell, US.
2. Tasha W., & Shelly S. (2006). A to Z GIS: An Illustrated Dictionary of Geographic Information Systems. RIC International.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments/ Presentation (05)	Software-Based Work/ Projects (10)	Attendance (05)
Remember	02	-	-	05
Understand	03	-	-	
Apply	08	-	05	
Analyze	09	-	-	
Create	08	05	05	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Remote Sensing Lab

Course Code	**: DSCRHL 2014**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 4.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the course, the students will be able to:

CLO1	Understand and use different remote sensing software for disaster risk management and climate science applications.
CLO2	Apply various data acquisition methods for remote sensing.
CLO3	Preprocess remote sensing data through techniques such as composite, mosaic, atmospheric correction, and enhancement.
CLO4	Perform visual image interpretation and digital image classification using supervised, unsupervised, and hybrid methods.
CLO5	Conduct georeferencing and terrain analysis, including geocoding, DEM, and DSM creation.
CLO6	Apply data analysis techniques such as classification, interpolation, and change detection.
CLO7	Analyze, interpret, and visualize remote sensing data for disaster management and climate science applications.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	3	3	3	2	2	2	2
CLO2	3	3	2	3	3	3	3	2
CLO3	2	3	3	3	2	3	3	3
CLO4	3	3	3	3	3	3	2	3
CLO5	2	2	3	3	3	3	3	3
CLO6	3	2	3	3	3	3	2	3
CLO7	3	3	3	3	2	3	3	3

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction to ERDAS Imagine: Layout, Tools, and User Interface.	9	CLO1 CLO2
2	Projection and Coordinate System: Projection Types and Transformation, Datum, and Types of Coordinate Systems.	9	CLO1 CLO5
3	Georeferencing: Types and Techniques.	9	CLO2 CLO5

4	Preprocessing of Image: Composite, Mosaic, Atmospheric Correction, and Image Enhancement	9	CLO3 CLO6
5	Image Classification: Supervised, Unsupervised, and Hybrid Classification	9	CLO4 CLO6
6	Accuracy Assessment: Accuracy Assessment using Different Methods.	3	CLO6
7	Change Detection: LULC Changes.	3	CLO6 CLO7
8	Application: Application of Remote Sensing in Disaster and Climate Science	9	CLO7

Textbooks:

1. Leica Geosystems Geospatial Imaging. (2006). ERDAS IMAGINE: Tour Guides.
2. Nayak, S., and Zlatanova, S. (Eds.). (2008). Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters. Springer Science Business Media.
3. Jensen, J.R. (2013). Remote Sensing of the Environment: An Earth Resource Perspective. 2nd Edition. Pearson.
4. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W. (2015). Remote Sensing and Image Interpretation. 7th Edition. Wiley.

References:

1. Campbell, J.B., and Wynne, R.H. (2011). Introduction to Remote Sensing. 5th Edition. Guilford Press.
2. Richards, J.A. (2012). Remote Sensing Digital Image Analysis: An Introduction. 5th Edition. Springer.
3. Schott, J.R. (2007). Remote Sensing: The Image Chain Approach. 2nd Edition. Oxford University Press.
4. Mather, P.M., and Koch, M. (2011). Computer Processing of Remotely Sensed Images: An Introduction. 4th Edition. Wiley.
5. Lu, D., and Weng, Q. (2007). A Survey of Image Classification Methods for Remote Sensing Data. International Journal of Remote Sensing.
6. Harris, R. (2018). Satellite Remote Sensing: An Introduction. Routledge.
7. Asrar, G. (Ed.). (1989). Theory and Applications of Optical Remote Sensing. Wiley.
8. Chuvieco, E. (2016). Fundamentals of Satellite Remote Sensing: An Environmental Approach. 2nd Edition. CRC Press.
9. Rees, W.G. (2013). Physical Principles of Remote Sensing. 3rd Edition. Cambridge University Press.
10. Tiwari, A.K., and Rai, S.C. (2016). Remote Sensing and Geographical Information System (GIS). BS Publications.
11. Liang, S. (2003). Quantitative Remote Sensing of Land Surfaces. Wiley.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (25)	Assignments/ Presentation (05)	Software-Based Work/ Projects (10)	Attendance (10)
Remember	03	-	-	10
Understand	03	-	-	
Apply	06	-	05	
Analyze	07	-	-	
Create	06	05	05	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: GIS Lab

Course Code : DSCRHL 2015 **Credits : 03**
CIE Marks : 50
Exam Hours : 4.0 **SEE Marks : 50**

Course Learning Outcomes: By the end of the course, students will be able to:

CLO1	Work with proprietary and open-source GIS software like ArcGIS, QGIS, Google Earth, and OpenStreetMap (OSM).
CLO2	Perform georeferencing of raster and vector data for GIS analysis.
CLO3	Change projection and coordinate systems for data obtained from various sources.
CLO4	Digitize data from hardcopy maps, satellite images, Google Earth, and GPS surveys to create layers for GIS analysis.
CLO5	Edit spatial data, build topology, manipulate, process, store, and link spatial data with attribute data.
CLO6	Analyze spatial data layers to extract information and inform decision-making.
CLO7	Create maps and visualize data through cartography and symbolization.
CLO8	Create databases and tables, and perform operations like fetching, inserting, and manipulating data.
CLO9	Apply GIS tools for disaster risk reduction, post-disaster management, and hazard-related analyses using both in-situ and satellite data.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	3	2	3	2	2	3	2
CLO2	3	3	3	3	2	2	2	3
CLO3	3	3	3	3	3	3	2	3
CLO4	3	2	2	3	3	2	3	3
CLO5	3	3	3	3	3	3	2	3
CLO6	3	3	3	3	3	3	2	3
CLO7	3	3	3	3	3	3	2	3
CLO8	3	3	3	3	3	3	3	3
CLO9	3	2	3	3	3	3	3	3

SL.	Course Contents	Hours	CLOs
1	Introduction to Desktop and Online GIS Applications: ArcGIS, QGIS, Google Earth, OSM.	9	CLO1
2	Projection and Coordinate System: Projection Types and Transformation, Datum, and Types of Coordinate Systems.	9	CLO3
3	Georeferencing: Types and Techquies.	6	CLO2
4	Attribute Data: Data Analysis and Management using Attribute Table.	6	CLO5 CLO8
5	Data Preparation: Creating Spatial Data from Primary and Secondary Sources.	6	CLO4
6	Data Editing: Raster and Vector Data Editing.	6	CLO5
7	Geoprocessing: Clip, Merge, Union, etc.	6	CLO6 CLO9
8	Spatial and Network Analysis: Local, Zonal, and Global Operation.	3	CLO6 CLO9
9	Map Presentation: Elements of Map and Map Preparation.	3	CLO7
10	Database and Table: Geodatabase Management.	3	CLO8
11	Application: GIS Application in Disaster Risk Management.	3	CLO9

Textbooks:

1. Law, M., & Collins, A. (2018). Getting to Know ArcGIS Desktop. Esri Press.
2. Esri. (2017). Understanding GIS: An ArcGIS Project Workbook (2nd Edition). Esri Press.
3. Lanclos, R., & Matt, A. (2021). Dealing with Disasters: GIS for Emergency Management. Esri Press.

References:

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

2. Chang, K. (2016). Introduction to Geographic Information Systems (9th Edition). McGraw-Hill.
3. Longley, P., Goodchild, M., Maguire, D., & Rhind, D. (2015). Geographic Information Systems and Science (4th Edition). Wiley.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (25)	Assignments/ Presentation (05)	Software-Based Work/ Projects (10)	Attendance (10)
Remember	03	-	-	10
Understand	03	-	-	
Apply	06	-	05	
Analyze	07	-	-	
Create	06	05	05	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Vulnerability and Risk Assessment

Course Code : DSCRHT 3001 **Credits : 03**
CIE Marks : 50
Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Explain the scope, importance, and methods of vulnerability and risk assessment.
CLO2	Identify and analyze hazards, exposure, and elements at risk, including cascading and compound disasters.
CLO3	Evaluate different risk assessment approaches, including probabilistic and deterministic methods.
CLO4	Apply risk modeling techniques and emerging technologies, such as GIS, AI, and machine learning, in risk assessment.
CLO5	Assess vulnerability frameworks and methodologies, distinguishing between static and dynamic vulnerability.

CLO6	Compare and contrast community-based risk assessment (CBRA) with urban risk assessment (URA), focusing on stakeholder participation and decision-making.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		3					
CLO2	3	2	3					
CLO3	3		3	2				
CLO4		2	3	3	2			
CLO5			3		3	3	2	3
CLO6				2	3	3	3	3

SL.	Course Contents	Hours	CLOs
1	Introduction: Scope of Vulnerability and Risk Assessment.	3	CLO1
2	Hazards: Hazard Identification Tools, Hazard Assessment, Natural and Technological Hazard Assessment, Cascading and Compound Disasters (e.g., earthquake-triggered tsunamis, climate-induced displacement).	5	CLO2
3	Vulnerability: Vulnerability Assessment, Components and Characteristics of Vulnerability, Conceptual Frameworks of Vulnerability, Vulnerability Assessment Methods, Dynamic vs. Static Vulnerability.	5	CLO5
4	Elements at Risk: Elements at Risk, Types of Elements at Risk, Exposure Analysis.	3	CLO2
5	Risk: Risk Evaluation, Risk Perception, Risk Transfer.	3	CLO3
6	Risk Assessment: Purpose of Risk Assessment, Qualitative and Quantitative Approach of Risk Assessment/Risk Estimation, Probabilistic vs. Deterministic Risk Assessment.	5	CLO3
7	Risk Modeling: Concept and Steps, Risk Modeling Tools (e.g., HAZUS, CAPRA, OpenQuake), Machine Learning and AI in Risk Assessment.	3	CLO4
8	Impact Assessment: Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), and Hazard Impact Assessment (HIA) Framework and Methodology.	4	CLO5
9	Individual and Multi-hazard Risk Assessment: Hazard-Specific Vulnerability and Risk Assessment Procedures and Multi-hazard Risk Assessment.	3	CLO6
10	Community-Based Risk Assessment: Tools of Community-Based Risk Assessment (CBRA): Hazard Mapping, Social Mapping, Participatory Rural Appraisal, Transect Walk, etc.	3	CLO6

11	Stakeholders: Participation of Stakeholders in CBRA, Role of Local Authorities in Community-Based Disaster Risk Management.	3	CLO6
12	Comparison: Difference between Urban Risk Assessment (URA) and CBRA/CRA, Participants, and Framework for URA.	2	CLO6
13	Application: PGIS, Volunteered Geographic Information (VGI), Application of GIS and RS Techniques in Citizen Science.	3	CLO4

Textbooks:

1. Westen et al (2011), A Guidebook of Multi-hazard Risk Assessment, Public Works
2. Ostrom L.T. & Wilhelmsen C.A. (2012) Risk Assessment: Tools, Techniques and Their Application. Wiley-Blackwell. US.

References:

1. Birkmann J. (2013) Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies. United Nations University Press. Japan.
2. Macaulay T. (2008) Critical Infrastructure: Understanding its Component Parts, Vulnerabilities, Operating Risks, and Interdependencies. CRC Press. US.
3. Schneider S.K. (2011) Dealing with Disaster: Public Management in Crisis Situations. 2nd Edition. M.E. Sharpe. US.
4. Schumann A.H. (2011) Flood Risk Assessment and Management. Springer. Netherlands.
5. Wisner B. (2004) At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge. US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Applied Geophysics

Course Code	**: DSCRHT 3002**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 3.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the scope, objectives, and disciplines of geophysics and distinguish between active and passive geophysical methods.
CLO2	Analyze the physical properties of earth materials and their relevance to seismic wave propagation and geophysical phenomena.
CLO3	Apply fundamental principles of seismic refraction and reflection methods to analyze subsurface structures.
CLO4	Evaluate the principles and applications of gravity, magnetic, electrical, and resistivity methods in geophysical surveys.
CLO5	Explore advanced geophysical techniques such as GPR, PS logging, MASW, and microtremor for subsurface investigations.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	1	1	1	1	1	1	1
CLO2	3	3	2	2	1	1	2	1
CLO3	3	3	3	3	1	1	2	1
CLO4	2	3	3	3	3	2	2	2
CLO5	2	3	2	3	3	1	3	2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction: Scope and objectives of geophysics, disciplines of geophysics, active and passive methods.	7	CLO1
2	Physical properties of earth materials: Stress and strain, Young's modulus, etc.	7	CLO2
3	Basic Concepts of the Seismic Method: Snell's law, wavefronts, ray paths, etc.	6	CLO2, CLO3
4	Seismic Refraction: Basic Theory.	4	CLO3
5	Seismic Reflection: Basic Theory.	6	CLO3
6	Principles and scope of gravity, magnetic, electrical, and resistivity methods.	6	CLO4
7	Theory and Applications: GPR, PS logging, MASW, microtremor, etc.	9	CLO5

Textbooks:

1. Kearey and Brooks (1984) An Introduction to Geophysical Exploration, Blackwell Publication.
2. Howell B.F. (1959) Introduction to Geophysics. McGraw-Hill. US.

References:

1. Burger H.R. Burger D.C. (1992) Exploration Geophysics of the Shallow Subsurface. Prentice Hall. US.
2. Dobrin M.B. (1988) Introduction to Geophysical Prospecting. 4th Edition. McGraw-Hill. US.
3. Keller C.V. Frischnecht F.C. (1966) Electrical Methods in Geophysical Prospecting. Pergamon. Oxford.
4. Milsom J.J. and Eriksen A (2011) Field Geophysics. 4th Edition. Wiley-Blackwell. US.
5. Reynolds J.M. (1997) An Introduction to Applied and Environmental Geophysics. Wiley-Blackwell. US.
6. Stacey F.D. Davis P.M. (2008) Physics of the Earth. 4th Edition. Cambridge University Press. UK.
7. Telford W.M., Geldart L.P. Sheriff R.E. (1990) Applied Geophysics. 2nd Edition. Cambridge University Press. UK.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Geotechnical Engineering

Course Code	**: DSCRHT 3003**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 3.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the fundamental concepts of soil origin, classification, and weight-volume relationships to assess soil properties.
CLO2	Analyze soil compaction, seepage, and stresses to evaluate soil behavior under various conditions.
CLO3	Evaluate soil compressibility, consolidation, and shear strength parameters for geotechnical design and applications.
CLO4	Assess lateral earth pressure, slope stability, and soil bearing capacity for infrastructure development and safety.
CLO5	Explore soil improvement techniques and site characterization methods for effective geotechnical planning and problem-solving.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	2	1	1	1	1	1	1
CLO2	3	3	2	2	1	1	2	1
CLO3	3	3	3	2	1	1	2	2
CLO4	3	3	3	3	2	2	3	2
CLO5	2	3	3	3	3	3	3	2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction: Scope, Origin of soil, Grain size, Weight-volume relationships.	3	CLO1
2	Plasticity and Structure of Soil: Liquid limit, Plastic limit, etc.	3	CLO1
3	Classification of Soil: Textural classification, Engineering behavior, AASHTO, Unified soil classification.	3	CLO1
4	Soil Compaction: General principles, Proctor tests, Factors affecting compaction, etc.	3	CLO2
5	Seepage: Laplace's equation, Flow nets, Mathematical solutions for seepage.	3	CLO2
6	In Situ Stresses: Saturated soil stresses, Capillary rise, Effective stress.	3	CLO2
7	Stresses in a Soil Mass: Normal and shear stresses, Embankment loading, etc.	3	CLO2

8	Compressibility of Soil: Consolidation fundamentals, Settlement, Compression index.	3	CLO3
9	Shear Strength of Soil: Mohr-Coulomb failure criterion, Shear strength parameters.	3	CLO3
10	Lateral Earth Pressure: Introduction and Rankine Active and Passive Earth Pressure.	3	CLO4
11	Slope Stability: Introduction and Determination of Factors of Safety.	4	CLO4
12	Soil Bearing Capacity: Bearing capacity for shallow foundations.	3	CLO4
13	Soil Improvements: Densification, Reinforcement, Grouting, Drainage techniques.	4	CLO5
14	Site Characterization: Planning, In situ tests, Sampling methods.	4	CLO5

Textbooks:

1. Das, B.M. (2021) Principles of geotechnical engineering. Cengage learning.
2. Coduto D.P., Yeung M.C. Kitch W.A. (2011) Geotechnical Engineering. 18th Edition. Pearson. US.

References:

1. Chen W.F. Lui E.M. (2006) Earthquake Engineering for Structural Design. CRC Press. US.
2. Kramer S.L. (1996) Geotechnical Earthquake Engineering. Prentice Hall. US.
3. Kumar K. (2008) Basic Geotechnical Earthquake Engineering. New age International Publishers. India.
4. McDowell P.W., Barker R.D., et al. (2002) Geophysics in Engineering Investigations. Geological Society of London and CIRIA. UK.
5. Paul D.K. Sharma M.L. (2006) Earthquake Engineering. Elite Publishing House. India.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	15
Apply	10
Analyze	10
Evaluate	05
Create	05

Course Name: Built Environment

Course Code	**: DSCRHT 3004**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 2.5**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the built environment and its components.
CLO2	Understand the properties of engineering materials.
CLO3	Evaluate the different types of loads imposed on a structure.
CLO4	Apply the BNBC in designing and building the infrastructures to make it resilient.
CLO5	Incorporate the safety and security issues in the built environment and how to apply build back better concept.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	2						
CLO2	2	3						
CLO3	3	3						
CLO4	3	3	2					3
CLO5	2	2		3	2	3		

SL.	**Course Contents**	**Hours**	**CLOs**
1	Built Environment: Introduction and its components.	3	CLO1
2	Structural forms and systems for buildings, Bridges, Communication and transmission structures.	4	CLO1
3	Types of construction materials - steel, Reinforced and prestressed concrete etc.	4	CLO2
4	Physical and chemical properties of built materials.	4	CLO2
5	Loads on structures, Structural dynamics, Types of foundation, Concept of bearing capacity, Settlement.	3	CLO3
6	Impact of Built Environment on Health, Sustainable design, Towards environment-friendly built environment.	4	CLO5
7	Concept on building code, General building requirements, Control and regulations, Structural design, Construction practice and safety, Building services, Alteration, Addition and change of existing building codes.	4	CLO4, CLO5
8	Building Construction, Considering Energy Efficiency and Safety.	4	CLO5

Textbooks:

1. Mehta, M., Scarborough, W. and Armpriest, D., 2016. Building Construction: Principles, Materials, and Systems (What's New in Trades & Technology).
2. Punmia B.C., Jain A.K. 2005. Comprehensives Basic Civil Engineering. Laxmi Publications. India.

References:

1. Bender, S.O., 2021. Constructing risk: Disaster, development, and the built environment (Vol. 4). Berghahn Books.
2. Chan A.P.C. and Cheung E. 2014. Public Private Partnership in International Construction. Taylor and Francis Group. US.
3. Douglas J. and Ransom B. 2013. Understanding Building Failures. 4th Edition. Taylor and Francis. US.
4. Johnston S.A., Nicholas S.S. and Parzeen J. 2013. The Guide to Greening Cities. 2nd Edition. Island Press. US.
5. Tymkow P., et al. 2013. Building Services Design for Energy Efficient Buildings. Routledge. UK.
6. Dowrick D.J. 2009. Earthquake Resistant Design and Risk reduction. 2nd Edition. Wiley-Blackwell. US.
7. BNBC. (2020). Bangladesh National Building Code (BNBC) 2020. In *Ministry of Housing and Public Works*.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments/ Presentation (05)	Software-Based Work/ Projects (10)	Attendance (05)
Remember	02	-	-	05
Understand	03	-	-	
Apply	08	-	05	
Analyze	09	-	-	
Create	08	05	05	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Geotechnical Engineering and Geophysics Lab

Course Code	**: DSCRHL 3005**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 4.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Perform and interpret physical and index property tests on various soil types to evaluate their characteristics.
CLO2	Conduct and analyze engineering property tests on soils to determine strength, permeability, compaction, and consolidation parameters.
CLO3	Apply geophysical methods for subsurface investigation, including data acquisition, processing, and interpretation using advanced techniques.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	3	2	2	1	1	1	1
CLO2	3	3	3	2	2	2	1	1
CLO3	2	3	3	3	3	3	3	2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Physical / Index Property Tests on Soils: a) Field identification test b) Moisture content determination test c) Determination of specific gravity of coarse-grained and fine-grained soils d) Sieve analysis e) Hydrometer analysis f) Determination of Atterberg limits of fine-grained soils (Determination of liquid limit, plastic limit, and shrinkage factors), g) Determination of in situ dry density.	25	CLO1
2	Engineering Property Tests on Soils: a) Determination of coefficient of permeability of soils (Constant head permeability test and Variable head permeability test) b) Determination of compaction characteristics of soils c) Direct Shear Test, d) Unconfined compression test e) Triaxial Compression Test (UU, CU, and CD)	25	CLO2

	f) Consolidation test.		
3	Data acquisition, processing, and interpretation: a) Downhole seismic test b) MASW c) Microtremor d) GPR.	40	CLO3

Textbooks:

1. Punmia B.C. (2005), Soil Mechanics and Foundation Engineering, 16th Edition Laxmi Publications Co., New Delhi.
2. Burger H.R. Burger D.C. (1992) Exploration Geophysics of the Shallow Subsurface. Prentice Hall. US.
3. Lambe T.W., Soil Testing for Engineers, Wiley Eastern Ltd., New Delhi.

References:

1. Head K.H., (1986), Manual of Soil Laboratory Testing, Vol. I, II, III, Princeton Press,
2. London.
3. Bowles J.E. (1988), Engineering Properties of Soil and Their Measurements, McGraw Hill Book Co. New York.
4. Coduto, Donald P. (1999), Geotechnical Engineering: Principles and Practices, 2nd ed., Prentice Hall, New Jersey
5. US Army (2001), Engineering Manual (EM) 110-1-1804: Engineering and Design, Geotechnical Investigations
6. US Army (1997), Field Manual (FM) 5-410: Military Soils Engineering.
7. Coduto D.P., Yeung M.C. Kitch W.A. (2011) Geotechnical Engineering. 18th Edition. Pearson. US.
8. Kramer S.L. (1996) Geotechnical Earthquake Engineering. Prentice Hall. US.
9. Kumar K. (2008) Basic Geotechnical Earthquake Engineering. New age International Publishers. India

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Tests (30)	Assignments/ Presentation (05)	Software-Based Work/ Projects (10)	Attendance (05)
Remember	02	-	-	05
Understand	03	-	-	
Apply	08	-	05	
Analyze	09	-	-	
Create	08	05	05	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Disaster Statistics and Data Science Lab

Course Code : DSCRHL 3006 **Credits : 03**
CIE Marks : 50
Exam Hours : 4.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the course, the students will be able to:

CLO1	Work with core R packages (statrs, sp, sf, terra) for statistical and geostatistical analysis.
CLO2	Perform data cleaning, preprocessing, imputation, and interpolation for disaster datasets.
CLO3	Apply spatial statistics and geostatistics to analyze disaster-related geospatial data.
CLO4	Conduct correlation and regression analysis, including machine learning for disaster risk assessment.
CLO5	Visualize and interpret disaster statistics using advanced data visualization techniques.
CLO6	Develop and validate predictive models for disaster forecasting using R and Python.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	3	2	3	3	2	2	3
CLO2	3	3	2	3	3	3	2	3
CLO3	3	3	3	3	3	3	3	2
CLO4	3	3	3	3	3	3	3	3
CLO5	3	3	3	3	3	3	3	3
CLO6	3	3	3	3	3	3	3	3

SL.	Course Contents	Hours	CLOs
1	Descriptive Statistics: Measures of central tendency, variability, and distribution fitting.	10	CLO1, CLO5
2	Data Cleaning & Preprocessing: Handling missing values, outliers, and standardization.	10	CLO2

3	Data Imputation & Interpolation: Kriging, IDW (Inverse Distance Weighting), Spline, and machine learning-based imputation.	10	CLO2, CLO3
4	Geostatistics & Spatial Statistics: Spatial autocorrelation, Variograms, Moran's I, Geographically Weighted Regression (GWR), using `sf`, `sp`, and `terra`.	10	CLO3, CLO4
5	Correlation & Regression Analysis: Pearson, Spearman, linear, multiple, and logistic regression.	10	CLO4, CLO5
6	Machine Learning for Disaster Risk Analysis: Decision Trees, Random Forest, SVM, and Neural Networks.	10	CLO4, CLO6
7	Time-Series Analysis for Disaster Forecasting: ARIMA, SARIMA, and LSTM models.	10	CLO6
8	Spatial Data Processing: Handling raster and vector datasets with `terra` and `sf`.	10	CLO1, CLO3
9	Data Visualization: ggplot2, Leaflet for spatial data visualization, Shiny dashboards.	10	CLO5

Textbooks:

1. Grolemund, G., & Wickham, H. (2017). R for Data Science. O'Reilly Media.
2. Wickham, H. (2017). Advanced R. Routledge.
3. Field, A., Miles, J., & Field, Z. (2012). Discovering Statistics Using R. Sage Publishers.

References:

1. Pebesma, E., & Bivand, R. (2021). Spatial Data Science with R. Chapman & Hall/CRC.
2. Cheng, Q. (2020). Geostatistics for Environmental and Disaster Applications. Springer.
3. James, G., Witten, D., Hastie, T., & Tibshirani, R. (2021). An Introduction to Statistical Learning with Applications in R (ISLR). Springer.
4. Maslin, M. (2021). Climate Change: A Very Short Introduction (4th edn). Oxford University Press.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50):

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50):

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Development and Resilience: Economic Concept

Course Code	**: DSCRHT 3007**	**Credits**	**: 03**
		CIE Marks	**: 30**
Exam Hours	**: 3.0**	**SEE Marks**	**: 70**

Course Learning Outcomes: At the end of the Course, the Student will be able to-

CLO1	Understand the evolution of key development theories and their current perspectives.
CLO2	Analyze how environmental and climate change issues are integrated into development thinking.
CLO3	Comprehend foundational concepts in micro and macroeconomics.
CLO4	Explore the connection between disaster and development, with a focus on the current situation in Bangladesh.
CLO5	Examine economic growth and development trends in Bangladesh and globally.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3					2		
CLO2	3				3	2		1
CLO3		2						
CLO4	2		3		3	2		
CLO5	2		2		3	2		

SL.	Course Contents	Hours	CLOs
1	Introduction; Basic understanding of development; Evolution of development theories, sustainable development, human development; Vulnerability and underdevelopment; Relationship between development, climate change, resilience.	5	CLO1 CLO2
2	The fundamentals of economics; Introducing economic way of thinking; Applying graphs to economics; Production possibilities	7	CLO3

	and opportunity cost; Market demand and supply; Markets in action; Markets and government in a modern economy.		
3	Microeconomics fundamentals; Applications of supply and demand; Demand and consumer behavior; Elasticity of demand and supply; Demand and consumer behavior; Theory of production and analysis of cost; Market structures (Perfect competition, Monopoly, Monopolistic competition, and oligopoly).	6	CLO3
4	Macroeconomics fundamentals; Measuring the size of the national economy; Business cycle and economic growth; Inflation and growth; Macroeconomic theory and policy (Monetary policy, fiscal policy); Growth, development, and the global economy; Unemployment, inflation, and economic policy.	7	CLO5
5	Human development index; Basic concept of Human development; Calculation of the individual and gross index; Evolution of the index.	5	CLO1
6	Climate change, resilience development industry in Bangladesh; Impact of disaster on microeconomic and macroeconomic indicators of Bangladesh; Cost-benefit analysis of disasters, long and short time impacts of climate change.	5	CLO4 CLO5
7	Global development strategies and disaster management, SDGs, SFDRR; International development and humanitarian industry.	5	CLO5
8	Case Study of some costly disasters: Bhola cyclone (1970), Cyclone Gorky (1991), Bangladesh, Flood (1988, 1998,2007), Kobe Earthquake (2005), Sichuan Earthquake (2008), The Great East Japan Earthquake(2011), Northridge Earthquake (1994), Hurricane Katrina (2005).	5	CLO2 CLO4

Textbooks:

1. Bankoff G. (2004) Cultures of Disaster: Society and Natural Hazard in the Philippines. Routledge. US.
2. Gilbert Rist. (2004) The History of Development: From Western Origins to Global Faith. Zed Books. Chicago
3. Samuelson, Paul A., and Nordhaus, William (2001), Economics, 19th Edition. New York: McGraw-Hill.
4. Dornbusch R., Fischer S., and Startz R. (1978), Macroeconomics, McGraw Hill.

References:

1. Collins A.E. (2009) Disaster and Development. Routledge. UK.
2. Hansjurgens B. Antes R. (2008) Economic Management of Climate Change: Risk, Mitigation Adaptation. Springer. The Netherlands.
3. Todaro M.P. Smith S.C. (2015) Economic Development. 12TH Edition. Pearson Higher Education. USA.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Geohazard Risk Reduction Approach

Course Code : DSCRHT 3008 **Credits : 03**
CIE Marks : 50
Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to-

CLO1	Understand various aspects of geohazards, vulnerabilities, and associated risks
CLO2	Evaluate the seismic responses of soils and structures
CLO3	Analyze components of seismic hazard assessments, including slope stability and liquefaction
CLO4	Explore key considerations for design and construction, along with techniques to mitigate geohazard risks
CLO5	Develop scenario-based earthquake risk models to estimate potential damages
CLO6	Apply strategies and practices for effective geohazard risk management

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		3					
CLO2		3	3	2				
CLO3		2	3	2				
CLO4			2	3	3	2		
CLO5			3		3	2		
CLO6					3	3	2	3

SL.	Course Contents	Hours	CLOs
1	Earthquake risk reduction: Introduction, Earthquake risk and hazard, The social and economic consequences of earthquakes, Earthquake consequences and their acceptability, Earthquake risk reduction actions	3	CLO1 CLO6
2	Seismic Hazard Analysis: Deterministic and probabilistic	6	CLO3 CLO5
3	Structural Dynamics: SDOF and MDOF; Seismic Response of Soils and Structures	4	CLO2 CLO3
4	Earthquake tips: Seismic effects on structures, architectural features, seismic design philosophy, open-ground storey buildings, shear walls, base isolation, and seismic dampers	9	CLO4 CLO6
5	Earthquake Resistance of Buildings: Strong and weak building types, structural form and earthquake resistance, codes of practice, improving resistance of non-engineered buildings	3	CLO4 CLO6
6	Liquefaction: Liquefaction hazard analysis and its countermeasures	6	CLO3 CLO6
7	Slope: Seismic slope stability analysis and its countermeasures	4	CLO3
8	Seismic Provisions in Bangladesh National Building Code	4	CLO4 CLO6
9	Case study: Retrofitting of soft-storey RC buildings in Nepal, Japan seismic risk reduction before and after the 1995 Kobe earthquake, Lesson learned from Great Historical Geo-Diasters (Example; 2015 Nepal earthquake and 1985 Mexico earthquake)	6	CLO5 CLO6

Textbooks:

1. Murty, C.V.R. (2005) Earthquake tips. Indian Institute of Technology Kanpur, India.
2. Kramer S.L. (1996) Geotechnical Earthquake Engineering. Prentice Hall. US.

References:

1. Coburn, A. and Spence, R. (2003) Earthquake protection. John Wiley Sons.
2. Day, R.W. (2012) Geotechnical earthquake engineering handbook: with the 2012 International building code. McGraw-Hill Education.
3. Balassanian S., Cisternas A. Melkumyan M. (2000) Earthquake Hazard and Seismic Risk Reduction, Series: Advances in Natural and Technological Hazards Research. Springer. Netherlands.
4. Bozorgnia and Bertero. Earthquake Engineering: From Engineering Seismology to Performance based Engineering, CRC Press
5. Dowrick D. (2009) Earthquake Resistant Design and Risk Reduction. 2nd Edition. Wiley-

Blackwell. US.
6. Kramer S.L. (1996) Geotechnical Earthquake Engineering. Prentice Hall. US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Hydro-meteorological Risk Reduction Approach

Course Code : DSCRHT 3009 **Credits : 03**
CIE Marks : 50
Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to-

CLO1	Conduct risk assessments for hydro-meteorological hazards
CLO2	Develop generic and scenario-based risk models
CLO3	Estimate risks for various scenarios involving hydro-meteorological hazards
CLO4	Identify structural and non-structural measures for risk reduction
CLO5	Evaluate risk reduction strategies using methods such as cost-benefit analysis
CLO6	Visualize risks associated with different hazards effectively

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	2	3					
CLO2		3	3	2	2			2
CLO3		3	3		3			

CLO4				3	3	2		
CLO5				2	3		2	
CLO6				3	2	3		1

SL.	Course Contents	Hours	CLOs
1	Hydro-meteorological hazard modeling risk assessment: An introduction	3	CLO1, CLO2
2	Physical, social, economic, and environmental vulnerability of flood, drought, cyclone, and riverbank erosion	4	CLO1, CLO3
3	Flood/ Riverine Hazard: People and livelihood related to river and flood consequences of development in flood plains; Flood types, characteristics, modeling, flood routing, basics of open channel flow, risk assessment, and reduction measures; Watershed and river basin management, FAP, policies	10	CLO1, CLO2, CLO4
4	Riverbank Erosion: Causes, contributing factors, failure types, protection measures, and practices in Bangladesh	6	CLO1, CLO4
5	Drought: Overview, causes, contributing factors, protection measures, and practices in Bangladesh	4	CLO1, CLO3, CLO4
6	Coastal Hazards: Overview of types, vulnerability assessment, mitigation, early warning, and integrated coastal zone management	6	CLO1, CLO2, CLO4
7	Mountainous Hazards: Vulnerability and risk reduction, landslide assessment, risk evaluation, mitigation methods, and initiatives in Bangladesh	6	CLO3, CLO4
8	Arsenic Contamination in Groundwater of Bangladesh and Mitigation Options	6	CLO4, CLO5

Textbooks

1. Bird E. (2011) Coastal Geomorphology: An Introduction. Wiley-Blackwell. US.
2. Cicin-Sain B. et al. (1998) Integrated Coastal and Ocean Management: Concepts and Practices. Biliana. Island Press. US.
3. Glade T. et al (Ed.) (2005) Landslide Hazard and Risk. Wiley-Blackwell. US.
4. Westen C.J. et al: Multi-hazard Risk Assessment, ITC

References:

1. Diaz H.F. Markgraf V. (2000) El Niño and the Southern Oscillation: Multiscale Variability and Global and Regional Impacts. Cambridge University Press. UK.

2. Finkl C.W. (Ed.) (2013) Coastal Hazards. Springer. Netherlands.
3. Glade T. et al (Ed.) (2005) Landslide Hazard and Risk. Wiley-Blackwell. US.
4. Lee E.M. Jones D.K.C. (2004) Landslide Risk Assessment. Thomas Telford Publication. UK.
5. Ministry of Water Resources, Government of the People's Republic of Bangladesh. (2005) Bangladesh Coastal Zone Policy. Bangladesh Secretariat. Dhaka.
6. Sassa K. Canuti P. (2008) Landslides-Disaster Risk reduction. Springer. Netherlands.
7. The H. John Heinz III Center for Science, Economics, and the Environment, 2000. The Hidden Costs of Coastal Hazards: Implications for Risk Assessment and Mitigation. Island Press. US.
8. United Nations Environment Programme (UNEP). (2005) Assessing Coastal Vulnerability: Developing a Global Index for Measuring Risk.
9. Wallendorf L. et al. (2011) Solutions to Coastal Disasters 2011. ASCE Publications. US.
10. Westen C.J. et al: Multi-hazard Risk Assessment, ITC
11. WMO (2008). Guide to Hydrological Practices, WMO.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Population, Migration and Shelter Management

Course Code	**: DSCRHT 3010**	**Credits**	**: 02**
		CIE Marks	**: 50**
Exam Hours	**: 2.5**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to-

CLO1	Define key concepts related to population dynamics, migration, and shelter management.
CLO2	Explain the drivers and consequences of migration in the context of disasters and climate change.
CLO3	Apply demographic methods to assess population vulnerabilities and displacement risks.
CLO4	Analyze policies and frameworks for managing displaced populations and shelter solutions.
CLO5	Evaluate the effectiveness of resettlement and shelter programs in disaster-prone areas.
CLO6	Design inclusive and resilient shelter planning strategies for displaced and vulnerable communities.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3							
CLO2	3							
CLO3	3	2	2		2			
CLO4	3	2	2		2	2		
CLO5	3	2	2		2	2	1	
CLO6	3	2	2	2	2	2	1	1

SL.	Course Contents	Hours	CLOs
1	Introduction to Population and Migration Studies - Key concepts: population dynamics, migration theories - Types and patterns of migration	3	CLO1
2	Drivers and Impacts of Migration - Push and pull factors - Socioeconomic and environmental impacts	2	CLO1 CLO2
3	Forced Migration and Displacement - Climate-induced displacement - Conflict-driven migration and humanitarian responses	3	CLO2 CLO3
4	Urbanization and Shelter Management - Rapid urbanization and informal settlements - Slum development and governance challenges	2	CLO3
5	Shelter and Housing Policies - Global frameworks on housing rights (e.g., SDG 11) - National and local housing policies	2	CLO3 CLO4

6	Disaster and Emergency Shelter Management - Disaster-resilient housing designs - Role of humanitarian agencies in shelter response	2	CLO4
7	Climate Change and Migration Nexus - Climate refugees and legal challenges - Case studies on climate-induced migration	2	CLO2 CLO5
8	Sustainable and Resilient Housing Solutions - Low-cost and sustainable housing technologies - Community-driven approaches to shelter development	2	CLO5
9	Migration Governance and Policy Interventions - International frameworks on migration governance - Policy tools for managing migration and integration	2	CLO6
10	Social and Economic Integration of Migrants - Challenges and opportunities in labor markets - Cultural adaptation and social cohesion	4	CLO6
11	Case Studies on Migration and Shelter Management - Best practices from different countries - Comparative analysis of migration policies	4	CLO6
12	Final Discussion and Policy Recommendations - Presentations on selected case studies - Future trends in population, migration, and shelter planning	2	CLO6

Textbooks:

1. Rodwin, L. (Ed.). (2022). Shelter, settlement & development. Taylor & Francis.
2. Newbold, K. B. (2021). Population geography: Tools and issues. Rowman & Littlefield.
3. Weeks, J. R. (2019) Population: An Introduction to Concepts and Issues, Thirteenth Edition

References:

1. George, J. W., Guthrie, P., & Orr, J. J. (2023). Redefining shelter: humanitarian sheltering. Disasters, 47(2), 482-498.
2. Opdyke, A., Goldwyn, B., & Javernick-Will, A. (2021). Defining a humanitarian shelter and settlements research agenda. International Journal of Disaster Risk Reduction, 52, 101950.
3. Friedman, A., & Chaki, B. (2025). Form and Function of a Shelter. In Fundamentals of Planning and Designing Sustainable Post-Disaster Shelters (pp. 97-113). Cham: Springer Nature Switzerland.
4. United Nations. Goal 11 | Department of Economic and Social Affairs [Internet]. [accessed 2025 Mar 20]. https://sdgs.un.org/goals/goal11

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Hazard Analysis Lab

Course Code : DSCRHL 3011 **Credits : 02**
CIE Marks : 50
Exam Hours : 4.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to-

CLO1	Explain the definition, scope, and classification of hazards, along with data sources for hazard analysis.
CLO2	Apply frequency and probability analysis techniques to assess hazard events.
CLO3	Evaluate intensity and magnitude determination methods for seismic, hydrological, and industrial hazards.
CLO4	Utilize hazard profiling, zonation mapping, and spatio-temporal analysis to assess multi-hazard interactions.
CLO5	Analyze physical hazard parameters such as ground motion, flood characteristics, and landslide risk factors.
CLO6	Interpret frequency-number (F-N) relationships for risk acceptability analysis and decision-making.
CLO7	Apply GIS, remote sensing, and computational tools for hazard analysis.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		3					
CLO2	3	2	3					
CLO3	3		3	2				
CLO4		2	3	3	2			
CLO5			3		3	3	2	3
CLO6				2	3	3	3	3
CLO7	3	2	3	3		3	3	3

SL.	Course Contents	Hours	CLOs
1	Introduction to Hazard Analysis: Definition and Scope of Hazard Analysis, Classification of Hazards (Natural, Technological, Biological), Data Sources for Hazard Analysis (National & International).	8	CLO1
2	Frequency and Probability Analysis of Hazard Events: Return Period & Recurrence Interval (Extreme Value Analysis), Statistical Distributions for Hazard Data (Gumbel, Log-Pearson Type III), Trend Analysis of Past Hazard Events (Climate & Seismic Data).	8	CLO2
3	Intensity and Magnitude Determination: Seismic Hazard Analysis (Magnitude Scales – Richter, Moment Magnitude, PGA), Hydrological & Meteorological Hazards (Rainfall Intensity, Cyclone Wind Speeds, Flood Discharge), Fire & Industrial Hazards (Heat Flux, Spread Rate, Toxic Gas Dispersion).	10	CLO3
4	Hazard Profiling & Zonation Mapping: Hazard Zonation Techniques (GIS & Remote Sensing Applications), Multi-Hazard Interaction & Overlapping Risks, Spatio-Temporal Analysis of Hazard Hotspots.	6	CLO4
5	Analysis of Physical Hazard Parameters: Earthquake Ground Motion Parameters (PGA, PGV, SA), Flood Hazard Assessment (Water Level, Velocity, Inundation Extent), Landslide Hazard Evaluation (Slope Stability, Soil Moisture, Rainfall Thresholds).	10	CLO5
6	F-N Curve and Risk Acceptability Analysis: Understanding Frequency-Number (F-N) Relationships, Application in Technological & Industrial Risk Assessment, Decision-Making Based on Risk Acceptability Criteria.	6	CLO6
7	GIS and Remote Sensing Applications in Hazard Analysis: Satellite-Based Hazard Monitoring (Flood Mapping, Drought Indicators).	6	CLO7
8	Computational & Software-Based Hazard Analysis: OpenQuake for Earthquake Hazard Modeling, Python/R for Statistical Hazard Analysis.	6	CLO7

Textbooks:

1. Westen et al (2011) Multi-hazard Risk Assessment Guidebook
2. Gao, J. (2023). Remote Sensing of Natural Hazards. CRC Press.

References

1. Hyndman, D., & Hyndman, D. (2006). Natural hazards and disasters.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Geo-informatics and MIS in Disaster Management and Climate Change

Course Code : DSCRHL 3012 **Credits : 02**
CIE Marks : 50
Exam Hours : 4.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the basics of Geo-informatics and spatial data analysis.
CLO2	Explore spatial data infrastructure, geospatial platforms, and database management.
CLO3	Apply remote sensing for data extraction in disaster management.
CLO4	Develop skills in spatial modelling for informed decision-making.
CLO5	Understand the role of information systems in decision support.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	2	1	3				
CLO2	2	3		3			1	1
CLO3	2	3	1	3				2
CLO4		1	2	1	1	1	2	1
CLO5		1			1	2	2	1

SL.	Course Contents	Hours	CLOs
1	Introduction to Geo-informatics.	3	CLO1
2	Spatial Data Infrastructure (SDI), Geospatial Platform, and Database Management, Web GIS.	10	CLO2
3	Remote Sensing for Disaster Management.	10	CLO3
4	Pre-processing and Information Extraction from LiDAR, RADAR, and UAV Images.	10	CLO3
5	Spatial Modeling.	10	CLO4
6	Introduction to Information Systems.	10	CLO5
7	MIS for Decision-making.	7	CLO5

Textbooks:

1. Oosterom P.V. et al. (Ed.) (2005) Geo-Information for Disaster Management. Springer. Netherlands.
2. Karimi H.A. (2008) Handbook of Research on Geoinformatics. Information Science Reference, New York. US.

References:

1. Brimicombe A. (2009) GIS for Environmental Modeling and Engineering. 2nd Edition. CRC Press. US.
2. Campagna M. (2005) GIS for Sustainable Development. CRC Press. US.
3. Shamsi U.M. (2005) GIS Applications for Water, Waste Water and Stormwater Systems. CRC Press. US.
4. Weng Q. (2009) Remote Sensing and GIS Integration: Theories, Methods, and Applications. McGraw-Hill. US.
5. Kenneth C. Laudon and Jane P. Laudon. (2008). Management Information Systems: Managing the Digital Firm (10th Edition).

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Disaster Risk and Crisis Management

Course Code : DSCRHT 4001 **Credits : 03**
CIE Marks : 50
Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Explain the role of mitigation and preparedness in disaster resilience.
CLO2	Identify and analyze different mitigation and preparedness strategies.
CLO3	Develop crisis planning and emergency communication frameworks.
CLO4	Assess response and recovery measures in post-disaster situations.
CLO5	Evaluate case studies of disaster response and recovery to identify best practices.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		2			2	1	
CLO2	2	3	3		3		2	
CLO3		2		3	3	3		2
CLO4			2		3	3	3	3
CLO5				2	3	3	2	3

SL.	Course Contents	Hours	CLOs
1	Mitigation and Preparedness for Resilient Communities, Mitigation Strategies, The Value of Mitigation and Preparedness.	4	CLO1 CLO2

2	Preparedness Activities: The Role of Preparedness in the Disaster Management Cycle, Resources Relevant to Preparedness, Obstacles to Preparedness, Government Preparedness (Planning, Exercise, Training, Equipment, Etc.), and Public Preparedness (Emergency Awareness and Education, Early Warning, Media as A Public Educator), Contingency Planning: Generic and Scenario-Based, Contingency Plan for the Major Responding Organization.	5	CLO1 CLO2 CLO3
3	Mitigation Measures: Resources Relevant to Mitigation, Types of Mitigation (Structural and Non-Structural), Guiding Principles of Mitigation, Assessing and Selecting Mitigation Options, Problem Areas of Mitigation, Requirement of Effective Mitigation, Incorporating Mitigation into Development and Relief Projects.	4	CLO2
4	Hazard-Specific Mitigation and Preparedness Measures.	5	CLO2 CLO4
5	Aims, Purpose, and Scope of Crisis Planning: Types of Crisis Plan, Standards, and Structure of a Plan.	3	CLO3
6	Emergency Communications: Guidelines for Crisis Communication, Situational Awareness, and Emergency Operations Center (EOC) and Procedures.	3	CLO3
7	Incident Command System (ICS) and Standard Operating Procedure (SOP).	3	CLO3
8	Crisis Management Essential.	3	CLO3
9	Framework and Approaches of Response and Recovery.	3	CLO4
10	Recognition of Post-Disaster Actions: Needs Assessment, Search and Rescue, Evacuation, First Aid, Medical Treatment, Provision of Relief (Food and Non-Food Items), Health and Disease Monitoring, WASH, Safety and Security, Critical Infrastructure Resumption, Emergency Social Services, Donations Management, Dead Body Management, Debris Management, Volunteer Management, Media, and Private Sector Role.	3	CLO4 CLO5
11	Recovery and Reconstruction Planning: Short-Term Measures, Logistical Constraints, Restoration of Services, Reconstruction of Damaged Structures, Long-Term Recovery Plan, Build-Back-Better.	3	CLO4
12	Dimension of Disaster Recovery: Psychological Recovery, Environmental-, Housing-, Educational-, Business-, Agricultural-Sector Recovery.	3	CLO4

13	Examples: Response and Recovery Plan Failures and Successes Around the World.	3	CLO5

Textbooks:

1. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK.
2. Haddow D., Bullock J., Coppola D.P. (2013) Introduction to Emergency Management. 5th Edition. Butterworth-Heinemann. UK.

References:

1. Pinkowski J. (2008). Disaster Management Handbook. CRC Press. US.
2. United Nations International Strategy for Disaster Reduction (UNISDR) (2004) Living with Risk: A Global Review of Disaster Reduction Initiatives. Geneva: United Nations.
3. Wisner B. (2004) At Risk: Natural Hazards, People ‘s Vulnerability and Disasters. Routledge. US.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom’s Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom’s Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Mainstreaming Disaster Management and Climate Resilience

Course Code	**: DSCRHT 4002**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 3.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Explain the fundamental concepts, processes, and challenges of mainstreaming disaster management and climate resilience.
CLO2	Explain the roles of governmental, non-governmental, and international institutions in disaster management.
CLO3	Analyze key policies, laws, and frameworks governing disaster management, including national legislation and international agreements.
CLO4	Identify and compare different disaster response and recovery mechanisms, including bilateral and multilateral assistance.
CLO5	Discuss the ethical, social, and operational challenges in disaster management, including coordination, resource allocation, and media relations.
CLO6	Examine the role of community-based disaster preparedness and local-level policy implementation.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	2						
CLO2	3		2					
CLO3	2	2	2					
CLO4			3	2	2			
CLO5					2	2	3	
CLO6				2	2	2		2

SL.	**Course Contents**	**Hours**	**CLOs**
1	Mainstreaming Disaster Management Framework: Fundamental Concepts of Mainstreaming, Process and Challenges of Mainstreaming, Techniques of Mainstreaming, Advocacy and Entry Points.	4	CLO1
2	Disaster Management Institutions and Governance: Governmental Agencies in Disaster Management, Fire Departments, Law Enforcement, Emergency Management Structures, Civil Protection, Emergency Medical Services, Public Health Agencies, Military, and other Institutions.	5	CLO2
3	International Organizations and Frameworks in Disaster Management: United Nations agencies, Red Cross and Red Crescent	5	CLO2 CLO3

	Roles, SAARC Disaster Management Framework, Regional Organizations in Disaster Relief, Coordination Mechanisms for International Assistance, and Climate-related Disaster Policies.		
4	Global Disaster Risk Reduction Policies and Agreements: Yokohama Strategy for Disaster Reduction, Hyogo Framework for Action (2005-2015), Sendai Framework for Disaster Risk Reduction (2015-2030), Global Best Practices in Disaster Risk Reduction, Role of Intergovernmental Agreements in Disaster Resilience.	5	CLO3
5	Climate Change and Environmental Policies in Disaster Management: Kyoto Protocol, Paris Agreement, UNFCCC's Disaster Risk Reduction Strategies, Conference of the Parties (COP), IPCC Reports on Climate-Induced Disasters.	5	CLO3 CLO4
6	National Disaster Management Policies and Legal Frameworks: Disaster Management Act, Standing Orders on Disaster (SOD), DM Policy, National Emergency Response Protocols, Role of Local Government in Disaster Planning.	5	CLO3 CLO6
7	Sectoral Policies and Community-Based Disaster Management: Cyclone Shelter Construction, Maintenance, and Management Guideline (2011), Cyclone Preparedness Programme (CPP), Coastal Zone Policy, Integration of Community-Based Approaches in National Frameworks.	5	CLO6
8	Disaster Response and Recovery Mechanisms: Disaster Declaration Procedures and Government Response Strategies, Long-term Recovery and Rebuilding Initiatives, Coordination of Aid between Government and NGOs, Bilateral and Multilateral Assistance, International Funding and Assistance Programs.	6	CLO4
9	Ethical, Social, and Operational Challenges in Disaster Management: Ethical Dilemmas in Resource Allocation, Media Management in Disaster Reporting, Policy Gaps and Institutional Challenges in Disaster Response.	5	CLO5

Textbooks:

1. Coppola D.P. (2011) Introduction to International Disaster Management. 2nd Edition. Butterworth Heinemann Press. US.
2. Ministry of Disaster Management & Relief, Government of the People 's Republic of Bangladesh (2020) National Plan for Disaster Management. Dhaka.

References:

1. Commonwealth of Australia (2004) Emergency Risk Management: Applications Guide. 2nd Edition. Emergency Management Australia. Australia.
2. National Disaster Management Legal Frameworks: Plan, Policy, Act and SOD

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Climate Science and Modelling

Course Code : DSCRHT 4003 **Credits : 03**
CIE Marks : 50
Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the fundamental components of climate, climate forcing mechanisms, and climate feedback processes.
CLO2	Assess climate change from both scientific and human perspectives, including isotope-based climate studies.
CLO3	Analyze different types of climate models, their development history, and their applications.
CLO4	Apply climate modeling techniques, including parameterization, simulation, downscaling, and bias correction.
CLO5	Evaluate the role of climate models in policy-making, risk assessment, and adaptation planning, with a focus on Bangladesh.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3	3	2	3				2
CLO2	3	3	2	3				3

CLO3	2	2	2	1	2		2	2
CLO4	3	3	2	3				2
CLO5	2	1	2	2	1	2	3	1

SL.	Course Contents	Hours	CLOs
1	Science of Climate: Components of Climate, Interactions of the Atmosphere, Ocean, and Land Surface.	3	CLO1
2	Climate Change Assessment: Scientific and Human Perspectives, Role of Isotopes in Climate Studies.	5	CLO2
3	Climate Forcings: External Causes (Milankovitch Variations, Solar Activity), Internal Factors (GHGs, Aerosols, Ozone Depletion, Volcanic Eruptions, and Ocean Circulation).	6	CLO1 CLO2
4	Climate Feedback and Sensitivity: Ice-Albedo Feedback, Water Vapor Greenhouse Effect, Cloud Feedback, and Combined Feedback Mechanisms.	6	CLO1
5	Introduction to Climate Modelling: History of Climate Modeling, Types of Climate Models (Energy Balance Models, Radiative-Convective Models, and General Circulation Models).	6	CLO3
6	Parameterization and Model Sensitivity: Climate Model Tuning and Simulating Full Climate Systems.	4	CLO3
7	Climate Change Scenarios and Projections: Model Intercomparisons, Leading Modeling Groups, and Agencies.	5	CLO3
8	Downscaling and Bias Correction: Statistical vs. Dynamical Downscaling, and Distribution Stretching Techniques.	5	CLO4
9	Application of Climate Models for Bangladesh: Climate Risk Modeling for Key Sectors, Adaptation Strategies, and Policy Integration.	5	CLO5

Textbooks:

1. McGuffie K., Henderson-Sellers A. (2013). A Climate Modelling Primer (3rd Edition). Wiley-Blackwell.
2. Neelin, J. D. (2010). Climate Change and Climate Modeling. Cambridge University Press.
3. IPCC. (2021). Climate Change 2021: The Physical Science Basis. Cambridge University Press.
4. Erda L. (2009). Climate Change Vulnerability and Adaptation in Asia and the Pacific. Kluwer, Netherlands.

References:

1. Washington, W. M., & Parkinson, C. L. (2005). Introduction to Three-Dimensional Climate Modeling. University Science Books.

2. Pierrehumbert, R. T. (2010). Principles of Planetary Climate. Cambridge University Press.
3. United Nations Framework Convention on Climate Change (UNFCCC). (2006). Technologies for Adaptation to Climate Change. Bonn, Germany.
4. Randall, D. A. (2015). Atmospheric Processes and Climate Modeling. Princeton University Press.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Research Methodology and Knowledge Management

Course Code : DSCRHT 4004 **Credits : 03**
CIE Marks : 50
Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the fundamentals of science, research methodologies, and the scientific enterprise.
CLO2	Formulate research questions, objectives, hypotheses, and apply critical argumentation.
CLO3	Apply ethical standards and professionalism in scientific research and writing.
CLO4	Utilize data collection and analysis techniques, including quantitative, qualitative, and advanced analytical methods.
CLO5	Develop and present a comprehensive research proposal, demonstrating scholarly rigor and technical writing skills.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	1							1
CLO2								2
CLO3								1
CLO4						1		2
CLO5								3

SL.	Course Contents	Hours	CLOs
1	Science, Research, and Scientific Enterprise.	3	CLO1
2	Concept Measurements, Challenges, and Constraints in Conducting Research.	3	CLO1 CLO2
3	Literature Review.	6	CLO1
4	Formulating Problems, Objectives, Questions, Assumptions, and Hypotheses.	3	CLO2
5	Research Methods: Pre-field Work Methods, Research with Field Work, and without Field Work.	3	CLO4
6	Citation and Reference List; Bibliographic Engines, e.g., Mendeley.	4	CLO3
7	Critical Reading and Technical Writing, Argumentation.	6	CLO2
8	Ethics and Professionalism in Science.	3	CLO3
9	Data and Data Collection Methods: Data, Measurement Scale, Sampling Methods, Type of Data (Primary and Secondary), Sources of Data (Primary and Secondary), Data Collection Methods (Quantitative, Qualitative, Observation Methods, Questionnaire, Interview, RRA/PRA, FGD); Quantitative Data Analysis, Interpretation and Result Validation Methods (Univariate Methods, Bivariate Methods, Time Series Analysis, Signal Processing, Spatial Analysis, Image Processing, Multivariate Analysis, and Directional Data Analysis).	8	CLO4
10	Research Proposal Writing for Research Project.	3	CLO5
11	Research Proposal Presentation.	3	CLO5

Textbooks:

1. D.G. Rossiter (2011) Research Skills and Methods, An ITC Publication.
2. Rodriguez H. et al. (2006) Hand Book of Disaster Research (Handbooks of Sociology and social Research). Springer. Netherlands.

References:

1. Dawson C. (2007) Laboratory Research Methods: A User-friendly Guide to Mastering Research Techniques and Projects. 3rd Edition. How to Books Ltd. UK.
2. Fernandez I.B., Gonzalez A., and Sabherwal R. (2003) Knowledge Management and KM Software Package. Prentice Hall. US.
3. Singleton Jr., R.A., and Stratis B.C. (2009) Approaches to Social Research. 5th Edition. Oxford University Press. UK.
4. Williams M. May T. 1996. Introduction to the Philosophy of Social Research. UCL Press. UK.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Multi-Hazard Risk Management Lab

Course Code : DSCRHL 4005 **Credits : 03**
CIE Marks : 50
Exam Hours : 4.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Apply GIS, remote sensing, and statistical tools for multi-hazard risk assessment.
CLO2	Identify and analyze natural and technological hazards using mapping and statistical methods.
CLO3	Conduct vulnerability and exposure analysis for population, infrastructure, and critical facilities.
CLO4	Perform probabilistic and deterministic risk assessments using simulation models.

CLO5	Develop multi-hazard risk models and simulate disaster scenarios.
CLO6	Assess cascading hazard interactions and conduct scenario-based risk analysis.
CLO7	Interpret risk assessment results for decision-making and disaster preparedness.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	2	3				3	3
CLO2	3	3	3					2
CLO3		3	3	3				
CLO4		2	3	3	2			
CLO5			3		3	3	2	3
CLO6				2	3	3	3	3
CLO7	3	2	3	3		3	3	3

SL.	**Course Contents**	**Hours**	**CLOs**
1	Introduction to Multi-Hazard Risk Analysis: Overview, Laboratory Tools & Software (GIS, Remote Sensing, HAZUS, OpenQuake, R, Python), Data Sources for Risk Assessment.	10	CLO1
2	Hazard Identification and Profiling: Mapping Natural & Technological Hazards, Temporal & Spatial Hazard Distribution, Statistical Frequency Analysis (Gumbel, Log-Pearson Type III).	10	CLO2
3	Multi-Hazard Vulnerability and Exposure Analysis: Population & Infrastructure Exposure Mapping, Social Vulnerability Analysis (PCA in R/Python), Critical Infrastructure Risk Mapping.	10	CLO3
4	Probabilistic and Deterministic Risk Assessment: Monte Carlo Simulations, Bayesian Methods, Worst-Case Scenario Analysis, Estimating Annualized Loss.	10	CLO4
5	GIS and Remote Sensing in Multi-Hazard Risk Analysis: Flood Risk Mapping using Sentinel-1/Landsat, Landslide Susceptibility Mapping, Earthquake Ground Motion Intensity Mapping (PGA Analysis).	15	CLO5
6	Multi-Hazard Risk Modeling and Simulation: Seismic Risk Modeling (OpenQuake), Hydrological & Flood Risk Simulation (HEC-RAS), Landslide Susceptibility Analysis (GIS & Python), Cyclone Track Prediction.	15	CLO5

7	Multi-Hazard Interaction and Cascading Effects: Understanding Cascading Hazards, Multi-Hazard Overlay Analysis (AHP in GIS), Scenario-Based Risk Assessment.	10	CLO6
8	Risk Communication and Decision Support Systems: Developing Multi-Hazard Risk Maps, Interpreting and Presenting Risk Data for Policymakers, Early Warning Systems for Multi-Hazard Preparedness.	10	CLO7

Textbooks:

1. Westen et al (2011) Multi-hazard Risk Assessment Guidebook.
2. Westen et al (2011) Multi-hazard Risk Assessment Exercise Book.
3. Gao, J. (2023). Remote Sensing of Natural Hazards. CRC Press.

References

1. Hyndman, D., & Hyndman, D. (2006). Natural hazards and disasters.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Numerical Simulation and Machine Learning Lab

Course Code : DSCRHL 4006 | **Credits : 02**
CIE Marks : 50
Exam Hours : 4.0 | **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the fundamentals of machine learning.
CLO2	Evaluate machine learning models using numerous metrics.
CLO3	Implement deep learning architectures and optimization techniques for practical applications.
CLO4	Apply optimization techniques for practical problem-solving.
CLO5	Utilize numerical simulation methods for engineering and experimental data analysis.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1		3		1				1
CLO2	1	3	1	1	1		3	2
CLO3	2	3	3	2		2	1	2
CLO4		3	3					1
CLO5	3	3	3	2	1	1	2	2

SL.	Course Contents	Hours	CLOs
1	Machine Learning Basics: Supervised, Unsupervised, and Reinforcement, Bias-Variance Trade-Off, Overfitting and Underfitting, Data Tuning and Augmentation, Gradient Descent (Batch, Stochastic), Resampling Methods (Bootstrapping, Cross-Validation), Linear Discriminant Analysis (IDA), Principal Component Analysis (PCA).	6	CLO1
2	Evaluation Metrics: AUC, Precision, Recall, Specificity, Sensitivity, Mean Absolute Percentage Error, Root Mean Square Error.	10	CLO2
3	Algorithms: Linear Regression (Usually Performed through OLS), Logistic Regression, Naive Bayes, K-Nearest Neighbors, K Means Clustering, Classification and Regression Trees (CARTs), Support Vector Machines, AdaBoost, Random Forest, ARIMA, Decision Trees, ID3, CHAID, C4.5, C5.0, Hierarchical Clustering.	10	CLO1 CLO2
4	Deep Learning: Artificial Neural Networks (ANN), Bayesian Neural Network (BNN), Convolutional Neural Networks (CNN).	6	CLO3

5	Miscellaneous: Game Theory and Its Applications, Agent-Based Modeling and Simulation, Optimization for Linear Programming (LP), Mixed-Integer Linear Programming (MILP), Quadratic Programming (QP), Second-Order Cone Programming (SOCP), Nonlinear Programming (NLP), Constrained Linear Least Squares, Nonlinear Least Squares, and Nonlinear Equations.	10	CLO4
6	Numerical Simulation Basics: a) Introduction to Applied Element Method (AEM), Finite Element Method (FEM), finite Volume Method (FVM), Finite Difference Method (FDM), Boundary Element Method (BEM), and Discrete Element Method (DEM).	10	CLO5
7	Applications: a) Solution of Simultaneous Equations Using MATLAB, b) Modeling of First and Second-Order Hydraulic Systems, c) Applications of Curve-Fitting to Experimental Data, d) Applications of Numerical Integration to Evaluate Moments of Inertia, Friction Work, and Volumetric Fluid Flow.	8	CLO5

Textbooks:

1. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
2. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
3. Hastie, T., R. Tibshirani, and J. H. Friedman. The Elements of Statistical Learning: Data Mining, Inference and Prediction. New York, NY: Springer, 2001. ISBN: 9780387952840.
4. MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521642989. Available on-line here.
5. Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.

References:

1. Cover, Thomas M., and Joy A. Thomas. Elements of Information Theory. New York, NY: Wiley-Interscience, 1991. ISBN: 9780471062592.
2. P.E. Lewis and J.P. Ward, The finite element method: Principles and Applications, Addison-Wesley, 1991.
3. Zienkiewicz and K. Morgan, Finite Elements and Approximations, John Wiley and Sons.
4. C.F. Gerald and P.O. Wheatley, Applied Numerical Analysis, Addison-Wesley, 1998.
5. M.A. Celia and W.G. Gray, Numerical Methods for Differential Equations, Prentice-Hall Int. Inc.
6. G.D. Smith, Numerical solution of Partial differential equations, Clarendon press, Oxford, 1978.
7. Stephen C. Chapra, McGraw-Hill, 2010. Applied Numerical Methods with MATLAB for Engineers and Scientists, 2nd Edition.
8. Cleve Moler, Numerical Computing with MATLAB, Electronic edition: The MathWorks, Inc.

9. Natick, MA, 2004, http://www.mathworks.com/moler. Print edition: SIAM, Philadelphia, 2004.http://ec-securehost.com/SIAM/ot87.html.
10. L. V. Fausett, Applied Numerical Analysis Using MATLAB® 2/E, Prentice Hall, ISBN: 0132397285.
11. S. Nakamura, Numerical Analysis and Graphic Visualization with MATLAB®, 2/e, Prentice Hall, 2002, ISBN:01306548921.
12. Gilat and V. Subramaniam, Numerical Methods for Engineers and Scientists, John Wiley Sons, Inc., 2008, ISBN: 9780471734406.
13. J. H. Mathews and K. D. Fink, Numerical Methods Using MATLAB®, 3rd ed, Upper Saddle River, NJ: Prentice Hall, 2004, ISBN: 0130652482.
14. J. Kiusalaas, Numerical Methods in Engineering with MATLAB®, Cambridge University Press, 2005, ISBN: 0521852889.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Software-Based Task/ Lab Tasks (30)	Lab Notebook/ Summary Report (10)	Attendance (10)
Remember	03	-	10
Understand	03	-	
Apply	05	03	
Analyze	08	03	
Evaluate	05	-	
Create	06	04	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Damage, Loss, and Need Assessment

Course Code	**: DSCRHT 4007**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 3.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Explain the concepts of disaster damage, losses, and factors influencing their increase.
CLO2	Differentiate between assessment and estimation in damage, loss, and post-disaster needs assessment (PDNA).

CLO3	Apply ECLAC, DaLa, and PDNA methodologies to assess disaster impacts across different sectors.
CLO4	Conduct sector-wise damage and loss assessments, including economic, social, infrastructure, and environmental sectors.
CLO5	Develop post-disaster recovery and reconstruction plans by linking risk assessment with damage evaluation.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1		1			2	1		1
CLO2			1		1	2		
CLO3	2	3	2	2	1	2	1	2
CLO4	3	3	2	2	2	2	2	3
CLO5			2		2	1	2	3

SL.	Course Contents	Hours	CLOs
1	Introduction: Concept of Disaster Damage and Losses; Factors Causing Increased Damage and Losses.	2	CLO1 CLO2
2	Damage and Loss Measures: Assessment vs Estimation; Concept of Post-disaster Needs Assessment (PDNA); Concept of Disaster Damage and Loss Assessment (DaLA).	2	CLO3
3	Assessment Methodology: ECLAC, DaLA, PDNA.	1.5	CLO3
4	Steps in the Application of ECLAC (Economic Commission for Latin American and Caribbean Region) Methodology.	1.5	CLO3
5	Conducting Damage and Loss Assessments by Sector: Economic Sector, Social Sector, Infrastructure, Environment, and Cross-Cutting Sectors.	32	CLO1 CLO2 CLO3 CLO4 CLO5
6	Post Disaster Need Assessment (PDNA): From Losses to Economic Recovery Plan, Damage to Reconstruction Needs.	3	CLO5
7	The Link between Risk Assessment and Damage Assessment	3	CLO5

Textbooks:

1. ECLAC. (2014) Handbook for Disaster Assessment. United Nations. Santiago, Chile.
2. GFDRR. (2013) Post Disaster Need Assessment Guidelines: Volume A.

References:

1. GFDRR. (2008) Disaster Damage, Loss and Need Assessment: Training Guidelines. Dhaka. Bangladesh.
2. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK.

3. The World Bank. (2010) Damage, Loss and Needs Assessment: Guidance Notes. Washington DC.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Disaster in Agriculture and Food Security

Course Code : DSCRHT 4008 **Credits : 02**
CIE Marks : 50
Exam Hours : 2.5 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand and explain the evolution of agriculture and major historical famines, and their impacts on society.
CLO2	Analyze the basic concepts of agriculture, including classification, factors influencing agriculture, and cropping systems relevant to Bangladesh's agro-ecological zones.
CLO3	Evaluate the relationship between agriculture and disasters, including pest management and human-induced and natural disaster impacts on agriculture.
CLO4	Assess food security and explore climate change impacts on agricultural productivity, with a focus on risk reduction strategies.
CLO5	Develop and propose disaster risk reduction measures, including early warning systems for agricultural resilience and sustainable food security.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		3					
CLO2	3		3		2			
CLO3			3	2	3		1	
CLO4		2		3	3	2	1	
CLO5				3	3	3	1	2

SL.	Course Contents	Hours	CLOs
1	Evolution of Agriculture (Domestication of Plants and Animals; Civilization, Agriculture and Disasters).	3	CLO1
2	Famine, the Great Famine of Ireland (Potato Famine), the Great Chinese Famine, the Famine in British India and Bangladesh (Bengal Famine of 1770, The Great Bengal Famine of 1943, The Famine of 1974).	2	CLO1
3	Green Revolution	2	CLO1 CLO2
4	Basic Concept of Agriculture (Classification of Agriculture, Factors of Agriculture, Cropping Pattern, Cropping Intensity, Crop Rotation, Irrigation, Crop Calendar, Carrying Capacity, Cropping Methods etc.).	5	CLO2
5	Agriculture of Bangladesh, Agro-ecological Zone of Bangladesh.	2	CLO2
6	Agriculture and Disaster (Natural and Human-Induced)	3	CLO3
7	Insect Pest Management	2	CLO3
8	Food Security	3	CLO4
9	Climate Change, Food Security and Agricultural Risk Reduction in Bangladesh	3	CLO4
10	Disaster Risk Reduction Measures in Agriculture	3	CLO5
11	Early Warning System and Agricultural Risk Reduction	2	CLO5

Textbooks:

1. Lal R. (2010) Climate Change and Food Security in South Asia. Springer. Netherlands.
2. Rasheed K.B.S. (2008) Water Resources Management: With Examples from Bangladesh. A H Development Publishing House. Dhaka.

References:

1. Rasheed K.B.S. (2008) Bangladesh: Resource and Environmental Profile. A. H. Development Publishing House. Dhaka.
2. Yu W.H. (2010) Climate Change Risks and Food Security in Bangladesh

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Project Planning, Monitoring, and Evaluation

Course Code : DSCRHT 409 **Credits : 03**

CIE Marks : 50

Exam Hours : 3.0 **SEE Marks : 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Differentiate between project and program management and describe the step-by-step methods of project planning.
CLO2	Develop competencies for creating a comprehensive project proposal and logical framework (Logframe).
CLO3	Understand and apply the purposes, processes, and guiding principles for effective project monitoring and evaluation.
CLO4	Critically assess the importance of environmental and social impact assessments and propose strategies for addressing conflicts and improving project outcomes.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3		2	2				
CLO2		2		3	2			
CLO3			3		2	2		
CLO4				2	3		2	3

SL.	Course Contents	Hours	CLOs
1	Basic Concepts: Definition Characteristics of a Project and Program, Difference between Project and Program, Project and Programme Managers Role; Project Classification & their Differences, Understanding Project Objective.	6	CLO1 CLO2
2	Project Life Cycle, Aspects and Activities of Different Phases, Project Generation and Screening.	5	CLO1 CLO3
3	Project Planning and Proposal Development: Definition, Purpose, Processes, Steps, Tips, Elements, Project Processing and Procedure in Bangladesh, Guidelines for Planning, Project Proformas, Uncertainty and Risk in Project Planning, Reason behind Project Failure.	6	CLO2 CLO4
4	Project Appraisal: Different Aspects of Project Appraisal-Technical Aspect, Managerial Aspect, Social Aspect, Economic Aspect, Financial Aspect. Determination of Investment Worth, Cash Flow in a Project. Steps Involved in Approval Process of Investment Projects Project Processing and Procedure in Bangladesh, Guidelines for Planning, Project Proformas, Uncertainty and Risk in Project Planning, Reason behind Project Failure.	8	CLO3 CLO4 CLO6
5	Logical Framework Approach in Project Management: Definitions and Use, Nine Different Steps in LFA, Building a Logframe Matrix, Elements of Project Management.	6	CLO2 CLO4
6	Project Monitoring Evaluation: Definitions, Purpose and Objectives, Elements and Components of a Good ME System, ME Plan and Results Framework. Characteristics of a Good Indicator, Monitoring Report, Methods and Types of Evaluation.	7	CLO6

7	Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA), Rapid Environmental Assessment (REA), etc.: History, Steps and Procedures, Assessment Methods and Parameters, Categories of Environmental Screening, Components of an EIA Reporting Outline, Environmental Management Plan, Benefits, Challenges, Bangladesh Key Environmental Concerns.	7	CLO3 CLO5 CLO6

Textbooks:

1. Chadha S. (1989) Managing Project in Bangladesh. University Press Limited. Dhaka.
2. Choudhury S. (1993) Project Management. Tata McGraw Hill Publishing Co. New Delhi
3. Dingle J. (1997) Project Management: Orientation for Decision Makers. John Wiley-Blackwell. US.

References:

1. International Labor Organization. (2000) Project Preparation, Implementation, Monitoring, Evaluation: User's Hand Book. Dhaka.
2. NORAD. (1999) The Logical Framework Approach. Oslo.
3. Young T. (2003) The Project Management Manual. Penguin Books. New Delhi.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Course Name: Climate Change Mitigation and Adaptation

Course Code	**: DSCRHT 4010**	**Credits**	**: 03**
		CIE Marks	**: 50**
Exam Hours	**: 3.0**	**SEE Marks**	**: 50**

Course Learning Outcomes: At the end of the Course, the Student will be able to:

CLO1	Understand the scientific basis of climate change, its global and regional impacts, and the necessity of adaptation
CLO2	Analyze climate change mitigation strategies, including emission reduction, clean energy solutions, and carbon sequestration.
CLO3	Evaluate geoengineering approaches and their potential risks and benefits.
CLO4	Assess adaptation measures at different levels, from infrastructure planning to community resilience strategies.
CLO5	Develop practical solutions for climate resilience using case studies, policy frameworks, and innovative technologies.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**
CLO1	3	3	2		2		1	1
CLO2	2	3	3	2		2	1	1
CLO3	1	3	3	2	2	1	3	2
CLO4		2	3	3		2	2	3
CLO5	3	3	2	3	3	2	3	3

SL.	**Course Contents**	**Hours**	**CLOs**
1	Climate Change Science & Impacts: Greenhouse Effect, Climate Feedback Mechanisms, Global Warming Potential, Extreme Weather Events.	6	CLO1
2	Necessity of Adaptation: IPCC Sixth Assessment Report, Unavoidable Climate Impacts, Cost-Effectiveness of Proactive Adaptation, Unpredictability of Climate Change.	6	CLO1, CLO4
3	Mitigation Strategies: Renewable Energy, Carbon Sequestration, Reforestation, Fossil-Fuel Subsidy Reduction, Carbon Trading, and Offsetting.	6	CLO2
4	Sectoral Adaptation: Adaptation in Agriculture, Water Resources, Coastal Protection, Resilient Urban Planning, and Infrastructure for Climate Resilience.	6	CLO4
5	Geoengineering Approaches: Carbon Dioxide Removal (CDR) (Biological, Physical, and Chemical Methods), Solar Radiation Management (SRM), Risks and Ethical Considerations.	7	CLO3

6	Global Climate Goals & Policies: 2030 and 2050 Emission Targets, GDP Decoupling from Carbon Emissions, Role of Clean Energy Investment, Case Studies of Successful Policies.	7	CLO2
7	Maladaptation & Social Adaptation: Avoiding Risky Development, Long-term Adaptation Planning, Governance for Resilience, Case Studies (Jakarta Relocation, Thames Barrier, France's Heatwave Response).	7	CLO4, CLO5

Textbooks:

1. IPCC (2021). Climate Change 2021: The Physical Science Basis. Cambridge University Press.
2. Houghton, J. (2015). Global Warming: The Complete Briefing. Cambridge University Press.
3. Klein, R.J.T., & Huq, S. (2017). Adaptation to Climate Change: From Resilience to Transformation. Routledge.
4. Oberthur, S., & Ott, H. (2019). The Kyoto Protocol: International Climate Policy for the 21st Century. Springer.

References:

1. Parry, M., Canziani, O., Palutikof, J., van der Linden, P., & Hanson, C. (2007). Climate Change 2007: Impacts, Adaptation, and Vulnerability. Cambridge University Press.
2. Pielke, R. (2010). The Climate Fix: What Scientists and Politicians Won't Tell You About Global Warming. Basic Books.
3. International Energy Agency (IEA) (2020). Clean Energy Investment Report.
4. Maslin, M. (2021). Climate Change: A Very Short Introduction (4th Edition). Oxford University Press.

Course Internal Evaluation (CIE) Breakdown (Number of Marks 50)

Bloom's Category	Tests (30)	Assignments (05)	Oral Presentation/ Debate/ Poster/ Project Work (10)	Attendance (05)
Remember	05	-	-	05
Understand	05	05	05	
Apply	10	-	05	
Analyze	10	-	-	

SEE-Semester End Evaluation (Number of Marks 50)

Bloom's Category	Test
Remember	05
Understand	10
Apply	15
Analyze	10
Evaluate	05
Create	05

Part D

19. Evaluation and Grading

1. Evaluation

Theory Courses

Marks Distribution		
Course Internal Evaluation	Class attendance	05%
	In-course and/or Assignment	45%
Semester End Evaluation		50%
Total		100%

Laboratory Courses

Marks Distribution		
Course Internal Evaluation	Class Attendance	10%
	Continuous Assessment	40%
Semester End Evaluation		50%
Total		100%

Field Work

Marks Distribution	
Field Assessment	50%
Final Report	50%
Total	100%

Project Work

Marks Distribution	
Research Proposal	10%
Proposal Defence	10%
Written Dissertation	60%
Final Defence	20%
Total	100%

Class Attendance

Five percent of the total marks will be awarded for class attendance in theory courses. Ten percent of the total marks will be awarded for class attendance in laboratory courses.

Marks of Attendance

Attendance %	**Marks** (Theory)	**Marks** (Laboratory)
90 and above	5	10
85 to 89	4	8
80 to 84	3	6
75 to 79	2	4
60 to 74	1	2
Less than 60	00	00

Eligibility to Sit for the Final Exam

- Students having 75% or more attendance on average (collegiate) are eligible to appear in the final examination.
- A student having 60-74% attendance is considered to be non-collegiate and will be eligible to sit for the final examination on payment of a fine 1,000 (One Thousand) BDT.
- Students having attendance less than 60% will not be allowed to sit for the final examination, but may seek readmission in the program.
- Student must have at least 30% attendance for readmission.

Preparatory Leave (PL)

All academic activities (classes, class assessment, etc.) will have to be completed at least 10 days before the semester final exam for the smooth functioning of the exam (exam registration, submitting class assessment, and preparing the students for exam). AC can reduce the time only in special circumstances.

Duration of Exam

The duration of the theoretical course final examinations will be as follows:

Credit	**Duration of Examination**
3 credit courses	3 hours
2 credit courses	2.5 hours

The duration of laboratory examinations will be 4 hours. The duration of Viva Voce will be 10-30 minutes.

Evaluation of Examination Script

In the final examination, each theory course will be evaluated by two teachers of the department or outside (who may be either from DU or outside DU). In a single-teacher course, the semester final test scripts must be evaluated by two teachers, one of whom must be the course teacher, and

another, a suitable second examiner who may be either from DU or outside DU, must be approved by the exam committee.

Evaluation by Third Examiner

In the semester final examination, if the difference in final exam marks in any course is more than 20%, the script will be evaluated by a third examiner. The final marks obtained will be the average of the third examiner's marks and the nearest examiner's marks. In cases where the nearest marks are equal, the final mark will be the average of the two higher marks.

Evaluation of Laboratory Courses

Evaluation of laboratory courses will be done by the course teacher/teachers. No option for a second or third examination is allowed in laboratory courses.

Evaluation of Field Works

Field work evaluation will be done by the field work coordinator/coordinators. The Field Report will be evaluated by the field trip coordinator/coordinators.

Thesis and Supervisor Selection

In order to develop skilled personnel in problem identification, methodologies, scientific interpretation, and producing a standard report, individual students shall carry out a supervised study independently on a specified topic. A thesis will be developed by each student with the guidance from his/her supervisor/co-supervisor, which is to be approved by the Academic Committee of the department. Students shall contact the faculty of their field of interest for the selection of a supervisor and/or co-supervisor. The Academic Committee shall approve the final list of supervisors. On completion, each student shall defend and submit a written thesis on the work undertaken. Upon the decision of the Academic Committee project may also be completed by group work as well as a field visit. Students may also carry out an internship at an organization/NGO/Agency or Industry upon the approval of the academic committee.

Evaluation of Thesis

The written proposal, proposal defence, and the final defence will be evaluated by the Examination Committee. The written Thesis shall be evaluated by the assigned Experts. The marks distribution has been shown above.

Viva voce

Viva shall be evaluated by the semester's examination committee at the end of the semester's final exam.

2. Grading Scale and Grades

- All marks will be entered in numerical form at the time of evaluation.
- Only when submitting the final grade sheet and while finalizing the results in the tabulation sheet, grades will be entered in numerical and letter grade form.
- Marks can be given in fractions up to two decimals. If the total marks of a course are in fractions. They should be raised to a higher whole number.
- GPA and CGPA can be in fractions up to two decimals. The second decimal will be raised to the next higher number if the third decimal number is 5 or above.
- Transcript issued to the students will include Letter Grades, Grade Point (GP), Grade Point Average (GPA), and Cumulative Grade Point Average (CGPA).
- Transcript will not include numerical grades.
- Numerical Grades, Letter Grades, Grade Point Averages (GPA), and Cumulative Grade Point Average (CGPA) will be given according to the following scale:

Numerical Marks	Letter Grades	Grade Points
80 above	A+	4.00
75 -79	A	3.75
70 – 74	A-	3.5
65 -69	B+	3.25
60 – 64	B	3.00
55 -59	B-	2.75
50 – 54	C+	2.50
45 -49	C	2.25
40 – 44	D	2.00
Less than 40	F	0.00
Incomplete (does not take an exam)	I	0.00
Withdrawn (does not attend any classes and take any exams)	W	0.00

3. Calculation of GPA and CGPA

GPA (Grade Point Average) will be calculated by multiplying the course credits by the GP (Grade Points) obtained in the courses and dividing the total credits. CGPA of more than one semester will be calculated by adding the GPA of the semesters concerned, multiplied by the semester credits, and dividing the results by the total credits of the semesters.

GPA of One Semester

$$= \frac{Credits\ of\ Course\ A \times GP\ obtain\ in\ Course\ A + \cdots + Credits\ of\ Course\ Z \times GP\ obtain\ in\ Course\ Z}{Total\ Credits\ of Courses\ of\ the\ semester}$$

CGPA of Year One

$$= \frac{Total\ GP\ of\ 1st\ Semester + Total\ GP\ of\ 2nd\ Semester}{Total\ Credits\ of\ 1st\ and\ 2nd\ semester}$$

CGPA of eight Semesters

$$= \frac{Total\ GP\ of\ 1st\ Semester + \cdots + Total\ GP\ of\ 8th\ Semester}{Total\ Credits\ (140)}$$

4. Promotion

Promotion will be based on the academic year. A minimum CGPA of 2.00 is required for promotion from the second to third, fourth to fifth, and sixth to seventh semesters. **For the final degree, a student must have to secure a minimum CGPA of 2.00.** Promotion from first to second semester, third to fourth semester, fifth to sixth semester, and seventh to eighth semesters will be automatic for those students having sixty percent attendance.

The minimum CGPA of a student, as mentioned above, is calculated taking into consideration the grade points obtained in courses of all previous class years. Besides, a student failing to clear up university or departmental dues shall not be promoted to the next class year.

5. Final Degree

For a BS Honours degree, a student needs to complete 140 credit hours without an F grade in any course, has to secure a minimum CGPA of 2.00, and complete the program **within six consecutive academic years**, including the year of first admission into the program.

6. Retaking of Examinations and Improvement of Grades

- *Improvement of grade/grades is applicable only for the students who get promoted.*
- A student securing a GPA of 3.00 or lower in any course may improve his/her grades by retaking the examination/examinations of the course/courses only once in the following session. In this case, marks of the initial class assessment will be added to the improved (if) final exam marks for final grading.
- *Retakes or improvements are not allowed in laboratory and field work-based courses.*
- A student with an F grade in any course/courses will be allowed to improve the grade/grades by retaking the final examination/examinations of the concerned course/courses for the ***second time.***

- In the case of improvements (with no F grade), there is generally no scope for improvement in the 7th and 8th Semesters. Upon meeting all the criteria above, a student can sit for Improvement Examinations until the publication date for the results of the 8th Semester.
- If a student has earned the required credits in year four (combined 7th and 8th semesters) but has an F grade in any course, their result will be marked as Incomplete (I). To obtain the degree, the student must improve the grade by retaking the failed course(s).
- **In all cases, class assessment marks will be retained.**
- In addition to the usual fees, a fine will be imposed for each course to be retaken as per the university rules or the decision of the academic committee of the department.
- For improvement exams, there will be no additional flexibility for rescheduling in case of overlapping schedules with his/her regular exams.
- The same rules will be applicable in the case of any student having an F grade due to being absent from any course/courses.

7. Readmission

- A student failing to get the requisite grade points for promotion to the next year may seek re-admission with the following two batches.
- If a student is not eligible to appear at the examination owing to inadequate attendance, he/she must seek readmission to study with the following batches.
- For re-admission, a student should apply within one month after the publication of the result of the concerned year. On re-admission, grades obtained earlier by a student in the class year of re-admission shall be cancelled, and the student shall have to retake all the courses and examinations.
- A student may take readmission only two times. If required, a student may take readmission twice to the same class and thus remain in the same class for three years, but the degree must be completed within twelve semesters, i. e. six years.
- In case of W in any course, he/she must go for readmission to continue in the class. The AC of the department must be convinced of the genuineness of his/her absence.

8. Drop Out

A student failing to get a minimum CGPA required for readmission two times in a row to the particular semester of the same year will be dropped out from the program.
If a student gets an F in any course and fails to improve his/her grade even after retaking the examination twice will not be given any further chances for improvement and will be dropped out from the program.

9. Class Representatives

Each batch will have two class representatives to maintain liaison with the course coordinator and the course teachers regarding their progress and problems. Class representatives can continue the whole academic period to serve the class, or a new representative can be elected or selected from the class every semester.

10. Course Teacher

The course teacher shall be finalized by AC before the beginning of a semester. The AC can make necessary changes in the course teachers if necessary (going on leave, illness, etc.). More than one teacher can take one course if deemed necessary by the AC.
Besides taking scheduled classes, the course teacher may arrange field visits if necessary.
The course teacher shall submit class assessment marks (attendance, mid-terms, presentation, and assignment), two copies to the chairman of the examination committee, and one copy to the controller of the examination before the semester final exam.
The course teacher and second examiner will submit two copies of mark sheets (final exam) to the chairman of the examination committee and one copy to the controller of the examination.

11. Semester Coordinator

The AC of the department will also select a semester coordinator for each semester, for the smooth functioning of the program. The semester coordinator will prepare routines, arrange and monitor classes and attendance, and help with the smooth functioning of the academic work. The semester coordinator will arrange the posting of relevant notices on the notice board. In case the semester coordinator falls sick, goes on leave, or is unwilling to continue, the academic committee will nominate a substitute.

12. Field Trip and Coordinator/Coordinators

For field trip courses field trip coordinator/coordinators shall be finalized at the beginning of the semester by the AC. The coordinator will fix the location and timeframe of the fields. All arrangements of field visits shall be carried out under the supervision of the Field trip coordinator.

13. Examination Committee

The Academic Committee of the department shall form an Examination Committee for each semester. The committee will include the Chairman and three members, including one external member who may be from DU or outside DU.

The selected course coordinator by the AC of the department may be a member of the examination committee, for smooth the functioning of the program.

14. Chairman of the Examination Committee

He/she will be responsible for getting questions from the course teachers, moderating and printing the questions, holding examinations, and publishing of results. The chairman of the examination committee will take necessary initiatives (formulating exam routines, issuing a letter for seeking class assessment marks from course teachers, seeking question papers from examiners, etc.) for the semester final examination at least ten days before the start of the final examination.

15. Tabulation and Tabulator of the Examination Results

- Two department teachers will be appointed as tabulators by the AC.
- The course teacher and second examiner will submit two copies of mark-sheets (final exam) to the chairman of the examination committee, and one copy to the controller of the examination.
- The course teacher will submit class assessment marks (attendance, mid-terms, presentation, and assignment), two copies to the chairman of the examination committee, and one copy to the controller of the examination at least fifteen days before the semester final exam.
- The two tabulators will enter the class assessment marks and semester final marks (average of the first and second examiner) into tabulation sheets and process the examination results.
- In the semester final examination, if the difference of final exam marks in any course is more than 20% the script will be evaluated by a third examiner. The final marks obtained will be the average of the third examiner's marks and the nearest examiner's marks. In cases where the nearest marks are equal, the final mark will be the average of the two higher marks.
- The tabulator, with the help of the controller's office, will prepare computerized tabulation sheets.
- The controller's office will publish the examination results at the end of the semester and issue the transcripts.

16. Credit Transfer

Credit transfer from any other programs or institutions is allowed for the B.S. Honours degree.

17. Plagiarism and Referencing

Plagiarism is the use of intellectual material produced by another person without acknowledging its source. Common examples are copying, paraphrasing (published, unpublished, or web-based) from others without acknowledging the authors.
Plagiarism is a serious academic offence and a violation of academic and student conduct rules. It is regarded as stealing intellectual property. **It is punishable with failing grades or possibly more severe action.**
Referencing is the process of acknowledging the sources (words and ideas of another author) used in easy, assignment, dissertation, or anything else.

18. Dean's Award

Students who have obtained a CGPA 3.75 without having any improvement, no F grade, no academic loss and readmission, no disciplinary action throughout eight semesters, and having at least 90% attendance, "Dean's Award" shall be presented to him/her.

19. Other General Regulations

Any matter not covered in the above guidelines, existing rules for the integrated Honours Course of the University of Dhaka will be applicable.