

Syllabus  
Department of Disaster Science and Management  
Faculty of Earth and Environmental Sciences  
University of Dhaka



BS Sessions 2012-2013 and onwards

[Last updated: October 2017]



**Department of Disaster Science and Management (DSM)**  
**Faculty of Earth and Environmental Sciences**  
**University of Dhaka (DU)**  
**Syllabus for B.S. Honors in DSM**  
**(Semester-System Course Structure)**

## 1. Preamble

Under the Semester System, the four-year B.S. Honors (integrated) Degree in Disaster Science and Management (DSM) at the University of Dhaka is a program comprised of eight semesters. Duration of the BS honors program is four years, six months for each semester.

Students are required to attend the entire courses equivalent to 160 credit hours in Disaster Science and Management (DSM) Honors program. Out of total courses, theory courses involve 160 credit hours; practical, field and project work involve 36 credit hours, and viva vocé 8 credit hours.

## 2. Definition of credit and Distribution of courses over the Semester:

Each semester shall be of 20 weeks

- 15 weeks for class teaching
- 2 weeks for preparation
- 3 weeks for holding the semester final examination

For a 4 credit or 3 credit courses there shall be three lecture classes per week i.e., a total of 45 lecture classes of 1 hour duration and for 2 credit course there shall be a two lecture classes per week i.e. , a total of 30 lecture classes of 1 hour duration. The duration of annual DSM fieldwork for two-credit equivalent Field Works courses is 05-10 workdays in the field.

The course and credit over eight semesters is illustrated below:

[Applicable for session 2012-13]

Year	Semester	Number of Courses	Credit
Year One	1 <sup>st</sup> Semester	7	14
	2 <sup>nd</sup> Semester	8	17
Year Two	3 <sup>rd</sup> Semester	9	18
	4 <sup>th</sup> Semester	8	21
Year Three	5 <sup>th</sup> Semester	8	21
	6 <sup>th</sup> Semester	8	21
Year Four	7 <sup>th</sup> Semester	7	22
	8 <sup>th</sup> Semester	8	24
4 Years	8 Semesters	63 Courses	158 Credits

[Applicable for session 2013-14]

Year	Semester	Number of Courses	Credit
Year One	1 <sup>st</sup> Semester	7	14
	2 <sup>nd</sup> Semester	8	18
Year Two	3 <sup>rd</sup> Semester	9	18
	4 <sup>th</sup> Semester	8	21
Year Three	5 <sup>th</sup> Semester	8	21
	6 <sup>th</sup> Semester	8	21
Year Four	7 <sup>th</sup> Semester	7	22
	8 <sup>th</sup> Semester	8	24
4 Years	8 Semesters	63 Courses	159 Credits

[Applicable for session 2014-15 onwards]

Year	Semester	Number of Courses	Credit
Year One	1 <sup>st</sup> Semester	7	15
	2 <sup>nd</sup> Semester	8	18
Year Two	3 <sup>rd</sup> Semester	9	18
	4 <sup>th</sup> Semester	8	21
Year Three	5 <sup>th</sup> Semester	8	21
	6 <sup>th</sup> Semester	8	21
Year Four	7 <sup>th</sup> Semester	7	22
	8 <sup>th</sup> Semester	8	24
4 Years	8 Semesters	63 Courses	160 Credits

### Course and Credit Distribution:

[Applicable for session 2012-13]

Course/Credit	Total Theory	Total Practical	Total Viva	Total Field/Project	Total
Course	43	12	4	4	63
Credit	113	26	7	12	158

[Applicable for session 2013-14]

Course/Credit	Total Theory	Total Practical	Total Viva	Total Field/Project	Total
Course	43	12	4	4	63
Credit	114	26	7	12	159

[Applicable for session 2014-15 onwards]

Course/Credit	Total Theory	Total Practical	Total Viva	Total Field/Project	Total
Course	43	12	4	4	63
Credit	114	26	8	12	160

### 3. Evaluation and Grading

#### Theory courses

Marks Distribution		
Class Assessment	Class attendance	05%
	In-course and/or Assignment	25%
Course Final Examination		70%
Total		100%

#### Practical courses

Marks Distribution		
Class Assessments	Class Attendance	10%
	Continuous Assessment	30%
Course final Examination		60%
Total		100%

#### Field Trip

Marks Distribution		
Field Assessment		40%
Final Report	Field Report(s)	40%
	Presentation on Report(s)	20%
Total		100%

#### Project Works

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

#### Class Attendance

Five percent of marks in theory courses and twenty percent of marks in practical courses are added from class attendances.

#### Marks of attendances

Attendance %	Marks (Theory)	Marks (Practical)
90 and above	05	10
85 to 89	04	8
80 to 84	03	6
75 to 79	02	4
60 to 74	01	2
Less than 60	00	00

### **In course and/or assignments**

Twenty five percent of marks in theoretical course are added from In-course and/or assignments. Assessment may be done by taking class test and/or by giving assignments.

For practical courses, thirty percent marks shall be allocated for the continuous class assessment.

The course teacher will announce the dates of in-course examinations at the beginning of the course. The in-course assessment will be of one hour duration and the teacher concerned will be responsible to assess the students of his/her course. There will be 1/2 test for each course. In theoretical courses assignment will be selected from the course syllabus or from topics related to course syllabus. Assignment may consist of written report or presentation or both.

## **4. Course Final Examination (Theory and practical Courses)**

For appearing in the semester final examination, every student is required to have authorized examination admit card supplied by the Controller of Examination on payment of dues (for each semester).

### **Eligibility of Setting for the Final Exam**

- Student having 75% or more attendance on average (collegiate) are eligible to appear in the final examination.
- Student having 60-74% attendance are considered to be non-collegiate and will be eligible to sit for the final examination on payment on fine tk. 1,000/= (One thousand).
- Student 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 academics activities (classes, class assessment etc) will have to be completed before 15 days of semester final exam for smooth functioning of the exam (exam registration, submitting class assessment, and preparation of students for exam). AC can reduce the time only in special circumstances.

### **Duration of Exam**

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

<b>Credit</b>	<b>Duration of Examination</b>
4 credit course	4 hours
3 credit course	3 hours
2 credit course	2.5 hours

Duration of practical examinations will be 4 hours irrespective of credit hours. The Class Test(s) for In-course Assessment will be taken usually after covering 40% of the course topics and the Course Final Examination on completion of the entire course. For each semester, the Departmental Academic Committee may fix an “In-course Examination/Class Test Week” for conducting the tests.

### **Evaluation of Examination Script**

In 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 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.

### **Evaluation by Third Examiner**

In the semester final examination if the difference of marks in any course is more than 20%, the script will be evaluated by a third examiner. The final marks obtained will be averaged of the nearest two marks, or third examiners marks if the difference between his/her marks and the two other examiner's marks are the same.

### **Evaluation of Practical Courses**

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

### **Evaluation of Field Trip**

In field trip/field visit, courses evaluation will be done by field trip coordinator/coordinators. Field Report and Presentation of field reports will be evaluated by field trip coordinator/coordinators and members of exam committee of the semester.

### **Research Project Conduction and Project Supervisor Selection**

In order to develop skilled personnel in problem identification, work-methodologies, scientific interpretation, producing a standard report; individual student shall carry out a supervised study

independently on a specified topic. A project will be developed by each student with the guidance from his supervisor/co-supervisor which is to be approved by the Academic Committee of the department. Students shall contact with faculty of their field of interest for the selection of supervisor and/or co-supervisor. The Academic committee shall approve the final list of supervisors. On completion of the Project, each student shall defend and submit written Project Report on the work undertaken. Upon the decision of Academic Committee project may also be completed by group work as well with field visit. Students may also carry out internship at an organization/NGO/Agency or Industry upon the approval of the academic committee.

### **Evaluation of Research Project**

The written dissertation will be evaluated by Project Supervisor, Co-supervisor and an assigned Expert (assigned by the academic committee). For the presentation of project, supervisor, co-supervisor, assigned expert and a representative of the respective Exam Committee will evaluate each student's presentation. Other faculty members/ supervisors can be present during the presentation of a project. Marks distribution has been shown above.

### **Viva voce**

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

### **Grading Scale and Grades**

At the time of evaluation all marks will be entered in numerical form. Only at the time of submitting the final grade sheet and while finalizing the results in the tabulation sheet, grades will be entered in both numerical and letter grade form.

Marks can be given in fraction up to two decimals. If the total marks of a course are in fraction. They should be raised to the higher whole number.

GPA and CGPA can be in fraction 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 Points Average (GPA), and Cumulative Grade Point Average (CGPA). Transcript will not include numerical grades.

Numerical Grades, Letter Grades, and 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 class and take any exam)	W	0.00

### Calculation of GPA and CGPA

GPA (Grade Points Average) will be calculated by multiplying the course credits by the GP (Grade Points) obtained in the courses and dividing the total by 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

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

#### CGPA of Year One

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

#### CGPA of eight Semesters

$$= \frac{\text{Total GP of 1st Semester} + \dots + \text{Total GP of 8th Semester}}{\text{Total Credits (152)}}$$

## 5. Sample Question Types and Marks Distribution and Duration of Exams

### Final Exam

- There will be no Multiple Choice Questions (MCQs) in final exam.



- Five questions will have to answer from seven questions in question papers. The total mark of each question will be 14.
- Last questions may be short notes (four have to answer from five topics) each short notes values 3.5 number.
- All theoretical courses' final exam will be held in 70 marks whether it is 2 credits, 3 credits or 4 credits courses. Duration of the exam will only vary with credits (2 credits course's duration of exam is 2.5 hours, 3 credits course's duration of exam 3hours and 4 credits course's duration of exam 4hours)
- Question setter will set seven questions.
- Class assessment marks will be 30 in all theoretical courses whether it is 2 credits, 3 credits or 4 credits courses.

### **Midterm Exam**

Courses teacher will decide about question type and duration etc. Question can be either objective type or descriptive.

### **Practical Exam**

All final practical exams will be in 60 marks whether it is 2 credits, 3 credits or 4 credits courses. There may be written parts in practical exam based on course curriculum. Number of questions will be selected based on course curriculum. In practical courses 40 marks will be added from class assessments.

### **Viva voce**

All viva voce will be in 100 marks whether it is 2 credits, 3 credits or 4 credits courses. Viva marks will be given by averaging the viva board member's marks.

## **4. Promotion**

Promotion will be year wise. Minimum CGPA (Cumulative Grade Point Average) 2 is needed only for promoting from second semester to third semester. Minimum CGPA 2.25 is needed for promoting fourth to fifth semester, and minimum CGPA 2.50 is needed for promoting from sixth to seventh semester. **For final degree a student must have to secure minimum CGPA 2.50.**

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 BS Honors degree a student need to complete 160 credit hours without F grade in any course, have to secure minimum CGPA 2.5, have to 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 GPA C+ (2.50) or lower in any course may improve his/her grades by retaking the examination/examinations of the course/courses only once with the available **immediate next batch** at his/her own risk. In this particular case, marks of the previous class assessment will be added with the improved (if) final exam marks of final exam.

*Retaking or improvements are not allowed in practical and field works based courses.*

A student with F grade only in any course/courses will be allowed to improve the grade/grades by retaking the examination/examinations of the concerned course/courses for the **second time with the available following batch** if he/she gets F in the first improvement test/tests, he/she will get the final chance of improvement but he/she must take his/her improvement with the following batch.

Improvement of midterm exam shall not be allowed.

In case of improvements (with no F grade), generally there is no scope for improvements in the 7<sup>th</sup> and 8<sup>th</sup> Semester. Upon meeting the all the criteria above, a student can sit for Improvement Exams until the date of the publication for the result of 8<sup>th</sup> Semester.

If a student has CGPA 2.5 in year four (7<sup>th</sup> and 8<sup>th</sup> semesters combined) but having F Grade in any of the 7<sup>th</sup> or 8<sup>th</sup> semester his/her result will be treated as incomplete. To get the degree the student shall have the opportunity to improve his/her grade by retaking the courses.

**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 university rules.

The student have to be mentally prepared to take the test of particular course even if it is held on the same day of his/her other examination.

The same rules will be applicable in the case of any student getting absent (I) in 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 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 a 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 even readmission for two times to the particular semester of the same year will be dropped out the program

If a student getting F in any course fails to improve his/her grade even after retaking the examination twice will not be given any further chance for improvement and will dropped out from the program

## **9. Class Representatives**

Each batch will have two class representatives (one male and one female) to maintain liaison with the course coordinator and the course teachers regarding their progress and problems. Student advisor/advisors will select class representatives. Class representatives can continue whole academic period to serve the class or in every semester new representative can be selected from the class.

## **10. Course Teacher**

Course teacher shall be finalized before the beginning of a semester by AC. The AC can make necessary change in course teacher if necessary (going on leave, illness etc). More than one teacher can take one courses if necessary.

Course teacher will take classes of designated courses and arrange field visit if necessary for the courses (i. e visiting Bangladesh Meteorological Department).

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 at least fifteen days before 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. Course Coordinator**

The AC of the department will also select a course coordinator for each semester, who may be a member of the examination committee, for smooth functioning of the program. AC can change course coordinator if necessary.

The course coordinator will prepare routines, arrange and monitor classes and attendances, ensure smooth functioning of the academic work, and help the chairman in getting questions from the question setters, holding examination, preparing exam routines, and publishing examination results.

Ensure submission of all class assessments of a particular semester fifteen days before the semester final exam. Courses coordinator will arrange posting of relevant notices on notice board.

In case of the Course Coordinator falling sick, going on leave, or is unwilling to continue, the academic committee will nominate a substitute.

### **12. Field Trip and Coordinator/Coordinators**

Field trip coordinator/coordinators shall be finalized by the beginning of the semester (having field visit) by AC. Coordinator will fix location and timeframe of the fields. All arrangement of field visits shall be carried out by the supervision of Field trip coordinator.

### **13. Examination committee**

The Academic committee of the department shall form an examination committee for each semester for three years. The committee will include a chairman and three members. The Academic Committee can make changes in examination committee if necessary. In special case, out of the three members the committee may have an 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 functioning of the program. If the AC decides, the chairman of examination committee can function as the course coordinator without any monetary benefit for the latter.

In case of any member of committee falling sick, going on leave, or is unwilling to be on the committee, the academic committee will nominate a substitute.

#### **Chairman of the Examination Committee**

He/she will be responsible for getting questions from the course teachers, moderating and printing the questions, holding of examinations, and publication of results. If the chairman desires, he/she may request the course coordinator to collect questions from the course teachers.

The chairman of examination committee will take necessary initiatives (formulating exam routines, issuing letter for seeking class assessment marks from course teachers, seeking question papers from examiners etc) of semester final examination at least one month before the starting of final examination.

#### **14. Tabulation and Tabulator of the Examination Results**

Two teachers of the department will act as tabulators. The chairman of the examination committee and the course coordinator will select the tabulators who should be preferably member of examination committee.

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 semester final exam.

The two tabulators will enter the class assessment marks and semester final marks (average of first and second examiner) in to tabulation sheets and process the examination results

In the semester final examination if the difference of marks in any courses is more than 20%, the script will be evaluated by third examiner. The final marks will be average of nearest two marks, or the third examiner's marks if the difference between his/her marks and two other examiner's marks are the same.

The tabulator will help the controller office to prepare three copies of computerized tabulation sheets. The controller's office will send one copy to the chairman of the department for preservation.

The controller's office will publish the examination results at the end of semester and issue the transcripts.

#### **15. Credit Transfer**

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

## **16. Plagiarism and Referencing**

Plagiarism is 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 violation of academic and student conduct rules. It is regarded as stealing of intellectual properties. **It is punishable with falling grades or possibly more severe action.**

Referencing is the process of acknowledgement of the sources (words and ideas of another author) used in essay, assignment, dissertation or anything else.

## **17. Dean's Award**

Students who have obtained 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.

## **18. Semester Break**

After completing all examination of Semester final (theory, practical, and viva, presentation etc) a semester, semester break will start. The duration of semester break 7-15 days. The AC will change (duration, time etc), if necessary. After semester break academic activities of next semester (classes) will start. In the semester break the department will take necessary steps to start next semester and prepare results of the semester final exam.

## **19. Other General Regulations**

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

## **20. Modules**

In order to have a quick impression and understanding of 64 courses spanned in 04 years, the courses have been distributed into 06 modules. They are:

**Module-I:** Basic Disaster Management Sciences

**Module II:** Tools and Techniques

**Module III:** Hazard Understanding, Analysis and Assessment

**Module IV:** Vulnerability Assessment and Risk Management

**Module V:** Crisis Response and Preparedness

**Module VI:** Policy, Planning and Legal Aspects

**Short description of the module is given below:**

**Module-1: Basic Disaster Management Sciences**

To address the disaster risk reduction from the realistic point of view of sustainable development using various tools, techniques and available knowledge, an application of basic and applied sciences is essential. This module consists of tailor-made courses of earth sciences, mathematics, statistics, engineering and social sciences related to natural and man-made disaster. The main objective of this module is to familiarize and develop the level of understanding of the background knowledge of the students with respect to the occurrences of the disasters and their management issues. The knowledge of this module will sharpen the student to find-out the association of disaster with basic sciences and how to apply this information towards hazard identification, vulnerability and risk reduction.

Module I	Course Name	Total Credit
Basic Disaster Management Sciences	Introduction to Disaster Science and Management	2
	Fundamentals of Earth Sciences	3
	Introduction to Environment and Ecosystem	2
	Basic Calculus for Disaster Sciences	2
	Earth Materials Lab.	2
	<i>Viva vocé</i>	2
	Basics of Climatology and Meteorology	3
	Introduction to Hydrology and Water Resources	2
	Society and Disasters	2
	Basic Statistics and Probability for Disaster Sciences	2
	Applied Linear Algebra	2
	Field Works and Reporting	2
	Applied Differential Equation	2
	Introduction to Computer Sciences and Programming	2
	Fundamentals of Built Environment	4
Total		34

## Module II: Tools and Techniques

Paradigm shift of disaster management involves the proper application of social, scientific and engineering tools for the adequate assessment of hazard, vulnerability and risk. Without knowing the proper application of tools and techniques, the assessment with regard to risk reduction could be biased, over estimated or underestimated. This module comprises of the best available computational and instrumental tools and techniques to strengthen both theoretical and practical background of the structural and non-structural vulnerability reduction. Through the completion of the courses under this module, the student will be able to know and apply the techniques and technology for the proper assessment of risk and develop the pathway towards the risk reduction.

Module II	Course Name	Total Credit
Tools and Techniques	Basic Cartography and Mapping Techniques	2
	Geodetic Surveying & Mapping	2
	Seismology & Geodesy	3
	Numerical Analysis and Sampling Techniques	3
	Principles of Remote Sensing	2
	Geographic Information System and Database Management	3
	Remote Sensing Lab.	2
	GIS Lab.	2
	Disaster Statistics Lab	2
	Research Methodology and Knowledge Management	4
	Geo-informatics and MIS in Disaster Management: Theory & Practices	3
Total		28

## Module III: Hazard Understanding, Analysis and Assessment

Any hazard is the fundamental cause of vulnerability and risk that leads to a disastrous event. Understanding and analyzing the hazard in terms of magnitude, intensity and frequency promotes the level of preparedness vis-a-vis capacity enhancement towards risk reduction. The objective of this module is to increase the mathematical (probabilistic and deterministic) and analytical (field survey and relevant commutation) investigations of various aspects of natural, man-made and climate change induced hazards for addressing structural and non-structural vulnerability reduction. From this module the students will learn basics of specific hazard,



hazard characterization and profiling, process, procedures and assumptions used for hazard analysis.

Module III	Course Name	Credit
Hazard Understanding and Analysis	Applied Geomorphology and Tectonics	3
	Geological and Hydro-meteorological Hazards	2
	Climatic Hazards and Climate Change	2
	Chemical, Industrial and Technological Hazards	2
	Biological Hazards and Public Health	2
	Hazard Analysis Lab.	2
	Environmental Pollution Lab	2
	<i>Viva vocé</i>	2
	Geophysical Application: Principle and Practices	2
	Geotechnical Application: Principle and Practices	2
	Field Works and Reporting	2
Total Credit		23

#### **Module IV: Vulnerability Assessment and Risk Reduction**

The risk management phase consists of the elements of mitigation, prevention, preparedness, prediction and early warning. Having the proper understanding of hazards as well as knowing the tools and techniques for hazard analysis and assessment, this module deals with the most delicate aspect of vulnerability assessment leading to risk mitigation and reduction. This module comprises of risk reduction approaches developing the generic and scenario based risk modeling of the major natural hazards. Climate risk modeling and adaption is also an integral part of the module. With the completion of the courses of this module, the students will be able to make an application-oriented vulnerability and risk assessment and develop a hazard specific as well as multi-hazard risk reduction/mitigation plan with both technical and community-based early warning measures.

Module IV	Course Name	Credit
Vulnerability Assessment and Risk Reduction	Mitigation, Prevention and Preparedness	4
	Vulnerability and Risk Assessment	3
	Urban and Regional Planning: Risk Mitigation Concept	4
	Risk Sensitive Land use Planning Lab.	2
	<i>Viva vocé</i>	2
	Seismic Risk Reduction Approach	3
	Hydro-meteorological Risk Reduction Approach	3
	Risk Reduction Lab.	3
	Field Works and Reporting	2
	Climatic Risk Modeling and Adaptation	3
	Prediction and Early Warning	4
Total		33

### **Module V: Crisis Response and Preparedness**

Based on the principles of building back better, the crisis management consists of the phase of response, recovery, reconstruction and rehabilitation. This module mainly deals with the post-disaster humanitarian approach considering mainly the emergency issues related particularly to the development and disparity aspects of disaster. The main objective of this module is to teach the post disaster damage assessment and make plans for immediate and long term management of the crisis through the mobilization of humanitarian agencies and the community at risk. Through the completion of this module, the students will learn from the past how to develop post-disaster plan to coordinate complex operations that must be solved within the stipulated timeframe and efficiently following the cycle of crisis management. Moreover, the students will be familiar with the responsibility of the national and international players responding to humanitarian assistances.

Module V	Course Name	Credit
Crisis Response and Preparedness	Disaster and Development: Economic Concept	3
	Population, Migration and Shelter Management	2
	Community based Risk Assessment and Planning: Theory and Practices	3
	Inequality and Disaster	2
	Response, Recovery and Rehabilitation	4
	<i>Viva vocé</i>	2
	Damage, Loss and Need Assessment	3
	Emergency and Crisis Planning	2
	Disaster in Agricultural and Food Security	3
	Damage and Need Assessment Lab.	2
	Research Project	6
Total		32

### **Module VI: Policy, Planning and Legal Aspects**

Planning policies and legal aspects are essential parts of managing risks, crises and emergencies arising out of disasters. They are set to establish a formal basis for achieving the objectives of any government or non-government organizations, institutions or businesses which adopt and enforce them for the purpose of disaster management. Apart from basic disaster science, they make up the critical matrix of disaster management which involves agencies and people ranging from international financial institutions, global think tanks to government and local actors. Purpose of this module is to deeply inculcate the essence of plans, policies and legal aspects; their formulation, implementation, monitoring and evaluation techniques among students. This module will light upon the critical actors and factors involved in this whole process so to enable the learners to create, utilize and maintain plans themselves. They will also come across the history of disasters in Bangladesh and the role of various local and international actors in response to these events as well as the current trends and traits of disaster management with particular focus on legal and ethical issues.

Module VI	Course Name	Credit
Policy, Planning and Legal Aspect	Disaster Management: Institutions and Instruments	2
	Main-streaming Disaster Management: National and International Practices	3
	Project Planning, Monitoring and Evaluation	3
	Bangladesh Studies & Disaster Management Approach	2
Total		10

The modules have been differentiated into risk management and crisis management to show

#### Classification of Modules

Broad Category of Disaster Management	Modules
Risk Management	Basic Disaster Management Sciences
	Tools and Techniques
	Hazard Understanding, Analysis and Assessment
	Vulnerability Assessment and Risk Reduction
Crisis Management	Crisis Response and Preparedness
	Policy, Planning and Legal Aspect

**Course Structure: B.S. (Honors) in Disaster Science and Management**

Course ID	1 <sup>st</sup> Semester	Credit	Course ID	2 <sup>nd</sup> Semester	Credit
DSMHT:101	Introduction to Disaster Science and Management	2	DSMHT:108	Basics of Climatology and Meteorology	3
DSMHT:102	Fundamentals of Earth Sciences	3	DSMHT:109	Applied Geomorphology and Tectonics	3
DSMHT:103	Introduction to Environment and Ecosystem	2	DSMHT:110	Introduction to Hydrology and Water Resources	2
DSMHT:104	Basic Calculus for Disaster Sciences	2	DSMHT:111	Society and Disasters	2
DSMHL:105	Basic Cartography and Mapping Techniques	2	DSMHT:112	Basic Statistics and Probability for Disaster Sciences	2
DSMHL:106	Earth Materials Lab.	2	DSMHT:113	Applied Linear Algebra	2
DSMHV:107	<i>Viva vocé</i>	2	DSMHL:114	Geodetic Surveying & Mapping	2
			DSMHF:115	Field Works and Reporting	2
<b>Total Credit</b>		<b>15</b>	<b>Total Credit</b>		<b>18</b>

[N.B: Credit distribution for course DSMHV:107 is 01 for session 2012-13 and 2013-14 and DSMHT:108 is 02 for session 2012-13]

Course ID	3 <sup>rd</sup> Semester	Credit	Course ID	4 <sup>th</sup> Semester	Credit
DSMHT:201	Applied Differential Equation	2	DSMHT:210	Seismology & Geodesy	3
DSMHT:202	Geological and Hydro-meteorological Hazards	2	DSMHT:211	Fundamentals of Built Environment	4
DSMHT:203	Climatic Hazards and Climate Change	2	DSMHT:212	Numerical Analysis and Sampling Techniques	3
DSMHT:204	Chemical, Industrial and Technological Hazards	2	DSMHT:213	Principles of Remote Sensing	2
DSMHT:205	Biological Hazards and Public Health	2	DSMHT:214	Geographic Information System and Database Management	3
DSMHT:206	Introduction to Computer Sciences and Programming	2	DSMHL:215	Remote Sensing Lab.	2
DSMHL:207	Hazard Analysis Lab.	2	DSMHL:216	GIS Lab.	2
DSMHL:208	Environmental Pollution Lab	2	DSMHF:217	Field Works and Reporting	2
DSMHV:209	<i>Viva vocé</i>	2			
<b>Total Credit</b>		<b>18</b>	<b>Total Credit</b>		<b>21</b>

Course ID	5 <sup>th</sup> Semester	Credit	Course ID	6 <sup>th</sup> Semester	Credit
DSMHT:301	Mitigation, Prevention and Preparedness	4	DSMHT:309	Disaster and Development: Economic Concept	3
DSMHT:302	Vulnerability and Risk Assessment	3	DSMHT:310	Seismic Risk Reduction Approach	3
DSMHT:303	Geophysical Application: Principle and Practices	2	DSMHT:311	Hydro-meteorological Risk Reduction Approach	3
DSMHT:304	Geotechnical Application: Principle and Practices	2	DSMHT:312	Population, Migration and Shelter Management	2
DSMHT:305	Urban and Regional Planning: Risk Mitigation Concept	4	DSMHT:313	Community based Risk Assessment and Planning: Theory and Practices	3
DSMHL:306	Disaster Statistics Lab	2	DSMHT:314	Inequalities and Disaster	2
DSMHL:307	Risk Sensitive Land use Planning Lab.	2	DSMHL:315	Risk Reduction Lab	3
DSMHV:308	<i>Viva vocé</i>	2	DSMHF:316	Field Works and Reporting	2
<b>Total Credit</b>		<b>21</b>	<b>Total Credit</b>		<b>21</b>

Course ID	7 <sup>th</sup> Semester	Credit	Course ID	8 <sup>th</sup> Semester	Credit
DSMHT:401	Response, Recovery and Rehabilitation	4	DSMHT:408	Damage, Loss and Need Assessment	3
DSMHT:402	Disaster Management: Institutions and Instruments	2	DSMHT:409	Main-streaming Disaster Management: National and International Practices	3
DSMHT:403	Climatic Risk Modeling and Adaptation	3	DSMHT: 410	Emergency and Crisis Planning	2
DSMHT:404	Research Methodology and Knowledge Management	4	DSMHT:411	Disaster in Agriculture and Food Security	3
			DSMHT:412	Project Planning, Monitoring and Evaluation	3
DSMHT:405	Prediction and Early Warning	4	DSMHT:413	Bangladesh Studies and Disaster Management Approach	2
DSMHL:406	Geo-informatics and MIS in Disaster Management: Theory & Practices	3	DSMHL:414	Damage and Need Assessment Lab.	2
DSMHV:407	<i>Viva vocé</i>	2	DSMHP:415	Research Project	6
<b>Total Credit</b>		<b>22</b>	<b>Total Credit</b>		<b>24</b>

[Note: Of the DSM Majors, each Theory course is denoted by four-letter code DSMHT (i.e., DSM Honors Theory), Practical/Lab course by the DSMHL (i.e., DSM Honors Lab), Field Works course by the DSMHF (i.e., DSM Honors Field), Project work by the DSMHP (i.e., DSM Honors Project) and viva vocé by the DSMHV (i.e., DSM Honors Viva vocé) followed by a three-digit number.]

## **DSMHT: 101 Introduction to Disaster Science and Management (Credit 02)**

1. Disaster: Definitions of Terminology; Sciences of Disaster; Meaning and Impact; a Four Phase Approach of Disaster Management; Disaster Trends.
2. Hazards: Natural Hazards (Meteorological, Hydrological hazards, Hydro-meteorological hazards, Climatic Hazards, Geological hazards and Biological hazards), Technological and Man-made hazards); Hazard Identification and Hazard profiling.
3. Risk: Component of Risk (Likelihood, Consequence and Trends); Risk Evaluation; Risk Acceptability and Alternatives.
4. Vulnerability: Physical Profile; Social Profile; Environmental Profile; Economic Profile; risk factors influencing vulnerability; Risk Perceptions.
5. Capacity: Definition, Relation with other disaster terminologies.
6. Fundamental Approach of Disaster Management in Bangladesh: History of Disaster Management, Paradigm shift; Disaster Management framework and Institutions.

### **References:**

1. Comprehensive Disaster Management Program (CDMP) (2009) Disaster Dictionary. Dhaka, Bangladesh.
2. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK.
3. Cees Westen et al (2011) Multi-hazard Risk Assessment. Public Works
4. Paul B.K. (2011) Environmental Hazards and Disasters: Contexts, Perspectives and Management. Wiley-Blackwell. US.
5. Pinkowski J. (2008) Disaster Management Handbook. CRC Press. US.
6. Smith K. & Petley D.N. (2009) Environmental Hazards: Assessing Risk and Reducing Disaster. Routledge. New York.
7. United Nations International Strategy for Disaster Reduction (UNISDR) (2004) Living with Risk: A Global Review of Disaster Reduction Initiatives. Geneva: United Nations.
8. Westen et al (2011) Multi-hazard Risk Assessment Guidebook
9. Wisner B. (2004) At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge. US.

## **DSMHT: 102 Fundamentals of Earth Sciences (Credit 03)**

1. Earth System: Origin of the Earth and the Solar System; Interior of the Earth; Rocks and Minerals (their types, texture, structure and composition).
2. Fundamental of Geological Sciences: Introduction to the Science of Geology, Geological Time Scale and Methods of Measurements; Geological Column; Geological Structures (Folds, Faults, Discontinuities), Scope of Geological science for Disaster Management studies.
3. Fundamental of Geography: Basic concepts in Geography (Themes in Geography, World Physical and Human Region), Modes of Explanation in Geography, Scope of Geography for Disaster Management Studies.

4. Earth's Surface Processes: Weathering process, Erosion and Denudations; processes of physical and chemical weathering, product of physical and chemical weathering, zone of weathering, rates of weathering, zone of accumulation.
5. Soil Formation: Soil Forming Factors, Soil Forming process, and Soil Profile characteristics of different soil, Physical, Chemical and Biological Properties of the soil.
6. Stratigraphic Concepts: Stratigraphic Contacts, Unconformities; Vertical and Lateral Successions; Cyclic Successions; Stratigraphic Categories and Classification.

### References:

1. Berry L.G. and Mason B. (1968) Elements of Mineralogy. Greenwood Press. US.
2. Boggs S. (2012) Principles of Sedimentology and Stratigraphy. Prentice Hall. US.
3. Bradshaw M., White G.W. and Chacko E. (2004) Contemporary World Regional Geography, 2<sup>nd</sup> Edition. McGraw Hill. US.
4. Bradshaw M.J. et al. (1978). The Earth's Changing Surface. Wiley-Blackwell. US.
5. Brady N.C. & Weil R.C. 2008. The Nature of Properties of Soils. 14<sup>th</sup> Edition. Pearson. US.
6. Leet L.D. et al (1982) Physical Geology. Prentice-Hall. USA.
7. Pettijohn F.J. (1975) Sedimentary Rocks. Harper & Row. US.
8. Plummer C., Carlson D. & Hammersley L. 2014. Physical Geology. 15<sup>th</sup> Edition. McGraw Hill. US.
9. Robinson H. (1976) Human Geography. M & E Handbooks. Plymonth. US.
10. Turbuck E.J., Lutgens F. K. and Tasa D.S. (2013) An Introduction to Physical Geology. 13<sup>th</sup> Edition. Prentice Hall. US.
11. Tyrrell G.W. (1952) The Principles of Petrology: An Introduction to the Science of Rocks. Dutton & Company Inc. New York.

### DSMHT: 103 Introduction to Environment and Ecosystem (Credit 02)

1. Environment:  
Definition of Environment, Components of Environment: biotic and abiotic, four Sphere of Earth: Lithosphere/ Geosphere, Hydrosphere, Atmosphere, Biosphere; Scope
2. Lithosphere:  
Definition, Structure of the Earth surface
3. Hydrosphere:  
Definition, Hydrological Cycle
4. Atmosphere:  
Definition of Atmosphere, Evolution of Atmosphere (early or primitive atmosphere, secondary atmosphere, living atmosphere), Basic Composition and Structure of Atmosphere, Weather and Climate: elements and factors
5. Biosphere:  
*Ecosystem*  
Definition of Ecology and Ecosystem, Component of Ecosystem, Food Chain and Food Web, Energy Pyramid, Trophic Level, Autotrophs, Heterotrophs, Herbivores, Carnivores, Decomposers etc



### *Biomes*

Definition of Biomes, Types and Distribution of Biomes (Terrestrial, Aquatic)

### *Biodiversity*

Definition, Types (Species Diversity, Genetic Diversity, Ecosystem Diversity, Functional Diversity), Conservation of Biodiversity (In-Situ, Ex-Situ)

6. Major Biogeochemical Cycles:  
Laws of Thermodynamics, Oxygen Cycle Carbon Cycle, Nitrogen Cycle, Phosphorus Cycle
7. Pollution and Pollutants:  
Definition, Types of Pollution and Pollutants (Air, Water, Soil, Noise and Thermal Pollution), Point Source Pollution, Non-point Source Pollution.

### **References:**

1. Botkin D. B. & Keller E. A. (2000) Environmental Science: Earth as a Living Planet. 3<sup>rd</sup> Edition. Wiley-Blackwell. US.
2. Enger E. and Smith B. (2008) Environmental Science: A Study of Interrelationship. McGraw Hill. US.
3. Keller E.A. (1985) Environmental Geology. CBS Pub & Distributor. India.
4. Merritts D. et al (1998) Environmental Geology: An Earth System Science Approach. W. H. Freeman & Company. US.
5. Miller G.T. & Spoolman S. (2012) Environmental Science. 14<sup>th</sup> Edition. Cengage Learning. India.
6. Park C. C. (2001) The Environment: Principles and Application. Routledge. US.
7. Pickering K.T. and Owen L.A. (1997) An Introduction to Global Environmental Issues. Routledge. US.
8. Ruth F. Weiner (2003) Environmental Engineering. Elsevier Publication

### **DSMHT: 104 Basic Calculus for Disaster Sciences (Credit 02)**

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).
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).
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. Leibnitz theorem. Rolle 's Theorem: Lagranges mean value theorems. Extrema of functions, problems involving maxima and minima.

4. Integrals: Antiderivatives and indefinite integrals. Techniques of integration. Definite integration using anti derivatives.
5. Definite integrals a limit of a sum. The fundamental theorem of calculus. Integration by reduction.
6. Application of Integration: Plane areas. Solids of revolution. Volumes by cylindrical shells. Volumes by cross sections. Arc length and surface of revolution.

#### **References:**

1. Anton H. et al. (1988) Calculus with Analytic Geometry. Wiley-Blackwell. US.
2. Bers L. & Karal F. (1976) Calculus. Holt, Rinehart & Winston. US.
3. Lang S. (1998) A First Course in Calculus. 5<sup>th</sup> Edition. Springer. Netherlands.
4. Swokowski E.W. (1992) Calculus with Analytic Geometry. Wadsworth Publishing Co Inc. California. US.

#### **DSMHL: 105 Basic Cartography and Mapping Techniques (Credit 02)**

1. Maps: Definition, History, Basic elements of map (Scale: Definition, Types and Use; Construction of scale- Linear, Comparative and Diagonal.
2. Aesthetics of Map
3. Maps and Map Projections; Map Scales and their Computations.
4. Map Reading and Interpretations, Map Reproduction-Enlargement and Reduction at different scales; Bearing, Azimuth, Distance, Plotting of Location and Data.
5. Map Design and Symbolology: Principles of map design; Cartographic Design; International Color Scheme; Theory, Models and Perception; Typographic Map Production, Thematic map: Definition and Concept: Methods/Techniques of Thematic Mapping- Choropleth, Isopleths, Dot, Flow, Proportional symbol, Isothermal and Diagrammatic method; Cartogram
6. Contour Maps Construction; Study of Topographic Maps, Classification of Maps and their applications (Weather maps, Geological maps).

#### **References:**

1. Blyth F.G. H. (1976) Geological Maps and their Interpretation. 2<sup>nd</sup> Edition. Arnold. UK.
2. Brown L.A. (1960) Map Making: The Art That Became a Science. Little Brown & Co. US.
3. Bygott J. (1967) An Introduction to Map Work and Practical Geography. University Tutorial Press. UK.
4. Kellaway G. P. (1970) Map Projection. 2<sup>nd</sup> Edition. Methuen & Co. UK.
5. Robinson et al (1953) Elements of Cartography. Wiley Publication

**DSMHL: 106 Earth Materials Lab. (Credit 02)**

1. Hand-specimen study of common Igneous, Metamorphic and Sedimentary rocks
2. Hand specimen study of rock forming minerals.
3. Soil Profiles.

**References:**

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. 3<sup>rd</sup> 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.

**DSMHL: 107 Viva vocé (Credit 02)**

Comprehensive oral examination of the courses taught.

**DSMHT: 108 Basics of Climatology and Meteorology (Credit 03)**

1. Climatology and Meteorology: Basic concept, Scales of Weather System.  
Climatology, Meteorology, Weather and Climate, Elements of Weather and Climate, Factors of Weather and Climate
2. Origin, Composition and Structure of Atmosphere  
Origin and Evolution of Atmosphere, Composition of Atmosphere, Structure of Atmosphere
3. Insolation, Energy Balance, Temperature
4. Atmospheric Pressure and Wind, General Circulation of Atmosphere, ITCZ, Jet stream, El Nino-La Nina Phenomenon, Walker Circulation
5. Humidity, Condensation, Precipitation  
Hydrological Cycle, Humidity (absolute humidity, specific humidity, relative humidity), Evaporation, Condensation (cooling of air, condensation nuclei, form of condensation), Stability and Instability of Atmosphere, Fogs, Cloud (formation and classification), monsoon, Precipitation (form, type and theory), and Human Induce Precipitation
6. Air masses, Fronts, and Cyclones
7. Climatic Classification  
Microclimate, Macroclimate, Urban Heat Island, Koppen's Classification, Thornthwite's Classification
8. Atmospheric Extreme Event and Hazards  
Cyclone, Tornado, Thunderstorm, Drought, Flood, Acid Rain, Nor'wester, Heat Wave, Cold Wave, Monsoon depression etc
9. Bangladesh: Climate and Climatic Hazard and Signal system.

**References:**

1. Allaby M. (2007) Encyclopedia of Weather and Climate. Vol I & II. Facts on File Inc. US.
2. Barry R. G. & Chorley R.J. (1987) Atmosphere, Weather and Climate. Methuen. UK.
3. Byers H.B. (1974) General Meteorology. 4<sup>th</sup> Edition. McGraw-Hill Co. US.
4. Hartman D.L. (1994) Global Physical Climatology. International Geophysics Series. Volume 56. PP. 412. Academic Press. US.
5. Hidore J.J. and Oliver J.E. (2009) Climatology: An Atmospheric Science. 3<sup>rd</sup> Edition. Prentice Hall. US.
6. Miller A. & Anthes R.A. (1980) Meteorology. C. E. Merrill Publishing Company. US.
7. Rohli R.V. & Vega A.J. (2007) Climatology. Jones and Bartlett Learning. Wall Street. US.
8. Franklyn W. Gole and Donn. Introduction to Meteorology
9. Robert H. Baker. Astronomy

**DSMHT 109: Applied Geomorphology and Tectonics (Credit 03)**

1. Basic concepts of Geomorphology, Natural agents (Glaciers, Running water and Wind) sculpturing the Earth's surface and their origin, Earth surface processes- Fluvial, Glacial, Aeolian and Coastal processes and their morphology. Major geomorphic features of the earth (Mountains, Rivers, Floodplains etc).
2. Global Tectonic: Continental drift, Seafloor spreading, Plate tectonics, Isostasy
3. Deformation of Earth Surface and Structural Landforms: folds and faults, landform controlled by folds, landform controlled by faults, criteria for faulting, landforms of major structural units.
4. Geomorphic Markers: Planar geomorphic markers (lacustrine shorelines, deltas, river terraces, alluvial fans, erosional surface), linear geomorphic markers (rivers, ridges, glacial moraines, lava flows, debris flow, landslide).
5. Stream Types and their relation to tectonics as well as lithology.
6. Geomorphic and tectonic units of Bangladesh; Geology of Bangladesh.

**References:**

1. Billings M.P. (1972) Structural Geology. 3<sup>rd</sup> Edition. Prentice Hall. US.
2. Brierley G. & Fryirs K. (2005) Geomorphology and River Management: Applications of the River Styles Framework. Blackwell publishing. UK.
3. Boggs S. (2012) Principles of Sedimentology and Stratigraphy. Prentice Hall. US.
4. Carlson D., Plummer C. et al. (2012) Physical Geology. McGraw-Hill Companies. US.
5. Douglas W.B. and Anderson R.S. (2011) Tectonic Geomorphology. 2<sup>nd</sup> Edition. Wiley-Blackwell. US.
6. Hugget R.J. (2007) Fundamentals of Geomorphology. Routledge Publication
7. Imam B. (2005) Energy Resources of Bangladesh. University Grants Commission. Dhaka. Bangladesh.

8. Khan F.L. (1991) Geology of Bangladesh. The University Press Limited. Dhaka. Bangladesh.
9. Selby M.J. (1985) Earth's Changing Surface. Clarendon Press. Oxford. UK.
10. Tarbuck E.J., Lutgens F.J., et al. (2010) An Introduction to Physical Geology. Prentice Hall. US.
11. Thornbury W.D. 1961. Principles of Geomorphology. Wiley-Blackwell. US.
12. Philip Kearey et al (2009) Global Tectonics, Wiley-Blackwell Publication

### **DSMHT: 110 Introduction to Hydrology and Water Resources (Credit 02)**

1. Introduction; Scope; Hydrologic Cycle; Precipitation, Runoff, Evaporation, Evapotranspiration and Infiltration Processes and their Measurements; Hydrograph; Unit Hydrograph; terminology of Drainage Basin-Quantitative Evaluation; Stream flow type and Velocity; River-Stage and Discharge
2. Introduction; Origin, Occurrence and distribution of Groundwater; Rock and sediments Properties affecting Groundwater (physical and hydraulic properties); Geologic Formations as Aquifers; Groundwater Movement-- Darcy's Law; Types of Aquifers and Aquifers vulnerability.
3. Chemistry of Groundwater; Isotope Hydrology. Groundwater contamination and Pollution—Sea-water Intrusion in Coastal Aquifers, Arsenic contamination, Industrial pollution.
4. Groundwater and Surface water Resources of Bangladesh: IWRM for DRR aspects.

### **References:**

1. Chow V.T. (1964) Handbook of Applied Hydrology. McGraw Hill. US.
2. Kazmann R.G. (1972) Modern Hydrology. Joana Cotler Books. New York. US.
3. Matthes G. (1982) The Properties of Groundwater. Wiley-Blackwell. US.
4. Raghunath H.M. (1990) Groundwater Hydrology. Wiley Eastern Ltd. India.
5. Todd D.K. (1980) Groundwater Hydrology. 2<sup>nd</sup> Edition. Wiley-Blackwell. US.
6. United Nations Development Program (UNDP) (1982) Ground Water Survey: The Hydrogeological Conditions of Bangladesh. UNDP Technical Report. US.
7. Ward and Robinson (1975) Principals of Hydrology, McGraw Hill Publication

### **DSMHT: 111 Society and Disasters (Credit 02)**

1. Evolution of Human Society, Civilization and Disaster, Agricultural Revolution, Industrial Revolution
2. Social Sciences Issues of Disaster: Social Structure, Institution, Change, Problems, Control, Legislation, Stratification etc.; Unequal Distribution of Resources and Opportunities, Role and Status Conflict; Gender and Social Disparity.
3. Social Philosophy of Disaster Management: Human Rights and Social Justice Perspectives as Indicated in different National and International Conventions; The Constitution of Bangladesh; NGO, Civil Society and Corporate Social Responsibilities. Ethical Considerations in Disaster.

4. Demographic Issues and Disaster: Demographic Variables, Population Growth, Composition, Distribution, Migration, Population Management and their Significance in Disaster.
5. Socio-Political Victims and Resources of Disasters: Disaster Effects on Poor, Women, Children, Elderly, Disabled, Marginal, Minority Groups and Socially Excluded Population. Interventions of Family, Neighbors, Kin, Community and Religion. Local Government, Voluntarism, Social Security and Safety Net Programs; Disaster issues in Academic Curricula and Media. Resource Mobilization and Resilience.
6. Psycho-Social Interventions in Disaster: Psycho-social Crisis and Conflict, Crisis Management. Support to Displace Population, Population with Special Needs and Victim Support Groups. Pro-active Disaster Management Approaches.
7. Bangladesh Studies: Evolution of Bangladeshi Society, Natural & Human Resources of Bangladesh, Government and Politics, Settlements (Urban and Rural)

### **References:**

1. Anthony G. (2013) Sociology, Polity Press, UK
2. Bankoff G. (2004) Cultures of Disaster: Society and Natural Hazard in the Philippines. Routledge. US.
3. Barker R.L. (2008) The Social Work Dictionary. NASW Press. US.
4. Engels F. (2000) The Origin of the Family, Private Property and the State
5. Kottak (2014) Introductory Anthropology
6. Moran E.F. (2010) Environmental Social Science: Human Environment Interactions and Sustainability. Wiley-Blackwell. US.
7. Sapir D.G. & Santos I. (2013) The Economic Impacts of Natural Disasters. Oxford University Press. UK.
8. Shafie H. (2009) Endowed Wisdom: Knowledge of Nature and Coping with Disaster in Bangladesh. CDMP. Dhaka.

### **DSMHT: 112 Basic Statistics and Probability for Disaster Sciences (Credit 02)**

1. Statistics – definition and scope: definitions of statistics - past and present, its 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.
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.
3. Characteristics of Statistical Data: measures of location, central tendency and their types, dispersion, skewness, kurtosis and their properties, moments, box-and-whiskers plots.
4. 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.

5. 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.
6. 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.

### References:

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. 8<sup>th</sup> Edition. Prentice-Hall. US.
4. Ross S.M. (2008) A First Course in Probability. 8<sup>th</sup> Edition. Pearson. US.
5. Roy M.K. (2004) Fundamentals of Probability and Probability Distribution. Romax Publications. Bangladesh.

### DSMHT: 113 Applied Linear Algebra (Credit 02)

1. Matrices and Determinants:  
Notion of matrix. Types of matrices. Matrix operations, laws of matrix Algebra. Determinant function. Properties of determinants. Minors, Cofactors, expansion and evaluation of determinants. Elementary row and column operations and row-reduced echelon matrices.
2. System of Linear Equations:  
Linear Equations. System of linear equations (homogeneous and non-homogeneous), Solution of System of Linear Equations using Different Methods, Application of system of linear equations.
3. Vector Spaces:  
Vectors in  $R^n$  and  $C^n$ : Inner product. Norm and distance in  $R^n$  and  $C^n$ . Abstract vector space over  $R$  and  $C$ . Subspace. Sum and direct sum of sub spaces. Linear dependence/independence of vectors; basis and dimension of vector spaces. Row and column space of matrix; rank of matrices. Solution spaces of systems of linear equation.
4. Linear Transformations. Kernel and image of a linear transformation and their properties. Matrix representation of linear transformations.
5. Eigenvalues and Eigenvectors. Diagonalization. Cayley Hamilton theorem. Applications.

### References:

1. Anton H. and Rorres C. (2000) Linear Algebra with Applications. 8<sup>th</sup> Edition. Wiley-Blackwell. US.
2. Greub W.H. (1967) Linear Algebra. Springer. Netherlands.
3. Lipschutz S. & Lipson M. (2012) Linear Algebra. 5<sup>th</sup> Edition. McGraw-Hill. US.

### **DSMHL: 114 Geodetic Surveying and Mapping (Credit 02)**

1. Definition of Surveying: Type of Survey: (Geodetic, Plane)
2. Surveying as the Basis of Large Scale Maps: The Framework of Topographical Maps; Principles of Triangulation; Types of Triangulation (Topographical, Principal, Major and Minor)
3. Methods of Surveying: Chain and Tape: Equipments; Recording of Field Data; Tie Line; Principles and Uses; Open and Closed Traverse Surveying; Measuring against Obstacles; Drawing Procedures; Advantages and Disadvantages of Chain and Tape Survey, Plane Table Surveying; Equipments, Method of Preparation; Open and Closed , Traverse Surveying; Advantages and Disadvantages of Plane Table Survey, Prismatic Compass; Equipments, Data Recording and Plotting; Advantages and Disadvantages of the Survey
4. Introduction to Total Station Survey: Introduction to the machine; Setting up the machine; Methods of Angle Measurement; Methods of Coordinate Measurement; Principles of Operation.
5. Cross section and map (topographic, geologic and geomorphic) reading.

### **References:**

1. Blyth F.G.H. (1965) Geological Maps and their Interpretation. E. Arnold. UK.
2. Keats J.S. (1973) Cartographic Design and Production. Longman. UK.
3. Monkhouse F.J. & Wilkinson H.R. (1971) Maps and Diagrams. 3<sup>rd</sup> Edition. Methuen. UK.
4. Robinson A.H. (1953) Elements of Cartography. Wiley-Blackwell. US.
5. Shingh R.L. and Dutt P.K. (1979) Elements of Practical Geography. Students' Friends. India.

### **DSMHF: 115 Field Works and Reporting (Credit 02)**

This course will comprise of theory and field activities. Before going to the field the student will be taught how to conduct the research work collecting and analyzing the data recorded and registered in the field. The theory part will be taught simultaneously in the class room and in field. Mainly the course will consist of the following items:

The objective of this course is to introduce the students with the natural environmental system encompassing the geological and geographical phenomena and how to document them in the form of systematic report writing. Students will be taught on the basic geological and geographical field methods, procedures of field measurements, recording and preservation of data for further analysis. In addition, students will try to identify hazards and environmental problems of the study area using sociological tools

First year field work will be made in a hilly terrain for a period of 7-10 days. In case of geological data collection, the student will be taught how to measure the attitudes (Dip and Strike) of sedimentary beds, determine the lithology and relevant geological environment. In



case of geographical aspects, student will identify the general geomorphology, natural drainage system, populations, and overall settlement pattern as well as general socio-economic conditions of the dwellers.

Students have to face a viva voce and submit a field report after completion of field work.

### **References:**

1. Black J.A. & Champion D.J. (1976) Methods and Issues in Social Research. Wiley-Blackwell. US.
2. Compton R.R. (1962) Manual of Field Geology. Wiley-Blackwell. US.
3. Low J.W. (1957) Geological Field Methods. Harper. US.
4. May T. & Williams M. (1996) An Introduction to the Philosophy of Social Research. UCL Press. UK.
5. Moser C.A. & Kalton G. (1971) Survey Methods in Social Investigation. 2<sup>nd</sup> Edition. Heinemann Educational. UK.

### **DSMHT 201: Applied Differential Equation (Credit 02)**

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, 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 1<sup>st</sup> order differential equations
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).
4. Systems of linear differential equations, homogeneous and non homogeneous systems of linear differential equations with constant coefficients

### **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, 9<sup>th</sup> Edition, Willey and Sons
3. S.L. Ross. (1974) Differential Equation. Wiley-Blackwell. US.
4. Zill D.G. (2009) A First Course in Differential Equations with Applications. 9<sup>th</sup> Edition. Cengage Learning. India.

## **DSMHT 202: Geological and Hydro-meteorological Hazards (Credit 02)**

1. Introduction to Geological and Hydro-meteorological Hazards.
2. Geological Hazards  
Earthquakes (Causes, types and effects of Earthquakes) Tsunami & Seiches (Naming Tsunami Generation, Velocity and height, coastal effects and vulnerability)  
Volcanoes (Origin & types of volcanic hazards, volcanic eruptions and products) Mass Movement Dry (Factors controlling downslope movement; causes, classification and effects of mass movements), Land subsidence and sinkholes
3. Hydro-meteorological Hazard  
Riverbank Erosion (Causes and effects, early warning), Coastal Erosions (Coastal geomorphic features, beach erosion and replenishment), Flood: Definition, Causes, Types, Flood Mitigation Measures (structural, non-structural), Flood Action Plan (FAP), Mass movement (wet): (Landslide, Avalanche and subsidence: causes, classification, measurement and effects), Salinity Intrusion, Arsenic Contamination
4. Geological & Hydro-meteorological Hazards in Bangladesh.

### **References:**

1. Bell F.G. (1999) Geological Hazards. CRC Press. US.
2. Bird E. (2008) Coastal Geomorphology. 2<sup>nd</sup> Edition. Wiley-Blackwell. US.
3. Hyndman D. and Hyndman D. 2010. Natural Hazards and Disasters. 3<sup>rd</sup> Edition. Cengage Learning. India.
4. Kusky T.M. (2005) Encyclopedia of Earth Sciences. Infobase Publishing. New York. US.
5. Lutgens F.K. & Tarbuck E.J. (2013) Earth: An Introduction to Physical Geology. 11<sup>th</sup> Edition. Pearson. USA.
6. Plummer C., Carlson D. & Hammersley L. (2014) Physical Geology. 15<sup>th</sup> Edition. McGraw Hill. US.

## **DSMHT 203: Climatic Hazards and Climate Change (Credit 02)**

1. Climatic and Meteorological Hazards: origin, life cycle, types, effects and measurement:  
Extreme temperature, Drought, Fog, Polar Vortex, Wildfire (forest fire & land fire), Tropical Cyclone, Extra-tropical Cyclone, Local Severe Storms: Thunderstorms, Nor'westers, Tornadoes.
2. Climatic and Meteorological Data Source (National and International): Bangladesh Meteorological Department (BMD) and Bangladesh Space Research and Remote Sensing Organization (SPARRSO), WMO, etc.
3. Climate Change  
Introduction to Climate Change: Definition, Scope, Multidisciplinary Approaches  
  
Science of Climate Change: Milankovitch Cycle, Natural and Anthropogenic Factors, Greenhouse Gases (GHG) and Greenhouse Effects  
  
Evidence of Climate Change: Past (Proxy Data), Present (Human Perception, Marker Species, Instrumental Data), Future (Climate Modeling)

Global Atmospheric & Oceanic Circulation: General Circulation Model, El-Nino and La-Nina and Climate Change

Impact of Climate Change: Sector Issues in Regional and International Context (Agriculture, Energy budget, Society and Culture, Indigenous People, Disease, Extreme Events and Climatic Hazards, Sea-level Change, Climatic Induced International Migration etc)

Response to Climate Change: Adaptation and Mitigation Measures, Loss and Damage Issue in Global Climate Change Dialogue

National, Regional and International Response to Climate Change: International Treaties, Protocols, IPCC, and UNFCCC (COP: historical development, success and failure),

Climate Change and Climate Politics: Grouping among Countries (Annex I, Annex II, Non-Annex, OECD, EIT, AOSIS, LDC, etc), Clean Development Mechanism (CDM), Carbon Trading, National and Individuals Interest, Climate Ethics and Justice

Climate Change in the Context of Bangladesh: Climate Change and Bangladesh, Bangladesh Climate Change Strategic and Action plan, National Adaptation Program of Action (NAPA), Climate Fund Use and Misuse : National and International (BCCTF: Bangladesh Climate Change Trust Fund, BCCRF: Bangladesh Climate Change Resilient Fund)

## References:

1. Asian Development Bank (ADB) (1994) Climate Change in Asia: Bangladesh Country Report. Manila. Philippines.
2. Bankoff G., Frerks G.& Hilhorst D. (2004) Mapping Vulnerability: Disasters, Development, and People. Earthscan. UK.
3. Barrie Pittock (2009) Climate Change: the science, impacts and solutions, CSIRO Publishing.
4. Cook, K.H. (2013) Climate Dynamics. Princeton University Press.
5. Donner L., Schubert W.& Somerville R. 2011. The Development of Atmospheric General Circulation Models: Complexity, Synthesis and Computation. Cambridge University Press. UK.
6. Erda L., Bolhofer W.C., et al. (1996) Climate Change Vulnerability and Adaptation in Asia and the Pacific. Springer. Netherlands.
7. Farmer G.T. & Cook J. (2013). Climate Change Science: A Modern Synthesis. Volume - 1. Springer. Netherlands.
8. Hyndman D. and Hyndman D. (2010). Natural Hazards and Disasters. 3<sup>rd</sup> Edition. Cengage Learning. India.
9. Knight C.G. & Jäger J. 2009. Integrated Regional Assessment of Global Climate Change. Cambridge University Press. UK.
10. O'Neil B.C. et al (2001) Population and Climate Change. Cambridge University Press.
11. Pittock A. 2009. Climate Change: The Science, Impacts and Solution. 2<sup>nd</sup> Edition. Routledge. US.

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

#### **DSMHT 204: Chemical, Industrial and Technological Hazards (Credit 02)**

1. Introduction to manmade hazards.
2. Types: engineering failure, fire hazard, nuclear hazard, chemical explosion, water logging, civil unrest & war, transportation accident, mine hazards, blow out, terrorism; Causes and their effects.
3. Flammable chemicals; Ignition and propagation of a flame front, Control measures, Fire extinguishment, Fire precautions.
4. Reactive chemicals; Water-sensitive chemicals, Toxic hazards from mixtures, Reactive hazards from mixtures, Oxidizing agents, Explosive chemicals, General principles for storage, Hazards arising in chemicals processing.
5. Radioactive chemicals; Hazards, Types of radiation, Control measures
6. Environmental Pollution, Hazardous Wastes
7. Reuse, Recycling, Resource Recovery
8. Industrial hazards, Work place, Work place health and safety
9. World's Worst Manmade & Technological Hazards: Bhopal Gas Tragedy (1985), Chernobyl Tragedy, Fukushima Meltdown, The Gulf of Mexico Blowout, The Love Canal Tragedy, Exxon Valdez Oil Spill, Twin tower collapse, Banqiao dam failure, Rana Plaza tragedy, Nimitoli tragedy, Syria Chemical Weapons etc...
10. Manmade Hazards: Bangladesh Context, Addressed Part in National Policies

#### **References:**

1. Carson P. and Mumford C. (1994) Hazardous Chemicals Handbook. Butterworth-Heinemann. Oxford. UK.
2. Davamani V. (2012) Technologies for Sustainable Green Environment. NIPA. India.
3. Dickenson et al (1999) Fire Service Emergency Care, Prentice Hall
4. Kevin Cassedy (1953) Fire Safety and Loss prevention, BH Publication
5. Jeremy Stranks (2012) Health and Safety at Work, Kogan Page
6. Macaulay T. (2008) Critical Infrastructure: Understanding its Component Parts, Vulnerabilities, Operating Risks, and Interdependencies. CRC Press. US.
7. Paul B.K. (2011) Environmental Hazards and Disasters. Wiley-Blackwell. US.
8. Schlager N. (1995) Breakdown: Deadly Technological Disasters. McGraw-Hill. US.
9. Shah V. (2009) Emerging Environmental Technologies. Springer. Netherlands.
10. Ruth F. Weiner (2003) Environmental Engineering. Elsevier Publication

### **DSMHT 205: Biological Hazards and Public Health (Credit 02)**

1. Introduction, types and causes behind biological hazards.
2. Human epidemics, livestock or animal epidemics, plants and agricultural epidemics.
3. Biological agents- Bacteria, Virus, Fungi, Zoonoses etc.
4. Psychosocial hazards-disaster trauma, occupational stress, workplace violence.
5. Public Health and its role in Disaster Management: Public health systems, Health promotion and disaster prevention, integrated approach.
6. Areas of Public Health: Community and Family Health, Global Health, Environmental and Occupational Health, Epidemics.
7. Identifying Socio-Psychological Needs in Mass Emergency: Global assessment of Needs and Priorities, Area specific requirements, Psychological Characteristics of Disaster Management, Different psychological considerations in natural and manmade disasters.
8. Environmental Impacts on Reproductive Health and Fertility
9. Health Policy and Management: Public Health Practices, Public Health Emergencies in large populations

#### **References:**

1. Adamowski K. (1998) Creating Excellence in Crisis Care. Wiley-Blackwell. US.
2. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK
3. Fallon L.F. & Zgodzinski E. (2011) Essentials of Public Health Management. 3<sup>rd</sup> Edition. Jones & Bartlett Learning. US.
4. Hodgkinson P.E. & Stewart M. (1998) Coping With Catastrophe: A Handbook of Post Disaster Psychological After Care. Routledge. UK.
5. Miller J. (2012) Psychosocial Capacity Building in Response to Disasters. Columbia University Press. US.
6. Noji E.K. (1996) The Public Health Consequences of Disasters. Oxford University press. UK.
7. Tracery J. Woodruff (2010) Environmental Impacts on Reproductive Health and Fertility, Cambridge Press

### **DSMHT 206: Introduction to Computer Sciences and Programming (Credit 02)**

Introduction to programming concept: Algorithms, flowchart and pseudocodes, function concept, the main function; elementary data types; different types operators and expression; statements-assignment statement, conditional statement; loop control constructs-while loop, for loop; array and pointer; data structures; command level argument passing; file I/O- input and output functions, programming.

Math lab concept: Math and computation, algorithm development, data acquisition, data analysis, exploration, and visualization

## **References :**

1. Harvard Shielt ( ) Teach Yourself C, Mcgraw Hill
2. Martin H. Trauth (2015) Matlab Recipe for Earth Sciences, Springer
3. The MathWorks, MathLab Simulink Student version manual - MathLab online book, Addition -MathLab , 2005.

### **DSMHL 207: Hazard Analysis Lab. (Credit 02)**

Frequency analysis, Intensity and Magnitude Determination, Hazard Profiling, Analysis of Physical Hazard Parameters, F-N Curve, Technological Hazard Analysis

### **DSMHL 208: Environmental Pollution Lab (Credit 02)**

Laboratory studies based on course DSMHT: 204

### **DSMHV 209: Viva vocé (Credit 02)**

Comprehensive oral examination of the courses taught.

### **DSMHT 210: Seismology and Geodesy (Credit 03)**

1. Seismicity and Earthquake; Brief History of Seismology; Historical & Instrumental Seismicity; Seismic Waves
2. Wave Propagation: waves in unbounded area, waves in a semi-infinite body, waves in layered body
3. Seismogram & Seismographs; Earthquake Magnitude and Intensity; Earthquake Magnitude, Depth & Location Calculation; Magnitude Saturation
4. Seismic Sources: Isotropic, Double Couple and CLVD
5. Focal Mechanism; Moment Tensor and Moment Tensor Inversion
6. Attenuation: Geometrical Spreading, Scattering, Multi-pathing, anelasticity; Green Function; Anisotropy
7. Earthquake Prediction; Electromagnetic Fields generated by Earthquakes; Paleoseismicity; Earthquake-related Hydrological and Geochemical Changes; Seismicity In and Around Bangladesh
8. Seismic Sensors: Seismometers, Accelerometers; Sensor Calibration; Seismic Networks and Data Formats
9. Geodesy: Basic Concepts of Geodesy, Scope of Geodesy; GPS: DGPS/cGPS; InSAR; GPS Constellation and Signals; Satellite Clocks and Time; Error Sources; Geodetic Coordinate System
10. Integration of Datasets: Seismology & Geodesy

## **References:**

1. Kramer S.L. (1996) Geotechnical Earthquake Engineering. Prentice Hall.UK.
2. Lee W.H.K. & et al. (2002) International Handbook of Earthquake and Engineering Seismology. Academic Press. UK.

3. Leon Reitter (1991) Earthquake Hazard Analysis: Issues and Insights. Columbia University Press, New York
4. Müller J. & Torge W. (2012) Geodesy. De Gruyter. Germany.
5. P. Borman (2002) New Manual on Seismological Observatory Practice. A GFZ Publication
6. Seth Stein & Michael Wyssession (2012) An Introduction to Seismology, Earthquakes and Earth Structures. Blackwell Publication
7. Smith J.R. (1997) Introduction to Geodesy: The History and Concepts of Modern Geodesy. Petersfield. UK.
8. Yeats R.S., Sieh K. and Allen C.R. (1996) The Geology of Earthquakes. Oxford University Press. UK.

### **DSMHT 211: Fundamentals of Built Environment (Credit 04)**

1. Built Environment: Introduction and its components.
2. Structural forms and systems for buildings, bridges, communication and transmission structures.
3. Types of construction materials - steel, reinforced and prestressed concrete etc;
4. Physical and chemical properties of built materials.
5. Loads on structures; types of foundation, concept of bearing capacity, settlement.
6. Impact of Built Environment on Health, sustainable design, towards environment friendly built environment.
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.
8. Building Construction Considering Energy Efficiency and Safety

#### **References:**

1. Bangladesh Housing and Building Research Institute. 1993. Bangladesh National Building Code.
2. Chan A.P.C. & Cheung E. 2014. Public Private Partnership in International Construction. Taylor & Francis Group. US.
3. Douglas J. and Ransom B. 2013. Understanding Building Failures. 4<sup>th</sup> Edition. Taylor and Francis. US.
4. Johnston S.A., Nicholas S.S. and Parveen J. 2013. The Guide to Greening Cities. 2<sup>nd</sup> Edition. Island Press. US.
5. Punmia B.C., Jain A.K. & Jain A.K. 2005. Comprehensives Basic Civil Engineering. Laxmi Publications. India.
6. Tymkow P., et al. 2013. Building Services Design for Energy Efficient Buildings. Routledge. UK.
7. Dowrick D.J. 2009. Earthquake Resistant Design & Risk reduction. 2<sup>nd</sup> Edition. Wiley-Blackwell. US.

## **DSMHT 212: Numerical Analysis and Sampling Techniques (credit 03)**

1. Introduction: Basic concepts of sampling, sampling frame, sample versus census, requirements of a good sample, selection bias, measurement bias, sampling and non-sampling errors, probability and non-probability samples, types of probability samples.
2. Simple Random Sampling: Simple random sampling, estimates of population characteristics and their standard errors, confidence intervals, sampling for proportions, sample size estimation for means and proportions.
3. Systematic sampling: estimating population characteristics, systematic sampling in some special populations.
4. Stratified Sampling: Definition and basic ideas, theory of stratified sampling, allocating observations to strata, defining strata.
5. Cluster sampling with equal probabilities: Notation for cluster sampling, one-stage cluster sampling, two-stage cluster sampling, designing a cluster sample.
6. Concept of Numerical Mathematics: Difference table, finite difference operators, interpolation and extrapolation.
7. Interpolation and inverse interpolation: uses of Newton's forward and backward interpolation formula; Lagrange's formula, subdivision of intervals, divided differences.
8. Numerical integration: Simpson's rule, Weddle's rule, trapezoidal rule, Gauss's quadratic formulae.
9. Solution of transcendental equations: method of interpolation or of false position, Newton-Raphson method, method of iteration.

### **References:**

#### **Texts (Sampling Techniques)**

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

#### **Texts (Numerical Analysis)**

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



### **DSMHT 213: Principles of Remote Sensing (Credit 02)**

1. Introduction; Scope; Concepts and Principles of Remote Sensing; Air- and Space-borne.
2. Electromagnetic Radiation and Its Interaction with Atmosphere and Earth Surface
3. Sensors, Sensor Types and Sensor Characteristics
4. Pre-processing: Visualization and Radiometric Operation; Image Enhancement, Correction Data for Imperfection of Sensor, Atmospheric Correction
5. Visual Image Interpretation; Digital Image Classification
6. Rectification and Terrain Analysis; Georeferencing, Geocoding , DEM & DSM
7. Remote sensing application in Disaster Science & Management

#### **References:**

1. Lillesand T.M., Kiefer R.W. and Chipman J.W. (2004) Remote Sensing and Image Interpretation. 5<sup>th</sup> edition. Wiley-Blackwell. US.
2. ITC (2010) A Core Book Of Geo-information Science and Earth Observation: A System based Approach.
3. Rashed T. and Jurgens C. (2010) Remote Sensing of Urban and Suburban Areas. Springer. Netherlands.
4. Weng Q. (2009) Remote Sensing & GIS Integration: Theories, Methods and Applications. McGraw Hill. US.

### **DSMHT 214: Geographic Information Systems (GIS) and Database Management (Credit 03)**

1. Introduction to GIS  
Development of GIS, Scope
2. Data and Information  
Data Type, Typology: Spatial Relationship
3. Map Projection and Coordinate System  
Reference Surface for Mapping, Map Projections, Coordinate Transformations
4. Data Entry and Preparation  
Data Acquisition, Digitizing from Existing Documents, Data Preparation
5. Data Retrieval and Database Management  
Tuple Selection, Attribute Projection, Query Definition: SQL & JSP
6. Network and Network Analysis
7. Vector Analysis  
Overlay: Intersect, Clip & Overwrite; Neighborhood Operation: Buffer and Thiessen Polygon
8. Raster Analysis  
Measurement: Location, Distance, Area Size, Classification, Overlay: Arithmetic Operation, Comparison Operators, Logical Operators, Conditional Expressions, Decision Tables

9. Data Quality: Accuracy & Precision
10. Visualization and Presentation
11. Application of GIS in Disaster Management

#### **References:**

1. Bonham-Carter G.F. (1991) Geographic Information Systems for Geoscientists: Modeling with GIS. Elsevier. UK.
2. Brimicombe A. (2009) GIS, Environmental Modeling and Engineering. 2<sup>nd</sup> Edition. CRC press. US.
3. Campagna M. (Ed.) 2006. GIS for Sustainable Development. CRC press. US.
4. Decker D. 2001. GIS Data Sources. Wiley-Blackwell. US.
5. Healey R.G. (1991) Database Management Systems. In Manguire D.J. et al (ed.). Geographical Information Systems: Principles and Technical Issues. Wiley-Blackwell. US.
6. ITC (2010) A Core Book of Geo-information Science and Earth Observation: A System based Approach.

#### **DSMHL 215: Remote Sensing Lab. (credit 02)**

Laboratory studies based on course DSMHT: 213

#### **DSMHL 216: GIS Lab. (credit 02)**

Laboratory studies based on course DSMHT: 214

#### **DSMHF 217: Field Works and Reporting (credit 02)**

Fieldwork in a suitable area in order to study methods of hazard mapping and systematic sampling. Each student shall submit a written report and defend their field findings

#### **DSMHT 301: Mitigation, Prevention and Preparedness (credit 04)**

1. Mitigation and Preparedness for Resilient Communities, Mitigation Strategies, The Value of Mitigation and Preparedness.
2. Preparedness Activities: the role of preparedness in the Disaster Management Cycle, resource relevant to preparedness, obstacles to preparedness, government preparedness (planning, exercise, training, equipment etc), public preparedness (emergency awareness and education, early warning, media as a public educator)
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. Hazard Specific Mitigation and Preparedness Measures.

#### References:

1. Carter W.N. 1991. Disaster Management: A Disaster Managers Hand Book. Asian Development Bank. Manila.
2. Coppola D.P. & Maloney E.K. (2009) Communicating Emergency Preparedness: Strategies for Creating a Disaster Resilient Public. Auerbach Publications. US.
3. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK.
4. Schwab A.K., Eschelbach K. & Brower D.J. (2006) Hazard Mitigation and Preparedness. Wiley-Blackwell. US.

#### DSMHT 302: Vulnerability and Risk Assessment (Credit 03)

1. Scope of Vulnerability and Risk Assessment
2. Hazard Identification Tools, Hazard Assessment, Natural and Technological Hazard Assessment
3. Vulnerability Assessment, Components and Characteristics of Vulnerability, Conceptual Frameworks of Vulnerability, Vulnerability Assessment Methods.
4. Elements at Risk, Types of Elements at Risk, Exposure Analysis
5. Risk Evaluation, Risk perception, Risk Transfer
6. The purpose of Risk Assessment, Qualitative and Quantitative Approach of Risk Assessment/Risk Estimation
7. Risk Modeling : Concept and Steps, Risk Modeling Tools (e.g. HAZUS, CAPRA, OpenQuake).
8. Environmental Impact Assessment (EIA), Social Impact Assessment (SIA) and Hazard Impact Assessment (HIA) Framework and Methodology
9. Hazard Specific Vulnerability & Risk Assessment Procedures; Multi-hazard Risk Assessment

#### 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. Ostrom L.T. & Wilhelmsen C.A. (2012) Risk Assessment: Tools, Techniques and Their Application. Wiley-Blackwell. US.
4. Schneider S.K. (2011) Dealing with Disaster: Public Management in Crisis Situations. 2<sup>nd</sup> Edition. M.E. Sharpe. US.
5. Schumann A.H. (2011) Flood Risk assessment and Management. Springer. Netherlands.
6. Wisner B. (2004) At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge. US.
7. Westen et al (2011), A Guidebook of Multi-hazard Risk Assessment, Public Works

### **DSMHT 303: Geophysical Application: Principles and Practices (Credit 02)**

1. Introduction, Scope and Objectives of Geophysics, Disciplines of Geophysics: Active and Passive Methods.
2. Physical properties of earth materials: stress and strain; Young's modulus, shear and bulk modules; Poisson's ratio; P and S waves; surface waves; seismic velocity; acoustic impedance, ground acceleration etc.
3. Basic Concepts of the Seismic Method: Snell's law; wave fronts; ray paths; reflection and transmission coefficients; elastic constants.  
Seismic Refraction –Basic Theory  
Physical basis of refraction; head waves; critical angle; travel time equation for simple plane horizontal layer model; extension of travel time equation to multiple layers; ambiguities arising from dipping layers.  
Seismic Reflection-Basic Theory  
Geometry of reflection; travel-time equation; normal moveout; reflection records; seismic sections.
4. Introduction, Principles and Scope of Gravity, Magnetic, Electrical and Resistivity methods.
5. Theory and Applications of Shallow Seismic Investigation Tools: GPR, PS Logging, MASW, Microtremor etc.

#### **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. 4<sup>th</sup> Edition. McGraw-Hill. US.
3. Howell B.F. (1959) Introduction to Geophysics. McGraw-Hill. US.
4. Keller C.V. & Frischnecht F.C. (1966) Electrical Methods in Geophysical Prospecting. Pergamon. Oxford.
5. Kearey and Brooks (1984) An Introduction to Geophysical Exploration, Blackwell Publication
6. Milsom J.J. and Eriksen A (2011) Field Geophysics. 4<sup>th</sup> Edition. Wiley-Blackwell. US.
7. Reynolds J.M. (1997) An Introduction to Applied and Environmental Geophysics. Wiley-Blackwell. US.
8. Stacey F.D. & Davis P.M. (2008) Physics of the Earth. 4<sup>th</sup> Edition. Cambridge University Press. UK.
9. Telford W.M., Geldart L.P. & Sheriff R.E. (1990) Applied Geophysics. 2<sup>nd</sup> Edition. Cambridge University Press. UK.

### **DSMHT 304: Geotechnical Application: Principles and Practices (Credit 02)**

1. Introduction & Scope.
2. Dynamic Soil Properties, Soil & Rock Mechanics, Measurement of Dynamic Soil Properties (Field tests & Laboratory tests), Index Properties (porosity, moisture content, Atterberg limits, Specific Gravity, Density, Unit Weight)
3. Strength of Natural Materials: Normal, Shear and Tensile Strength; Strength Measurement (Unconfined, Point Load, Tensile Strength Tests); Mohr Circles
4. Deformation and Deformation Types (elastic, plastic, brittle)
5. Soil Improvements: Densification Techniques, Reinforcement Techniques, Grouting and Mixing Techniques, Drainage Techniques, Verification of Soil Improvement, Retaining Walls
6. Geotechnical Hazards: Liquefaction, Subsidence etc.
7. Site Characterization: In situ Geotechnical Tests; Geotechnical Soil Classification

### **References:**

1. Chen W.F. & Lui E.M. (2006) Earthquake Engineering for Structural Design. CRC Press. US.
2. Coduto D.P., Yeung M.C. & Kitch W.A. (2011) Geotechnical Engineering. 18<sup>th</sup> Edition. Pearson. US.
3. Kramer S.L. (1996) Geotechnical Earthquake Engineering. Prentice Hall. US.
4. Kumar K. (2008) Basic Geotechnical Earthquake Engineering. New age International Publishers. India.
5. McDowell P.W., Barker R.D., et al. (2002) Geophysics in Engineering Investigations. Geological Society of London and CIRIA. UK.
6. Paul D.K. & Sharma M.L. (2006) Earthquake Engineering. Elite Publishing House. India.

### **DSMHT 305: Urban and Regional Planning: Risk Mitigation Concept (Credit 04)**

1. Definition, objective and scope of urban planning. Urban functions, activities and land use components. Modern principles of planning—town centre, residential area, recreational area, industrial area, commercial area, transportation network, metropolitan region, satellite town, new town, special areas like airport, seaport, railway station, bus terminal.
2. Distinction between urban and rural areas. Analysis of rural settlement patterns. Social and cultural characteristics of rural communities. Meaning of rural development. The concept, nature and scope of integrated rural development. Integration of functional and spatial aspects in the context of rural development. Planning procedures for integrated rural development
3. Regionalization and the delineation of planning region, Levels of planning - national, regional, sub-regional and local. Need and scope of regional planning. Steps of planning.
4. Risk Components in Urban and Rural Planning

5. Risk Reduction Issues in Urban and Rural Planning, Integration of Risk Information into planning.

### **References:**

1. Dewberry L.N. & Davis. (2008) Land Development Handbook. 3<sup>rd</sup> Edition. McGraw-Hill. US.
2. George C.K. (2007) Basic Principles and Methods of Urban and Regional Planning. 3<sup>rd</sup> Edition. Libro-Gem Books. Lagos.
3. Hall P. & Jones M.T. (2010) Urban and Regional Planning. 5<sup>th</sup> Edition. Routledge. UK.
4. Institution of Civil Engineers. (1995) Megacities: Reducing Vulnerability to Natural Disasters. Thomas Telford. UK.
5. Vale L.J. & Campanella T.J. (2005) The Resilient City: How Modern Cities Recover from Disasters. Oxford University Press. UK.

### **DSMHL 306 Disaster Statistics Lab. (Credit 02)**

Use of Statistical Tools in Disaster Science and Management: R, SPSS

### **DSMHL 307: Risk Sensitive Land use Planning Lab (Credit 02)**

Disaster Risk Reduction Enhanced Land Use Planning (LUP), Importance of Disaster Risk Information in LUP, Steps adopted in Disaster Risk Sensitive Land Use Planning (DRSLUP) - identifying the existing land use pattern, disaster risk assessment, vulnerability assessment, hazard characterization, consequence analysis, risk estimation, risk evaluation, mainstreaming disaster risk assessment result in LUP, Land use planning options, Enabling environment for incorporating disaster risk information in LUP, Application of GIS and RS in LUP mapping.

### **DSMHV 308: Viva vocé (Credit 02)**

Comprehensive oral examination of the courses taught.

### **DSMHT: 309 Disaster & Development: Economic Concept (credit 03)**

1. Introduction; Basic understanding of development; Evolution of development theories, sustainable development, human development; Vulnerability and underdevelopment; Relationship between development and disaster.
2. The fundamentals of economics; Introducing economic way of thinking; Applying graphs to economics; Production possibilities 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).
4. Macroeconomics fundamentals; Measuring the size of 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.
5. Human development index; Basic concept of Human development; Calculation of the individual and gross index; Evolution of the index.
6. Disaster & development industry in Bangladesh; Impact of disaster on microeconomic and macroeconomic indicators of Bangladesh; Cost-benefit analysis of disasters.
7. Global development strategies and disaster management, SDGs, SFDRR; International development and humanitarian industry.
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).

## References:

1. Asian Disaster Preparedness Center (ADPC) (2012) Natural Disasters and Development (Module 2). Regional Training Course on Pre-Disaster Natural Hazard Loss Estimation. Bangkok. Thailand.
2. Collins A.E. (2009) Disaster and Development. Routledge. UK.
3. Hansjurgens B. & Antes R. (2008) Economic & Management of Climate Change: Risk, Mitigation & Adaptation. Springer. Netherlands.
4. Oliver M.J. & Aldcroft D.H. (2007) Economic Disasters of the Twentieth Century. Edward Elgar publication. UK.
5. Tietenberg T. & Lewis L. (2009) Economic Development and Environmental Gain. 6<sup>th</sup> Edition. Prentice Hall. US.
6. Chiang, Alpha. C and Wainwright (2005), Fundamental Methods of Mathematical Economics. 4th Edition. New York: McGraw-Hill.
7. Samuelson, Paul A., and Nordhaus, William (2001), Economics, 17th Edition. New York: McGraw-Hill.
8. Salvatore, Dominick (2004), Microeconomic Theory. Schaum's Outline Series. 3rd Edition. New York: McGraw-Hill,
9. Bankoff G. (2004) Cultures of Disaster: Society and Natural Hazard in the Philippines. Routledge. US.

10. Gilbert Rist. (2004) The History of Development: From Western Origins to Global Faith. Zed Books. Chicago
11. Todaro M.P. & Smith S.C. (2015) Economic Development. 12TH Edition. Pearson Higher Education. USA.

### **DSMHT 310: Seismic Risk Reduction Approach (Credit 03)**

1. Earthquake Vulnerability: qualitative measures of vulnerability and quantitative measures of vulnerability; vulnerability of different classes of building, vulnerability of contents of buildings, damage models as functions of ground motion measures, microzoning effects on vulnerability functions, upper and lower bounds on vulnerability, earthquake risk reduction potential, human vulnerability to casualties, inter-earthquake effects.
2. Seismic Response of Soils and Structure
3. The design and construction process- choice of form and materials, seismic design of foundations and soil-retaining structures, design and detailing of new structures for earthquake ground shaking, earthquake resistance of services, architectural detailing for earthquake resistance, Retrofitting.
4. Earthquake Risk Modeling and Management: earthquake risk modeling, business interruption, reduction of business interruption, Planning for Earthquakes, earthquake insurance, earthquake risk management in developing countries, impediments to earthquake risk reduction.
5. Seismic Hazard Analysis, Seismic Slope Stability Analysis, Liquefaction Susceptibility analysis.

### **References:**

1. Balassanian S., Cisternas A. & Melkumyan M. (2000) Earthquake Hazard and Seismic Risk Reduction, Series: Advances in Natural and Technological Hazards Research. Springer. Netherlands.
2. Bozorgnia and Bertero. Earthquake Engineering: From Engineering Seismology to Performance based Engineering, CRC Press
3. Dowrick D. (2009) Earthquake Resistant Design and Risk Reduction. 2<sup>nd</sup> Edition. Wiley-Blackwell. US.
4. Kramer S.L. (1996) Geotechnical Earthquake Engineering. Prentice Hall. US.

### **DSMHT 311: Hydro-meteorological Risk Reduction Approach (Credit 03)**

1. Hydrometeorological Hazard modeling & Risk Assessment: An introduction
2. Physical, Social, Economic and Environmental Vulnerability of flood, drought, cyclone and river bank erosion
3. Flood/ Riverine hazard



People and Livelihood Related to River and Flood Consequences of Development in flood plains, Recurrence Period/Flood Frequency curves, Flood types; their characteristics and associated vulnerabilities, Causes of Flood, Flood Modelling, Impacts of climate and rainfall, soil, catchment hydrology and water balance model

Elements at risk, flood risk assessment, risk reduction: Structural and Nonstructural Measures

Watershed Management Integrated River Basin Management, Integrated Flood Management, Implementation Plan and Monitoring, Trans-boundary International River Laws, Policies and Organizations, FAP, Water Policy of Bangladesh, Farraka Barrage and Bangladesh, Flood Forecasting

4. Riverbank Erosion: Causes, Contributing factors, types of failures, Riverbank Protection Measures, Riverbank erosions in Bangladesh: Scenario and practices
5. Coastal Hazards (Tsunami, Coastal Flooding, Coastal Storms, Coastal Erosion, Accretion, Saline Water Intrusion, Sea Level Rise, Land subsidence), Required dataset, frequency, Coastal Hazard Vulnerability Assessment, Mitigation Measures, Early warning, Integrated Coastal Zone Management.
6. Introduction to Mountainous Hazards, Overview of Mountainous Vulnerability Assessment and Risk Reduction.  
Estimating the probability of landslides, Estimating the Consequences, Landslide Vulnerability assessment, evaluation & quantifying landslide risks. Mountainous Risk Reduction Methods (Structural and Non structural: Monitoring, Prediction and Early warning; Engineered Structures; Geophysical tools in Mountainous Hazard investigation; Education, Capacity Building and Public Awareness).  
Landslide risk reduction initiatives in Bangladesh
7. Arsenic Contamination in Groundwater of Bangladesh and Mitigation options

## References:

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. Bilibana. Island Press. US.
3. Diaz H.F. & Markgraf V. (2000) El Niño and the Southern Oscillation: Multiscale Variability and Global and Regional Impacts. Cambridge University Press. UK.
4. Finkl C.W. (Ed.) (2013) Coastal Hazards. Springer. Netherlands.
5. Glade T. et al (Ed.) (2005) Landslide Hazard and Risk. Wiley-Blackwell. US.
6. Lee E.M. & Jones D.K.C. (2004) Landslide Risk Assessment. Thomas Telford Publication. UK.
7. Ministry of Water Resources, Government of the People's Republic of Bangladesh. (2005) Bangladesh Coastal Zone Policy. Bangladesh Secretariat. Dhaka.
8. Sassa K. & Canuti P. (2008) Landslides-Disaster Risk reduction. Springer. Netherlands.

9. 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.
10. United Nations Environment Programme (UNEP). (2005) Assessing Coastal Vulnerability: Developing a Global Index for Measuring Risk.
11. Wallendorf L. et al. (2011) Solutions to Coastal Disasters 2011. ASCE Publications. US.
12. Westen C.J. et al: Multi-hazard Risk Assessment, ITC
13. WMO ( 2008). Guide to Hydrological Practices, WMO.

### **DSMHT 312: Population, Migration and Shelter Management (Credit 02)**

1. Demographic Factors and Processes  
Fertility, Mortality, Migration, Marriage and Nuptiality, Life Expectancy, Birth Rate, Death Rate etc
2. Population Distribution and Density  
Population Distribution, Population Density, Factors Affecting Population Density and Distribution (Physical, Economic, Political and Social)
3. Population Growth, Demographic Theories and Model  
Population Growth, Malthus Theory, Demographic Transition Model, Optimum Population Theory etc.
4. Population and Resources: Population Resource or Burden, Optimum Population, Over Population, Under Population
5. Migration  
Migration, Types of Migration (Internal Migration, External Migration, Emigration, Immigration, Voluntary Migration, Population Transfer or Involuntary or Forced Migration, Impelled or Reluctant or Imposed Migration, Return Migration, Seasonal Migration), People Who Migrate (Emigrant, Immigrant, Refugee, Internally Displaced Person or IDP), Determinant or Factors of Migration (Push Factors and Pull Factors: Environmental, Political, Economic, Cultural), Rural-Urban Migration, Impact of Migration: Diffusion, Assimilation, Acculturation,; Migration Theories
6. Urban and Rural Population, Population Policies, Population and Disaster.
7. Environmental Migration: definitions, types & patterns.
8. Environment induced Internal Migration: disaster and migration, the characteristics of migrants, changing livelihoods, IDPs- Asian & African cases and effects of migration on urbanization: Examples of Bangladesh.
9. Environment & climate induced International Migration: Asian & African cases
10. Climate Change induced Environmental Migration: population response to cyclones, floods, and river bank erosion: Examples of Bangladesh
11. Gender Dimension of Environmental Migration: The impacts of climate change on women.
12. Introduction: Definition, Causes behind Refugee, Environmental Refugees.

13. Managing Migration- Role of different Organizations (UNHCR, IOM, ILO, BMET, BOESL)
14. Causes behind Refugee in Bangladesh and Refugee Management in Bangladesh.

### **References:**

1. Afifi T. & Jager J. (2010) Environment, Forced Migration and Social Vulnerability. Springer. UK.
2. Clarke J.I. (1965) Population Geography. Pergamon Press. Oxford. UK.
3. Edwards A. & Ferstman C. (2010) Human Security and Non-Citizens: Law, Policy and International Affairs. Cambridge University Press. UK.
4. Finnemore M. & Sikkink K. (1998) International Norm Dynamics and Political Change. International Organization, 52, pp. 887-917.
5. Guinness P. (2002) Migration: Access to Geography. Hodder & Stoughton. UK.
6. Hornby W.F. & Jones M. (1993) An Introduction to Population Geography. Cambridge University Press. UK.
7. Lucas D. & Meyer P.A. (1994) Beginning Population Studies. Australian National University.
8. Preston S., Heuveline P. & Guillot M. (2001) Demography: Measuring and Modeling Population Processes. Wiley-Blackwell. US.
9. Thomas B. (1972) Migration and Urban Development. Methuen and Co. Ltd. UK.

### **DSMHT 313: Community based Risk Assessment and Planning: Theory and Practices (Credit 03)**

1. Most Vulnerable People in Disaster: Issues and Concerns, Social Exclusion and Vulnerabilities.
2. Social Exclusion Analysis framework, Guidelines for Gender Sensitive Risk reduction Measures.
3. Tools of Community Based Risk Assessment (CBRA): Hazard Mapping, Social Mapping, Community Rural Appraisal, Transect Walk, Seasonal Calendars, Historical time line, Focus Group Discussion, Venn diagram, Vulnerability Matrix.
4. Introduction and Purpose of Urban Risk Reduction (URA). Difference between URA & CRA.
5. Participants of URA, Steps of URA & Framework for URA
6. Participation of Stakeholders in CBRA, Role of Local authority in Community based Disaster Risk Management.
7. Bottom Up Inclusive Participatory Approach, Stakeholder Participation, PGIS, Volunteered Geographic Information (VGI).

8. Application of GIS and RS techniques in Citizen Science
9. Case Studies of CBRA: Best Practices

## **References:**

1. ADPC, Plan Bangladesh & Islamic Relief Worldwide. (2010) Urban Risk Assessment: A Facilitator's Guidebook.
2. Ministry of Food & Disaster Management, Government of the People's Republic of Bangladesh. (2009) Practicing Gender and Social Exclusion in Disaster Risk Reduction. Dhaka. Bangladesh.
3. Map Action (2011) Field Guide to Humanitarian Mapping
4. UN-HABITAT (United Nations Human Settlement Program) (2007) Enhancing Urban Safety and Security: Global Report on Human Settlements 2007. EarthScan Publication. London.

## **DSMHT 314: Inequality and Disasters (Credit 02)**

1. Inequalities in Societies: Definition, Theory and Causes of Inequalities, (Economic, Gender, Disabilities, Political, Socially Exclusive Groups, Ethnicity, Religion, Minority, Class and Caste System, Age, Nationality etc)
2. Social Stratification: Definition, Causes and Consequences, Theory: Marxist, Weber's Model
3. Disasters & Gender:  
 Concepts & Definitions,  
 Gender-disaster relationship: Spatial, Social, and Economic  
 Causes of Gender Vulnerability, Women in Culture and Society, Assessing Women's Disaster Resilience, Women organizing to reduce Risk  
 Gender Vulnerability to natural hazards: Social vulnerability, Economic vulnerability  
 Impact of different disasters: Natural disasters: floods, cyclones, river bank erosion, draughts and earthquakes, urban disasters: Fire hazards  
 Disaster and Health (Reproductive & Communicable): During Disaster, After Disaster  
 Disaster and Security: Personal security (During & After), Food security (During & After), Economic security (During & After)  
 Gender Resilience & Coping: Immediate strategy, Long term strategy
4. Disabilities (Mental and Physical) and Disaster
5. Socially Exclusive Groups and Disaster
6. Class and Caste System (Race/Ethnicity, Religion, Minority) and Disaster.
7. Age Inequality and Disasters
8. Inequalities and Health Issues in Disaster (Mental and Physical)
9. Social Inequalities and Responses, Relief and Rehabilitation in Disaster

10. Inequalities and Disaster Risk Reduction Measures: Pre, During and Post Disaster Phase; Mainstreaming Inequality Issues in Disaster Risk Reduction;
11. Social Safety Net/Socio-Economic Safety Net Program
12. Policy, Planning and Legal Aspects of Inequality Issues in Disaster
13. Inequalities inclusive Disaster Risk Reduction
14. Theoretical Interpretations of Inequality: From Classical to Post Modern Approach
15. Measurement of Inequality in Societies
16. Inequality, Poverty and Disasters

## References

1. Babones S.J. (2009) Social Inequality and Public Health. Policy Press. UK.
2. Brunsma D.L., et al. (2007) The Sociology of Katrina: Perspectives on a Modern Catastrophe. Rowman & Littlefield. Maryland. US.
3. Butler T. & Watt P. (2006) Understanding Social Inequality. Sage. UK.
4. DeFronzo J. (2011) Revolutions and Revolutionary Movements. 4<sup>th</sup> Edition. Westview Press. US.
5. Ennals R. (2007) From Slavery to Citizenship. Hoboken. US.
6. Kerbo H. R. (2009) Social Stratification and Inequality. McGraw-Hill. US.
7. Marger M. (2013) Social Inequality: Patterns and Processes. 13<sup>th</sup> Edition. McGraw-Hill. US.
8. Neckerman K. (2004) Social Inequality. Russell Sage Foundation. US.
9. PPRC & UNDP. (2011) Social Safety Nets in Bangladesh, Review of Issues and Analytical Inventory: Volume I. Dhaka. Bangladesh
10. Price T.D. & Feinman G.M. (1995) Foundations of Social Inequality (Fundamental Issues in Archaeology). Vol. 1. Springer. US.

## DSMHL 315: Risk Reduction Lab. (Credit 03)

Laboratory studies based on course DSMHT: 302, DSMHT: 310 & DSMHT: 311.

## DSMHF 316: Field Works and Reporting (Credit 02)

The objective of the field works is to prepare vulnerability and risk maps based on the field investigations and using GIS and RS as well as proposing risk reduction measures (structural and non-structural) considering the gravity of the risk.

## **DSMHT 401: Response, Recovery and Rehabilitation (Credit 04)**

1. Framework and Approaches of Response and Recovery
2. Recognition of Pre-disaster Actions; warning and evacuation, pre-positioning of resources and supplies, last-minute mitigation and preparedness measures.
3. Recognition of Post Disaster Actions; search and rescue, First Aid medical treatment, Evacuation, Disaster Assessments, treating the hazards, provision of water, food and shelter, health, sanitation, safety and security, critical infrastructure resumption, emergency social services, donations management, media's role in evacuation in urban and rural settings.
4. Disaster Response and Recovery Planning: Response planning, recovery planning, Short term recovery planning, long-term recovery planning
5. Coordination; the Incident Command System, the Disaster Declaration Process.
6. Emergency plan and its Activation: process of planning, disseminating the plan, testing and revising the plan, integration of plan in theory and practice.
7. Specialized Planning: emergency medical planning, veterinary plan, planning for educational institutions, planning for industries, planning for tourism, planning for libraries and archives, planning for terrorism & crowd emergencies, plan for the mass media, psychiatric help, integration of plans.
8. Reconstruction Planning: temporary measures, restoration of services, reconstruction of damaged structures, development & mitigation.
9. Emergency Management Training: the cause and effect model, the concept based approach, scenario based methods.
10. Dimension of Disaster Recovery: Debris Management, Environmental Recovery, Historical and Cultural Resources, Housing, Business, Infrastructure, Social Psychological and Public Sector Recovery.

## **References:**

1. Alexander D. (2002) Principles of Emergency Planning and Management. Oxford University Press. UK.
2. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK.
3. Gustin J.F. (2010) Disaster and Recovery Planning: A Guide for Facility Managers. 5<sup>th</sup> Edition. Fairmont Press. US.
4. Gustin J.F. (2013) Disaster and Recovery Planning: A Guide for Facility Managers. 6<sup>th</sup> Edition. Fairmont Press. US.
5. Haddow D., Bullock J. & Coppola D.P. (2013) Introduction to Emergency Management. 5<sup>th</sup> Edition. Butterworth-Heinemann. UK.
6. Klaene B.J. & Sanders R.E. (2007) Structural Fire Fighting: Strategy and Tactics. 2<sup>nd</sup> Edition. Jones & Bartlett Learning. US.

7. Miller J. (2012) Psychosocial Capacity Building in Response to Disasters. Columbia University Press. US.
8. Phillips B.D. (2009) Disaster Recovery. CRC Press. US.

#### **DSMHT 402: Disaster Management: Institutions and Instruments (Credit 02)**

1. Governmental Disaster Management Agencies; Government Emergency Management Structures: Fire Departments, Law Enforcement, Emergency Management and Civil Protection, Emergency Medical Services, Public Health, The Military and other Institutions.
2. Bilateral Disaster Management Assistance: How governments provide bilateral assistance, monetary assistance, Equipment and supplies, Expertise.
3. Government Agencies Involved in Bilateral Assistance: Overseas diplomatic missions, International development agencies, National disaster management agencies, Other government agencies, Military resources
4. Nongovernmental Organizations: Types of nongovernmental organizations involved in emergency management, The emergency management role of nongovernmental organizations, The private sector, Academia
5. Nongovernmental Emergency Management Operations: Funding, Coordination, NGO / Military Cooperation, Standards of conduct, Case Study (The International Federation of Red Cross / Red Crescent Societies)
6. Multilateral Organizations :Multilateral organizations explained, Regional international organizations, The emergency management role of multilateral organizations
7. The United Nations: The United Nations system, United Nations agencies and programs, The United Nations role in emergency management, The Consolidated Appeals Process
8. Disaster Management Act, Law, Plan and Policy: their guidelines.
9. International Instruments: Hyogo Framework for Action, SAARC Framework for Action, UNHABITAT, Disaster Management Act, Law and Policy in Bangladesh.

#### **References:**

1. Ansell J. and Wharton F (1992) Risk: Analysis, Assessment, and Management. Wiley-Blackwell. US.
2. Asian Development Bank (ADB) (2005) Review of Asian Development Bank Policy and Assistance. Manila.
3. Asian Disaster Reduction Center (2005) Total Disaster Risk Management: Good Practices.
4. Broadleaf Capital International (1999) The Australian and New Zealand Standard on Risk Management. Broadleaf Capital International. Pymble. Australia.
5. Commonwealth of Australia (2004) Emergency Risk Management: Applications Guide. 2<sup>nd</sup> Edition. Emergency Management Australia. Australia.
6. Coppola D.P. (2011) Introduction to International Disaster Management. 2<sup>nd</sup> Edition. Butterworth Heinemann Press. US.
7. Ministry of Disaster Management & Relief, Government of the People's Republic of Bangladesh (2010) National Plan for Disaster Management. Dhaka.

8. National Disaster Management Legal Frameworks: Plan, Policy, Act and SOD

### **DSMHT 403: Climate Modelling and Adaptation (Credit 03)**

1. Introducing Climate Modeling, Types of Climate Models: Energy Balance Climate Model, One dimensional Radiative-convective Climate Model, and Dimensionally Constrained Climate model, General Circulation Models, Paleoclimatic Model, and Projections of Future Climate Change.
2. Processes of Climatic Model Development, Sensitivity of Climate Model & Model Evaluation.
3. Types of adaptation to climate change: anticipatory and reactive.
4. Adaptation characteristics and processes: Components and Forms of adaptation, Climate Stimuli for Adaptation, Adaptation Types and Forms, Systems, Scales, and Actor, Processes and Evaluation of Adaptation
5. Technologies & Options for Adaptation: adaptation in coastal zones, adaptation technologies for water supplies, adaptation options for agriculture, adaptation options for health, infrastructure technologies for adaptation
6. Adaptive Capacity and its Determinants: Economic Resources, Technologies, Information and skills, Infrastructure, Institution, Equity. Enhancing Adaptive Capacity.
7. Climate Change Adaptation Options in Bangladesh, NAPA, Endowed Knowledge Inclusion in Adaptation.

### **References:**

1. Asia Pacific Water Forum. 2012. Framework Document on Water and Climate Change Adaptation: For Leaders and Policy-makers in the Asia-Pacific Region. Philippines.
2. Erda L. 2009. Climate Change Vulnerability and Adaptation in Asia and the Pacific. Kluwer. Netherlands.
3. Guill S. 1996. Vulnerability and Adaptation Assessments: an International Handbook. Kluwer. Netherlands.
4. McGuffie K. & Henderson-Sellers A. 2013. A Climate Modelling Primer. 3<sup>rd</sup> Edition. Wiley-Blackwell. US.
5. Ministry of Environment and Forest, Government of the People's Republic of Bangladesh. 2005. National Adaptation Program of Action. Dhaka. Bangladesh.
6. Patt A.G. 2008. Assessing Vulnerability to Global Environmental Change: Making Research Useful for Adaptation, Decision Making and Policy. Earthscan. UK.
7. Schellnhuber H.J. & Cramer W.P. 2006. Avoiding Dangerous Climate Change. Cambridge University Press. UK.
8. United Nations Framework Convention on Climate Change. 2006. Technologies for Adaptation to Climate Change. Bonn. Germany.



## **DSMHT 404: Research Methodology and Knowledge Management (Credit 04)**

1. Science, Research and Scientific Enterprise
2. Concept Measurements, Challenges & Constraints in Conducting Research
3. Literature Review
4. Formulating Problems, Objectives and Questions; Assumption and Hypothesis
5. Frameworks: Conceptual, Process, Analytical and Research Framework
6. Research Methods: Pre-field work, Field Work & without Field Work
7. Citation and Reference List; Bibliographic Engines e.g. Mandalay.
8. Critical Reading and Technical Writing, Argumentation
9. Ethics and Professionalism in Science
10. 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, Questionnaires, Methods, 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)
11. Research Proposal; Proposal to Thesis
12. Research Presentation and Publication  
Scientific Articles, Publication of Report, Grey Literature, Conference Paper, Presentation of Research, Poster.

### **References:**

1. Dawson C. (2007) Practical Research Methods: A User-friendly Guide to Mastering Research Techniques and Projects. 3<sup>rd</sup> Edition. How to Books Ltd. UK.
2. D.G. Rossiter (2011) Research Skills and Methods, An ITC Publication
3. Fernandez I.B., Gonzalez A. & Sabherwal R. (2003) Knowledge Management and KM Software Package. Prentice Hall. US.
4. Rodriguez H. et al. (2006) Hand Book of Disaster Research (Handbooks of Sociology and social Research). Springer. Netherlands.
5. Singleton Jr. R.A. and Stratis B.C. (2009) Approaches to Social Research. 5<sup>th</sup> Edition. Oxford University press. UK.
6. Williams M. & May T. 1996. Introduction to the Philosophy of Social Research. UCL Press. UK.

## **DSMHT 405: Prediction and Early Warning (Credit 03)**

1. Understanding Early Warning System: Defining Early Warning System (EWS), Community based/managed Early Warning System, Essential features of Community

Based Early Warning Systems, Early Warning Practices and Systems, The gap between warning and heeding.

2. Application of technologies for monitoring and warning of hazards.
3. Modeling Techniques for early warning (flood, landslide, tsunami, flash flood, drought)
4. Key Elements of Early Warning Systems; Risk Knowledge, Monitoring and Warning, Dissemination and Communication, Response Capabilities
5. Essentials of EWS; Effectiveness, Efficiency, Equity, Legitimacy
6. Cross Cutting Issues; Effective Governance and Institutional Arrangements, A Multi Hazard Approach, Cultural Diversity and Gender Perspectives, Involvement of Local communities
7. Role of Government, Media & NGOs in Early Warning System.
8. Electronic Warning System: Sensors, Alarms & Information Networks; Role of communications system in early warning system of impending disasters; wire lines and wireless communication application.
9. Awareness Development through Education, Seminar, conference, Olympiad, Poster, Media etc.
10. Early Warning Systems in Bangladesh.

#### **References:**

1. Bell F.G. (1999) Geological Hazards. Taylor and Francis. US.
2. Gasparini P. et al. (ed.) 2007. Earthquake Early warning System. Springer. Netherlands.
3. Glade t., et al. (Ed.) 2005. Landslide Hazard and Risk. Wiley-Blackwell. US.
4. Nayak S. 2008. Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters. Sringer. Netherlands.
5. Nemec Jr.J. et al. (Ed.) 1993. Prediction and Perception of Natural Hazard. Springer. Netherlands.
6. Sene K. (2008) Flood Warning, Forecasting and Emergency Response. Springer. Netherlands.
7. Shafie H. (2009) Endowed Wisdom: Knowledge of Nature and Coping with Disaster in Bangladesh. CDMP. Dhaka.
8. Tankut A.T. (Ed.) 2009. Earthquakes and Tsunamis. Springer. Netherlands.
9. Zschau J. & Kèuppens A.N. 2003. Early Warning Systems for Natural Disaster Reduction. Springer. Netherlands.

#### **DSMHL 406: Geoinformatics and MIS in Disaster Management: Theory & Practices (Credit 03)**

1. Introduction to Geoinformatics and Its Scope
2. Spatial Data Infrastructure (SDI), Web GIS, Q GIS
3. Remote sensing for disaster management: Multispectral and Hyperspectral remote sensing concepts.

4. Pre-processing and Information Extraction from LiDAR, RADAR, UAV Image (drone, nano satellite)
5. Spatial modeling: Spatial analysis and modeling (knowledge driven and data driven methods); Geostatistical analysis; 3-D analysis; interpolation; topographic analysis using TIN; DEM and surfacing; Network Analysis
6. Application of Geoinformation for Disaster Management: Microzonation mapping, early warning, Vulnerability analysis, Real-time mapping, Hazard Monitoring, Decision making, Relief operation and Response Mapping, Food Security Analysis
7. Disaster database creation and management.

#### **References:**

1. Brimicombe A. (2009) GIS for Environmental Modeling and Engineering. 2<sup>nd</sup> Edition. CRC Press. US.
2. Campagna M. (2005) GIS for Sustainable Development. CRC Press. US.
3. Karimi H.A. (2008) Handbook of Research on Geoinformatics. Information Science Reference, New York. US.
4. Oosterom P.V. et al. (Ed.) (2005) Geo-Information for Disaster Management. Springer. Netherlands.
5. Shamsi U.M. (2005) GIS Applications for Water, Waste Water and Stormwater Systems. CRC Press. US.
6. Weng Q. (2009) Remote Sensing and GIS Integration: Theories, Methods, and Applications. McGraw-Hill. US.

#### **DSMHV 407: Viva vocé (Credit 02)**

Comprehensive oral examination of the Courses taught.

#### **DSMHT 408: Damage, Loss and Need Assessment (Credit 03)**

1. Introduction: Concept of disaster damage and losses; Factors causing increase in damage and losses;
2. Damage and Loss Measures: Assessment versus estimation; Concept of Post-disaster Needs Assessment (PDNA); Concept of disaster damage and loss assessment (DaLa); Concept of pre-disaster loss estimation (PDLE).
3. Assessment Methodology: ECLAC, DaLa, PDNA.
4. Steps in the Application of ECLAC (Economic Commission for Latin American and Caribbean region) Methodology.
5. Conducting Damage and Loss Assessments by Sector: Economic Sector, Social Sector, and Infrastructure and Cross Cutting sectors.
6. Post Disaster Need Assessment (PDNA): From Losses to economic Recovery Plan, From Damage to reconstruction Needs.

7. Link between Risk Assessment and Damage Assessment
8. Latest Loss Estimation Modeling and Disaster Impact Analysis for Effective Policy Formation: Cost Benefit Analysis, Applied Technology Council (ATC-13), HAZUS (Hazard in USA) Methodology, the ACM (Advanced Component Method), CatSim (Catastrophe Simulation) Model, Input-Output Model, Computable General Equilibrium (CGE) Model, the Social Accounting Matrix (SAM) Method and Econometric Model.

## **References:**

1. Chakrabarti D. & Bhat M.R. (2006) Micro-finance and Disaster Risk Reduction. Knowledge World. India.
2. Coppola D.P. (2007) Introduction to International Disaster Management. Elsevier. UK.
3. Hansjurgens B. & Antes R. (Ed.) (2008) Economic & Management of Climate Change Risk Mitigation & Adaptation. Springer. Netherlands.
4. The World Bank. (2010) Damage, Loss and Needs Assessment: Guidance Notes. Washington DC.
5. GFDRR. (2013) Post Disaster Need Assessment Guidelines: Volume A.
6. GFDRR. (2008) Disaster Damage, Loss and Need Assessment: Training Guidelines. Dhaka. Bangladesh.

## **DSMHT 409: Main-streaming Disaster Management: National and International Practices (credit 03)**

1. Mainstreaming Disaster Management Framework: Fundamental Concepts
2. Comparison of DRM and DRR.
3. Disaster Risk Assessment: Hazard Characterization and Frequency Analysis, Consequence Analysis, Risk Estimation, Risk Prioritization.
4. Mainstreaming Disaster Risk Assessment Results in Plan Formulation: Analyzing the Risk Impact to the Land use and physical Framework, Identifying Development Issues, Goals, Objectives and Targets Based on the Risks, Identifying DRR Measures, and Identifying Intervention Measures to Respond to Disaster Risk.
5. Mainstreaming gender issues in Disaster Management (From Bangladesh Perspective): GAD Approach.
6. Mainstreaming Disaster Risk Reduction in Land use planning, Education, Environment and Natural resources and housing.
7. Mainstreaming Climate Change Adaption into Development Planning.
8. Mainstreaming DRR in Investment Programming, Budgeting, Project Monitoring and Evaluation: Post plan formulation mainstreaming, Investment Programming, Integration

of disaster risk reduction into national and local government development planning, Intra-government horizontal and vertical integration.

9. Main Streaming Disaster Management: DDM and CDMP Approach
10. Mainstreaming Direct and Indirect Impact of Natural Disaster in SAARC and ASEAN countries.

## **References:**

1. Asian Disaster Preparedness Center (ADPC) (2010) Urban Governance and Community Resilience Guides: Mainstreaming Disaster Risk Reduction. Manila. Philippines.
2. The Provention Consortium. (2007) Tools for Mainstreaming Disaster Risk Reduction: Guidance Notes for Development Organizations. Provention Consortium. Switzerland. Benson C. & Twigg J.
3. The Provention Consortium. (2009) Mainstreaming Disaster Risk Reduction into Development: Challenges and Experience in the Philippines. Switzerland. Benson C.
4. UNDP-UNEP. (2011) Mainstreaming Climate Change Adaption into Development Planning. A Guide Book for Practitioners.
5. United Nations Development Programme (UNDP). (2010) Mainstreaming Disaster Risk reduction in sub national Development: land use/physical planning in Philippines.

## **DSMHT 410: Emergency and Crisis Planning (Credit 02)**

1. Introduction: definitions, principles, scenarios, structure of a plan, Standards in emergency planning.
2. Aims, Purpose and Scope of Emergency Planning
3. Emergency Plan and its Activation: Process of planning, dissemination of Plan, Integration of Plan in Theory and Practice.
4. Specialized Planning: Contingency planning- Generic and Scenario based, Contingency Plan for Major Responding Organization
5. Incident Command System (ICS) and Standing Operation Procedure (SOP)
6. Sustainability of emergency preparedness, · Critical infrastructure planning
7. Emergency Communications, Emergency Operations Center (EOC) and Procedures
8. Understanding Crisis: Proliferation and Recognizing a Crisis, Characteristics of Crisis, Classifying a Crisis.
9. Crisis Communication: Essentials of Crisis Communication, Guidelines for Crisis Communication.
10. Role play exercise fro national to community level
11. Crisis Management Essentials (Bangladesh Perspective)

## **REFERENCES:**

1. Alexander, David (2002) Principles of Emergency Planning and Management. Tera Publishing. UK

2. Nudell M. & Antokol N. (1988) Handbook for Effective Emergency and Crisis Management. Lexington Books. US.
3. Lerbinger, Otto. (2012) The Crisis Manager: Facing Disasters, Conflicts and Failures. Routledge. New York.
4. Moore, Tony; Lakha, Raj(ed.). (2002) Tolley's Handbook of Disaster and Emergency Management: Principles and Practice. Elsevier. London.
5. Haddow, George D; Bullock, Jane A. (2006) Introduction to Emergency Management. Elsevier. London.

### **DSMHT 411: Disaster in Agriculture and Food Security (Credit 03)**

1. Evolution of Agriculture (Domestication of Plants and Animals; Civilization, Agriculture and Disasters).
2. Famine, the Great Famine Ireland (Potato Famine), the Great Chinese Famine, Famine in British India and Bangladesh (Bengal Famine of 1770, The Great Bengal Famine of 1943, The Famine of 1974).
3. Green Revolution
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. Agriculture of Bangladesh, Agro-ecological Zone of Bangladesh.
6. Agriculture and Disaster (Natural and Human Induced)
7. Food Security
8. Climate Change, Food Security and Agricultural Risk Reduction in Bangladesh
9. Disaster Risk Reduction Measures in Agriculture
10. Early Warning System and Agricultural Risk Reduction

### **References:**

1. Brammer H. (1996) The Geography of Soil of Bangladesh. University Press Limited. Dhaka. Bangladesh.
2. Brammer H. (2012) The Physical Geography of Bangladesh. University Press Limited. Dhaka. Bangladesh.
3. Datta M. et al. (2008) Climate Change and Food Security. New India Publishing. India.
4. Hossain A. (2010) Fundamentals of Irrigation and On-farm Water Management: Volume 1. Springer. Netherlands.
5. Hossain A. (2011) Practices of Irrigation & On-farm Water Management: Volume 2. Springer. Netherlands.
6. Lal R. (2010) Climate Change and Food Security in South Asia. Springer. Netherlands.
7. Rasheed K.B.S. (2008) Bangladesh: Resource and Environmental Profile. A. H. Development Publishing House. Dhaka.
8. Rasheed K.B.S. (2008) Water Resources Management: With Examples from Bangladesh. A H Development Publishing House. Dhaka.
9. Yu W.H. (2010) Climate Change Risks and Food Security in Bangladesh. Earthscan. UK.

## **DSMHT 412: Project Planning, Monitoring and Evaluation (Credit 03)**

1. Basic Concepts: definition & characteristics of a project & program, difference between project and program, project and programme managers role; project classification & their differences, understanding project objective.
2. Project life cycle, aspects and activities of different phases, project generation and screening.
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.
4. Project Appraisal: different aspect 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.
5. Logical framework approach in project management: definitions and use, nine different steps in LFA, building a logframe matrix, Elements of Project Management.
6. Project Monitoring & Evaluation: definitions, purpose and objectives, elements and components of a good M&E System, M&E Plan and results framework. Characteristics of a good indicator, Monitoring report, methods and types of evaluation.
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 a EIA reporting outline, environmental management plan, benefits, challenges, Bangladesh key environmental concerns.

### **References:**

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

### **DSMHT 413: Bangladesh Studies & Disaster Management Approach (Credit 02)**

1. Linkage of natural hazard occurrence with the Tectonic, Physiographic and Geomorphic Units of Bangladesh
2. Energy, mineral and natural resource reserve in Bangladesh. Relation of natural resource occurrence with geologic units
3. Evolution of Disaster Management Approach in Bangladesh: Relation of Disaster Management with historical evolution of Bangladesh (from specific focus on 1970s Cyclone
4. History of the Disaster Management Ministry and Interlinked Responsibilities of Line Ministries: Flow Diagram of Disaster Management History, Disaster Management Act and Bureau, Linked Responsibilities of 19 Line Ministries regarding DRR , Details of SOD
5. Disaster Management Approach in 5<sup>th</sup> and 6<sup>th</sup> Five Years Plan of Bangladesh
6. Details of Comprehensive Disaster Management Programme (CDMP) I & II
7. Detailed Discussion on Cyclone Preparedness Programme of Bangladesh: Focused on its Organogram
8. Components of Flood Action Plan (FAP) in Bangladesh

### **References:**

1. Ahmad Q.K. (1994) Bangladesh: Past two Decades and the Current Decade. Dhaka: Bangladesh unnayan parishad. Bangladesh.
2. Badrul Imam (2003) Energy Resources of Bangladesh, a UGC Publication
3. Baquee A. (1998) Peopling in the Land of Allah Jaane: Power, Peopling and Environment: The Case of Char-lands of Bangladesh. University Press Limited. Dhaka.
4. Brammer H. (1997) Agricultural Development Possibilities in Bangladesh. University Press Limited. Dhaka.
5. Brammer H. (2000) Agroecological Aspects of Agricultural Research in Bangladesh. University Press Limited. Dhaka.
6. Brammer H. (2002) Land Use and Land Use Planning in Bangladesh. University Press Limited. Dhaka.
7. Choudhury G. W. (1993) The Last Days of United Pakistan. University Press Limited. Dhaka.
8. Faaland J. and Parkinson J.R. (1976) Bangladesh: The Test Case for Development. University Press Limited. Dhaka.
9. Gritzner C.F. Bangladesh: Modern World Nations. Chelsea House Publishers.US.
10. Novak J.J. (1993) Bangladesh: Reflection on the Water. University Press Limited. Dhaka.
- Rasheed K.B.S. (2008) Bangladesh: Resource and Environmental Profile. A. H. Development Publishing House. Dhaka.



**DSMHL414: Damage and Need Assessment Lab. (Credit 02)**

Laboratory studies based on course DSMHT: 409

**DSMHP 415: Research Project (Credit 06)**

In order to develop skilled personnel in problem identification, work-methodologies, scientific interpretation, producing a standard report; individual student shall carry out a supervised study independently on a specified topic (i.e., a Project assigned to them by the Academic Committee of the department). On completion of the Project, each student shall defend and submit written Project Report on the work undertaken. Upon the decision of Academic Committee project may also be completed by group work as well with field visit. Students may also carry out non-paid internship if academic committee could make liaison with organization/NGO/Agency or Industry.