M.Sc Coastal Disaster Management
(Syllabus)

Department of Coastal Disaster Management
Brookshabad Campus
Port Blair – 744 103
Andaman Islands
## M. Sc., Coastal Disaster Management, Port Blair
(Syllabus)

### Semester Pattern

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Theory/ Practical</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DMPB 411</td>
<td>Oceanography</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 412</td>
<td>Composition &amp; Classification of the Solid Earth and Atmosphere</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 413</td>
<td>Coastal Geomorphology</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 414</td>
<td>Marine Geology</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 415</td>
<td>Meteorological Hazards</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 416</td>
<td>Crustal deformity structures &amp; Geodynamics</td>
<td></td>
<td>3+1=2</td>
</tr>
<tr>
<td></td>
<td>DMPB 417</td>
<td>Field work and Lab I (covering courses 411, 412)</td>
<td></td>
<td>1+1=2</td>
</tr>
<tr>
<td></td>
<td>DMPB 418</td>
<td>Field work and Lab II (covering courses 413, 414)</td>
<td></td>
<td>1+1=2</td>
</tr>
</tbody>
</table>

### II Semester

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Theory/ Practical</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DMPB 421</td>
<td>Natural &amp; Manmade Hazards</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 422</td>
<td>Application of Geophysical techniques for Microzonation &amp; Natural Hazard Identification</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 423</td>
<td>Remote Sensing</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 424</td>
<td>Geographical Information System</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 425</td>
<td>Capability models of disaster risk assessment</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 426</td>
<td>Public, Biological &amp; Agricultural Hazard</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 427</td>
<td>Urban/Rural planning &amp; hazard mapping</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 430</td>
<td>Internship</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

### III Semester

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Theory/ Practical</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DMPB 511</td>
<td>Disaster Management</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 512</td>
<td>Design &amp; protection structures</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 513</td>
<td>Environmental Impact Assessment</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>DMPB 514</td>
<td>Disaster prediction &amp; regional forecasting</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 515</td>
<td>Coastal &amp; hydrological hazards</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 516</td>
<td>Field work and Lab V (covering courses 511, 512)</td>
<td></td>
<td>1+1=2</td>
</tr>
<tr>
<td></td>
<td>DMPB 517</td>
<td>Industrial hazards mitigation</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>DMPB 518</td>
<td>Earthquake seismology &amp; Internal structure of the Earth</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

### IV Semester

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Theory/ Practical</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DMPB 521</td>
<td>Project work</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**Grand Total:** Hard Core (63) + Soft core (9) = 72
FIRST SEMESTER
DMPB - 411 - OCEANOGRAPHY

Unit I

Introduction to Oceanography -- Oceanographic instruments, Physical properties of seawater -- Density, viscosity, surface tension, conductivity and their relationship, UV radiation, Acoustics.

Unit II

Waves, types, deep water and shallow water, -- forces causing waves -- sea and swell -- surf -- storm surges, tsunami -- wave effect on beaches. Tides, types, tide generating forces, Tidal currents, tides in coastal ocean, Energy in tides. Atmosphere, atmospheric heat budget, Coriolis Effect -- winds on a rotating earth, seasonal wind pattern, monsoons -- land and sea breezes -- El Ninos.

Unit III

Ocean structure, sea surface temperatures, sea surface salinities, oceanic depth zones, water masses, water mass movements, sea ice, icebergs. Ocean basin - Seafloor features - Ocean sediments, origin and sizes of sediments particles -- biogenous sediments, lithogenous sediments, hydrogenous sediments -- sediments transport, atmospheric transport

Unit IV

Introduction to marine chemistry -- Chemical composition of seawater -- major and minor elements -- their importance distribution. Radio nuclides in the sea -- dissolved gases -- Carbon dioxide and oxygen -- BOD and COD -- Other gases. -- Mineral wealth of the sea, salt, glauconitic, petroleum, phosphorite, manganese nodules, oil and gas & minerals -- potential, economy of extraction.

Unit V

Biological ocean process -- Ecosystems, food webs, and tropic levels -- photosynthesis, chemosynthesis, primary production, light as a limiting factor -- nutrients as limiting factors, phosphorus and nitrogen cycles, dissolved organic matter, particles in seawater, dissolved oxygen, trace elements, distribution of production -- upwelling and production. Open ocean organism: Distribution of Coastal Intertidal organisms. Deep ocean life - Bottom dwelling organisms: coral reefs, deep-ocean benthos, vent communities, kelp forests, and mariculture.

Text Books:
Reference Books:
DMPB – 412 - COMPOSITION AND CLASSIFICATION OF THE SOLID EARTH AND ATMOSPHERE

Unit I


Unit II

**Sedimentary Rocks**: Terrigeneous, Chemical and Biochemical Rocks; Structure and of texture of the sedimentary rocks; Grain size, shape, Mineralogy and Chemistry of Sedimentary rocks. Classification of Sedimentary rocks- Conglomerate, Breccias, Sandstone, Arkoses, Greywacke, Mud rock, Shale, Siltstone, Carbonate rock, Evaporates. Weathering and Diagenesis, Oxidation and Reduction.

Unit III

**Sedimentary Environments**: Continental Environment- Fluvial, desert, Glacial, Lacustrine, Swamp and Transitional. Coastal, Deltaic, Estuarine, Lagoon, Littoral, Beaches. Marine Shelf-Shallow Sea, Reef, Submarine Canyon, Slope, Rise and Pelagic Trench

Unit IV

**Metamorphic Rocks**: Definition of Metamorphism, Agents and types of metamorphism (Pressure, Stress, Temperature, Chemical activities of fluids) - Local metamorphism, Regional and Continental metamorphism. Dynamo thermal metamorphism, Importance of Metamorphic rocks, Migmatites, Eclogite, Mylonite and Serpentine. **Ophiolite**: Structure and Composition of Ophiolite, Origin of Ophiolite, and Ophiolite tectonics of Andaman region.

Unit V

Basic properties of Atmospheric Composition of the Earth, evolution of hydrosphere, oxygen and carbon budgets, Vertical temperature structure of the atmosphere, wind structure in the atmosphere, temporal and latitudinal variability

**Reference:**
Unit I  
Coastal Processes  
Waves – Definition- Different types of waves – wave height, length, amplitude – Reflection, refraction and diffraction of waves.  
Current 
Wave induced normal and long shore currents- rip currents, Ebb currents – wind, river and tidal induced currents  
Tides  
Equilibrium theories of tides – Diurnal, spring and neap tides – tides and coastal landforms  

Unit II  
Coast  
Definition – classification, Genetic and morphological classification (Johnson,Cotton and King)  
Shoreline changes – classification and types of shorelines  
Concept of shoreline changes – quaternary eustatic changes – causes and effects – geomorphic indicators of Neotectonic movements – stream channel morphology causes – drainage modifications, fault reactivation – uplift and subsidence pattern in coastal areas  

Unit III  
Coastal erosion processes and landforms  
Concept and process of coastal erosion- landform of coastal erosion, sea cliff, shore platform, caves arches, stacks, blow hole wave cut terraces  
Coastal deposition processes and landforms  
Concept and processes of coastal deposition – landforms of coastal deposition, beaches, spits, bars beaches ridge, tombola, bay wave built terraces – barrier islands, sand dunes, mangrove, salt marsh estuaries and delta  

Unit IV  
Sea wall –groins-jetties –cliff stabilization- beach feeding-dune building- artificial nourishment  

Unit V  
Coastal issues, Applied coastal geomorphology  

Reference:  


UNIT I


UNIT II

Fault Structure: Normal Fault, reverse fault, strike slip and transform fault. Joints; Unconformity and types. Structural Landforms. Rift valleys or Graben; Block Mountain or Horst.

UNIT III


UNIT IV

Geometry of Plate Tectonics – Poles of rotation – Triple junctions and plate evolution. The globe according to the plate tectonics. Continental Positions in the past, crust formations at ridges. Forces on Plates – The hot-spot frame of reference, Plate Velocities - Plate tectonics and Mantle convection.

UNIT V


Text Books;


References:

DMPB – 417 - Lab I

(Cover Courses 411,412, Oceanography, Composition & Classification of the Solid Earth)

Part I – 411
Field work to collect the following data and submission Report
1. Measuring devices 1: Secchi disc, Lux meter, Turbidity meter,
3. Estimation of Salinity and Dissolved Oxygen.
4. Determination of wind pattern, temperature and pressure from an area.
In the Laboratory analysis of the data and submission of report in the form Record 12 hours

Part II – 412
5. Field study of various types of Igneous, Sedimentary and Metamorphic rocks: Granite, Basalt, Limestone, Sandstone and Clay stone and Ophiolite and submission of Field Report.
6. determination of grain size distribution in beach / river with sieves and report to be submitted
7. In the laboratory i) microscopic identification of the rock types such as granite, basalt, sandstone, limestone and ophiolite and ii) grain size analyses of the data to be plotted In the form of curves and reports to be submitted in the form of Record 12 hours

DMPB – 418 - Lab II
(Cover Courses 413, 414 Marine Geology & Geomorphology, Crustal deformity structures & Geodynamics)

Part I – 413
Field study 1) Beach profiling using Total Station, Marking various Geomorphic features
2) Measurement of Wave Period and submission of Field Report
3) In the Laboratory: Based on the field data collected from the beach profiling and wave parameters the following parameters such as Wave height, Wave celerity and determination of breaking wave types – Spilling Breakers, Plunging Breaker, Surging Breaker are to be carried out in the report in the form of Record 12 hours

Part II – 414
Field investigation to identify 1) Folds, Faults and Joints; 2) Identification of underwater geomorphic features through Side-scan sonar and or Echo Sounder and submission of Field Report Laboratory: Structural Map problem related fault, fold and submission of report in the form of Record. 12 hours
SECOND SEMESTER
DMPB-421 - NATURAL AND MAN MADE HAZARDS

Unit I 8 hours

**Natural hazards;** Hazard definition – Types of hazard, Seismic hazard; Earthquake, Landslide, volcano. Coastal hazard: Tsunami, Storm surge, Erosion.

Unit II 8 hours

**Hydrological hazard;** Floods, Drought. Meteorological hazard: Cyclone; Thunderstorms, Lightning, Meteorites, Nature fire hazard.

Unit –III 10 hours

Types of manmade hazards: Landslide, Soil erosion, Forest fire, Desertification, Mine, Quarries, Hunting, Hostile encounter, Big game trapping, Driving, Booby traps.

Unit IV 14 hours

Chemical hazards: nuclear hazard, release of toxic element in the air, soil and water. Industrial pollution, effluent contamination, acid rain. Biological hazards: Populations growth – its impact on biodiversity, effect of over exploitation of resources – ecological disturbance – such as soil degradation, hydrological cycle, pollution and Epidemic.

Unit V 8 hours

Air pollutions hazard: Metrological factors for air pollution- Hazard mitigation – Global warming, ozone depletions- climate change - sea level changes and its effect on biodiversity. Causes, impact and mitigations of all the above hazards

**Text Books:**

**References Books:**
UNIT I 12 hours

Physical properties of earth material: Electrical resistivity of rocks; Induced polarization in rocks; Spontaneous Polarization; Dialectic constant of rocks; Seismic wave velocity of rocks; Effect of moisture on Seismic velocity; Variation of density in rocks; Magnetic susceptibility of rocks; Thermal conductivity of rocks; Natural radioactivity of rocks; Interrelationship of geophysical parameter and water saturation of rocks.

UNIT II 8 hours

Description of Seismic Imaging System with 24 channel and field procedure and seismic method to detect fault in the tectonically distributed zones. Description of Proton Procession Magnetometer, principle and field procedure, for identification and interpretation of intrusive rocks, cavity, subsidence and fractures/faults.

UNIT III 10 hours


UNIT IV 8 hours

Ground Penetrating Radar (GPR) Instrument description and principle and field procedure, method to study landslide, subsurface cavity, subsidence, and fault and interpretation

UNIT V 10 hours

Transient electromagnetic (TEM) principle, description of the equipment, – types of loop TERRA TEM, concept of frequency domain such as high, intermediate and low frequency duration for the estimation of the geological formation with depth and to determine quality of water (salt water intrusion) & identification of the subsurface due to pollution. – application and interpretation.

References:

DMPB - 423 - REMOTE SENSING

Unit I 8 Hours

Unit II 10 Hours
Remote sensing, Principles of remote sensing, Energy sources and radiation principles, Energy interactions in the atmosphere, Energy interactions with earth surface features, Black body radiation, Data acquisition and interpretation active and passive sensing, Characteristics of Images, Satellites orbit, Geostationary, Sounders and swath, resolution of satellite, Multi-spectral, Thermal and hyper spectral sensing, Weather satellites, Land and marine observation satellites,

Unit III 10 Hours
Digital image processing – image rectification and restoration, image enhancement, contrast manipulation, multi image manipulation, image classification- supervised and unsupervised classification, data merging, Hyper spectral image analysis, introduction to image processing software.

Unit IV 10 Hours
SAR, Altimetry, Radiometry, Microwave and Lidar sensing, radar development, side-looking radar system operation, synthetic aperture radar, geometric characteristics of side looking radar imagery, Transmission characteristics of radar signals, other radar image characteristics, radar image interpretation,

Unit V 10 Hours
Fundamentals of visual image interpretation- Basic visual image interpretation equipment, Land use/Land cover, Wetland, Geologic and soil mapping, Agricultural, forestry, rangeland, water resource, urban and regional planning, Environmental and natural disaster assessment – Principles of landform identification and evaluation. Ocean color monitor and SST mapping.

Text Books:

Reference Books

DMPB - 424 - GEOGRAPHICAL INFORMATION SYSTEM (GIS)

Unit I 8 Hours
Geographical information system – definition, components of GIS, data sources, data structures- point features, line features and polygon features, raster and vector, data capturing- primary and secondary data capture, pre-processing, spatial querying and analysis, overlay function, neighborhood function and connectivity function, spatial data presentation.

Unit II 5 Hours
File management, data base management systems in GIS- data base, query, SQL statement - data manipulations and product generation, Environmental GIS, Data acquisition system using GPS, component of GPS, DGPS, Kinematic GPS, factors that affect GPS, GPS application.

Unit III 8 Hours
Spatial data- field, object, computer representation of geographic information, raster representation, vector representation, point, line and polygon representation, topology, scale and resolution, sources of error and data quality, database design, convention, mapping concepts and coordinate systems- types of projection, geographic and planar, projection.

Unit IV 7 Hours
Methods of spatial interpolations in GIS – Visualizations in GIS, quantitative and qualitative data, time series, map cosmetics, map dissemination. Linking terrain, and climate to target the vulnerability due to natural disasters using GIS and remote sensing.

Unit V 8 Hours

Text Books:
7. Andrew Skidmore, 2008, Environmental modeling with GIS and remote sensing, Taylor & Francis
**DMPB - 428 - Lab III**

(Covering Courses 421, 422- Application of Geophysical techniques for Microzonation and Natural Hazard Identification)

**Field study:** Students can opt in any one in section A or section B

**Section A:**
1. Identification of Fault, and / or Fracture zone from the Seismic / Resistivity/ and GPR Images
2. Identification of Horst and Graben structures with GPR and /or Resistivity Imaging Systems.

**Section B**
4. Ground water quality / quantity assessment from data obtained by Vertical Electrical Sounding (VES) by adopting Wenner or Schlumberger Technique. Students should submit the technical details about the measurements, interpretation and submission of Field Report.

**Laboratory:**  
5. Risk assessment of Hazard and  
6. Vulnerability mapping are to be studied through map or imagery and submission of report in the form of Record.

**DMPB - 429 - Lab IV**

(Covering courses 423&424 - Remote sensing & GIS)

Geographical Information System

Part I - 423

1. Exploring GIS software
2. Onscreen digitizing (point, line and polygon)
3. Data base design
4. Layout preparation
5. Querying database
6. Displaying data
7. Editing data
8. Working with layers and map symbology
9. Thematic map preparation
   a. Road map
   b. Drainage map
   c. Contour map
   d. Landuse map
   e. Vulnerability map
10. Leica Photogrammetric suite

**12 hours**
Part II – 424
Remote sensing

1. Study of Pocket stereoscope, Mirror stereoscope, 3D view
2. Study of land use, drainage pattern, structural and lithological features
3. Data browsing in internet
4. Usage of topoindex and identification of path and row of satellite
5. Exploring image processing software
6. Data downloading, georeferencing the data
7. Digitization in image processing software
8. Digital image processing: Image enhancement, image manipulation
   9. Image classification supervised and unsupervised classification
   10. Hazard identification and vulnerable area estimation

12 hours

DMPB – 430 – INTERNSHIP

(Training on Natural or Manmade/ Disaster identification / management through Government Agencies or Non- Governmental Organization / University / Institution for period of one month)
Unit –I  5 hours

**Definition Disaster and Hazards** – Communication and dissemination of disaster related information and awareness generation; institutional framework and financial management - Disaster cycle – Definition of hazard, risk and vulnerability – vulnerability Atlas of India

Unit-II  15 hours

**Hazard Mitigation:** Building code – vulnerability analysis – core group functions – capacity building. **Preparedness:** State and District level, hospital and school – Retrofitting – Role of doctors, paramedical, electricians etc – Incident command systems.

Unit –III 10 hours

**Relief and Response:** Search and Rescue (SAR), First aid, Shelter management, drinking water, electricity – language. **Rehabilitation and Finance:** Environmental problems of Rehabilitation – Microfinance – NGO’s role.

Unit – IV 10 hours

**Disaster Recovery:** Basic principles of disaster recovery, Disaster Recovery planning – Steps for disaster recovery planning – Disaster Recovery among stack holders – organizing disaster recovery team – role of Information Technology – Budget for disaster recovery.

Unit – V 8 hours

**Planning and Management:** Risk assessment – Role of Government agencies for CRZ regulation and implementation of management plans – Role of Early Warning System (EWS) in Disaster Management – Early warning system for cyclone, Tsunami, storm surge, earthquake – Studies on impact of long term disasters like Sea level rise, global warnings in Island Nations. Mock drill.

**Text Book:**

**Reference books**
4. Sathis Modh, Introduction to Disaster Management, Macmillan, New Delhi
DMPB -512 DESIGNS AND PROTECTION STRUCTURE

Unit I 10 Hours

The large civil engineering structure such as hang cord structure, pellicle structure, shell structure etc. giant structure, the space city structure, etc. extremely high layer new structure system. The emulation is in conjunction with long-range monitor and laboratory experiment to research.

Unit II 10 Hours

Seismic design of buildings: – Types of buildings (Wood frame, steel frame, and concrete and masonry buildings). Seismic design of bridges: The city bridge with super across new structure system of great bridge. Earthquake damages to bridges, seismic conceptual design, and seismic performance criteria,

Unit III 10 Hours

Earthquake damage as a result of i) structural problems (foundation failure, foundation connections, soft story, torsion moments, shear, flexural failure, connection problems. ii) Damage as a result of soils (liquefaction, landslide, and weak clay), iii) Damage Secondary causes of structural damage (surface faulting, damage caused by nearby structures and lifelines). Earthquake resistance design, seismic isolation, passive energy dissipation, active control. The structure designed to anti-earthquake anti-breeze design.

Unit IV 10 Hours

Mitigation, solid remediation procedures, (gravel drains, deep mixing method, sand compaction pile method, improving slope stability and preventing landslides), Soil structure interaction to improve earthquake response, structural elements that prevent damage and improve dynamic response).

Unit V 8 Hours

The modern structure is as result of large-scale experiment technique (numeral simulate, physics simulate). The long range is in conjunction with to experiment the software platform. The disaster prevention function design method and norm standard of the important engineering structure. The large and complicated structure’s safety assessment and health monitor.

Text Books:

DMPB- 513 – ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Unit I  10 hours
EIA: Definition – Objective – Types – Step by step procedure for conducting EIA, EIA regulation in India, Risk Assessment vs EIA and limitations of EIA.

Unit II  10 hours

Unit III  10 hours
Monitoring and environmental auditing, Environment management and disaster management plans, cost benefit analysis, Public participation, EIA report and content.

Unit IV  10 hours
Environmental Management Plan and Policies; Key features of national environmental Policy act – Conceptual approach of environmental impact studies – Plan and management of impact studies.

Unit V  8 hours

Text Books:

References:
UNIT-I 8 Hours
**Prediction, Forecasting and Managing:** Principles – Nationwide HPC Grid Integrating / Interfacing HPC and Satellite Resources – Togetherness of Disaster Strategic User Groups Sharing of spatial and non spatial data – Security issues – Collaborative development of parallel stimulations pre and post disaster information availability to end users.

UNIT II 8 Hours

UNIT III 8 Hours

UNIT- IV 6 Hours

UNIT-V 6 Hours

**Text Books:**

**Reference Books**
1. Web materials and different agencies policy plans.
Design and Protection structures
Field Study: students can opt any one from; section A or B or C

Section A:
1. Building strength analysis using GPR
   a. Concrete thickness measurement
   b. Concrete pillar identification
   c. Basement measurement
   d. Weakness identification

Section B:
2. Road analysis using GPR
   a. Road thickness identification
   b. Old and new layer identification
3. Foundation stability analysis using GPR

Section C:
4. Weathered profile in rocky area analysis using GPR
5. Subsurface analysis for new building construction (subsurface cavity & structural weakness) using GPR.
6. Application of GIS in Disaster Management

24 Hours

DMPB - 520 - LAB VI
(Covering courses 513 & 514 – Environmental Impact Assessment & Disaster prediction & regional forecasting)

Students Field Study of the following:
1. Terrain and Topography
2. Climate and Meteorology
3. Soil quality
4. Geology formation underneath the site
5. Hydrology and Water Quality
7. Ecology of the site and surrounding.
8. Noise
9. Ambient Air quality
10. Public Consultation
11. Assessment of the Potential Environmental Impact.
12. Analysis and evaluation of Risk Mitigation and Field Report should be submitted.

24 Hours

In the Laboratory: Detailed analysis of meteorological, soil, water quality is to be made
FOURTH SEMESTER
DMBP – 521 – PROJECT WORK
SOFTCORE
DMPB 414 – MARINE GEOLOGY

Unit I 8 hours

Unit II 8 hours

Unit III 8 hours
Sea level changes – transgression and regression – relative and eustatic sea level changes – causes and consequences of sea level changes – Pleistocene sea levels – future sea level and indicators of former sea levels (Micro paleontology, archeological, bathymetric and satellite imagery data) – impact of sea level changes in geomorphology and lithology

Unit IV 7 hours
Marine Instruments

Unit V 5 hours
Estuary (origin, classification, circulation) – lagoons – sediments (lithogene-ous, biogeneous, cosogenous)

Reference:
1. H. Kuenen, Marine Geology; Baltzell Press (November 4, 2008)
DMPB – 415 - METEOROLOGICAL HAZARDS

Unit I  
6 Hours

Hydro meteorological disasters – various methods of quantitative precipitation, forecast (Analog, use of NWP output), Satellite application, and Radar application related to rainfall estimation, drought and rainfall monitoring. Rainfall Runoff relations - concept of Hydrograph, rainfall model, runoff models.

Unit II  
6 Hours

Large scale windstorms: hurricanes, typhoons, winter extra-tropical cyclones, Floods and other hydrological hazards: river floods, coastal floods, drought, wildfires - Temperature and temperature extremes: heat waves, cold waves, frost and ice storms - Thunderstorm-related hazards: tornadoes, hail, lightning.

Unit III  
8 Hours

Space weather: solar effects on the Earth environment and their socio-economic impacts, Modelling windstorm and flood losses, Windstorm and flood damages in India/world - Flood monitoring and mitigation, Flood and windstorm engineering, Insurance aspects of flooding and climate change, Weather derivatives

Unit IV  
8 Hours

Cyclones, genesis, dynamics, products and forecasting; Atmospheric instability, thunderstorms, products of thunderstorms, cloud electrification, ground and cloud discharge (lightening), types of lightening, energy and hazards, precautions against lightning, Lightning Protection Systems (including lightning conductor). Tornado, waterspout, downdraughts, updraughts, microburst, gust fronts, hazards.

Unit V  
8 Hours

Meteorites, characteristics, movements. Planetary activities, Solar system, Radiation intensity, global circulation and energy transfer, diurnal and monthly variation of atmospheric pressure leading to weather change. Climate Change/Global Warming: Origin, occurrence, forecasting and mitigation.

**Text Books:**

Reference Books:
Unit I  
6 Hours
Development of State and District disaster risk assessment – Indian state and its districts, Hazards and its risk assessment.

Unit II  
7 Hours
Development of disaster risk assessment, management and response plans at village / ward / Gram Panchayat, block / Urban local body level and its capacity building mechanism.

Unit III  
7 Hours
Constitutions of disaster management teams and committees at all level – representation of women in all committees and team and its advantages and disadvantages.

Unit IV  
8 Hours
Capacity building in cyclone and earthquake resistant features for houses in disaster prone districts, training in retrofitting and construction of technology, demonstration units. Integration of disaster management plans with development plans of local self-governments.

Unit V  
8 Hours
Capacity building of disaster management teams for drought, volcanoes, epidemic, biohazards, etc. Special training for women in first aid, shelter management, water and sanitation, rescue and evacuation, etc.,

Text Books:

Reference Books:
1. Web materials and different agencies policy plans.
**DMPB – 426 - PUBLIC, BIOLOGICAL AND AGRICULTURAL HAZARD**

**Unit I**
7 hours

**Public health and biological hazards;** Outbreak of dengue and malaria epidemics, contagious diseases e.g. AIDS, protection and awareness.

**Unit II**
5 hours

Ground water contamination; water-borne diseases affecting bowels/kidney.

**Unit III**
8 hours

Definition; Biohazards – Classification – Levels of hazards - Human disasters due to air accidents and bomb explosions – development of field disaster victim – identification capability and enhancement of forensic and pathology capabilities.

**Unit IV**
8 hours


**Unit V**
8 hours


**Text Book:**

**Reference books**
3. Shaw, Disaster Management, Orient Longman, New Delhi
6. Gaur, Disaster Management, Authors press, New Delhi
8. Sathis Modh, Introduction to Disaster Management, Macmillan, New Delhi
10. Sundar, Disaster Management, Sarup & sons, New Delhi
DMPB - 427 - URBAN/ RURAL PLANNING AND HAZARD MAPPING

Unit I 6 Hours

Introduction; Urban Area Interpretation, Various classification system; Residential area classification; Principals of sub-division; Unit of sub-division; Urban sprawl; Environment of residential area; Process of built form; Suitability analysis,

Unit II 7 Hours

Rural land use and settlement patterns, Settlement patterns associated with major agriculture types - Space Use, Space use classification system; NIROV space use classification making of inventories; Case study, Land use Planning, Issues in land use planning; Classification of Land Use;

Unit III 7 Hours

Introduction to planning, Historical development of planning, general development plans, Information for planning, Zoning, Land subdivision regulations, Strategic Planning, Environmental land use planning, Economic development

Unit IV 8 Hours

Land use change monitoring urban sprawl mapping, Aerial Photo & Census Operation, Census operation in India, Population estimation through remote sensing-Basic principles, Updating of population data, case studies, Traffic and parking survey, Traffic surveys; Traffic volume; Parking surveys; Role of RS & GLS in Transportation Planning.

Unit V 8 Hours

Integration of hazard loss considerations in urban infrastructure planning, Facilities location and planning, Hazard mapping and zoning, Building regulations, Building codes, Performance standards, Shelters, Evacuation route planning.

Text Books:


Reference Books:


4. There will also be a limited number of readings from journal articles and/or chapters of books which will be on reserve in the library and from material on the worldwide web (WWW).
DMPB – 416 - COASTAL AND HYDROLOGICAL HAZARDS

Unit I

Coastal Hazards; Causes, locations, Modes of occurrence of various coastal hazards like Tsunamis, Storm Surges and Erosion. Their origins and mitigation measures. Historical records of tsunamis. Hydrodynamics of tsunamis and storm surges, Tsunami Early Warning Systems, Construction of tsunami walls, levees etc. Mitigation of their effects.

Unit III

Marine Pollution, Coastal Salinities, Oil slicks, Impact of sea level rise. Water pollution, water quality, classes of water pollutants, pollutant trace elements in water, Arsenic, Cadmium, lead, mercury and other inorganic chemicals in water, acidity, alkalinity, salinity, sewage and water pollution – Ground water rise, causes of rising ground water.

Unit III

Historical perspective coastal hazards and disaster management in India; vulnerability assessment in coastal disaster management, island risk management pertaining to cyclone and sea level rise and trends of coastal disaster management. Coastal early warning system, community based disaster management system.

Unit IV

Hazards from floods, causes of flooding. Flood diversion measures, real-time flood forecasting, methods of flood forecasting. Flood hazard inundation modeling, mitigation plan in a flood-prone area, floodplain management, characteristic and identification, measures to mitigate flood damage, flood hazard and risk assessment, Integrated Flood Management Information System (IFMIS), urbanization and flooding, flood impact on flora and fauna, flood hazards in India, urban flooding, flood control, flash flooding, riverine floods and tidal floods.

Unit V


Text Book:


Reference Books:

# DMPB – 417 - INDUSTRIAL HAZARDS MITIGATION

<table>
<thead>
<tr>
<th>Unit</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>6</td>
</tr>
<tr>
<td>II</td>
<td>7</td>
</tr>
<tr>
<td>III</td>
<td>7</td>
</tr>
<tr>
<td>IV</td>
<td>8</td>
</tr>
<tr>
<td>V</td>
<td>8</td>
</tr>
</tbody>
</table>

- **Unit I**: 6 hours
  - Definition – source and types of Industrial hazards – toxic release – type of toxic effects – toxic rate parameters

- **Unit II**: 7 hours

- **Unit III**: 7 hours
  - Rapid ranking, qualitative, quantitative, semi-quantitative methods. Effect model - protection against contamination of the environment from radioactive fallout.

- **Unit IV**: 8 hours
  - Effluent contamination and acid rain – environment and ground water pollution and management – solid waste management - monitoring and protective measures - safe toxic waste disposal technologies.

- **Unit V**: 8 hours

## Text Books:


## Reference books

2. Disaster prevention and mitigation 1984. UNDRO publications, Geneva
5. World Disaster Report, 1993, International Federation of Red Cross
DMPB- 418 - EARTHQUAKE SEISMOLOGY AND INTERNAL STRUCTURE OF EARTH

UNIT I

Global Seismology and Seismic waves: Waves, Pulse and Ray, Detecting Seismic waves, Seismometers and Geophones. The Earth is Concentrically Layered: - Spherical symmetry of the Earth’s interior, finding the path of a Ray through the refraction, reflection. Snell’s law. Tracing Rays through the Earth.

UNIT II

Seismic features of the Earth’s Core and Mantle, Longitudinal and transverse waves. The Mantle-Core differences, Other Seismological features of the Earth’s. Attenuation of Ray path. Seismic tomography

UNIT III


UNIT IV


UNIT V

Seismic Reflection: Velocity determination using normal movement NMO; Stacking dipping reflector and migration common depth- point (CDP) stacking

Books: