PONDICHERRY UNIVERSITY

(A Central University)

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

Hard Core				Soft Core		
Sl. No	**Course Code**	**Theory/ Practical**	**Credit**	**Course Code**	**Theory/ Practical**	**Credit**
I SEMESTER						
1	DMPB 411	Oceanography	4			
2	DMPB 412	Composition & Classification of the Solid Earth and Atmosphere	4			
3	DMPB 413	Coastal Geomorphology	4	414	Marine Geology	**3**
4	DMPB 416	Crustal deformity structures & Geodynamics	3	415	Meteorological Hazards	**3**
5	DMPB 417	Field work and Lab I (covering courses 411, 412)	1+1=2			
6	DMPB 418	Field work and Lab II(covering courses 413, 414)	1+1= 2			
II SEMESTER						
1	DMPB 421	Natural & Manmade Hazards	4			
2	DMPB 422	Application of Geophysical techniques for Microzonation & Natural Hazard Identification	4			
3	DMPB 423	Remote Sensing	4			
4	DMPB 424	Geographical Information System	3			
5	DMPB 428	Field work and Lab III (covering courses 421, 422)	1+1= 2	DMPB 425	Capability models of disaster risk assessment	3
d6	DMPB 429	Field work and Lab IV (covering courses 423, 424)	1+1= 2	DMPB 426	Public, Biological & Agricultural Hazard	3
7	DMPB 430	Internship	2	DMPB 427	Urban/Rural planning & hazard mapping	3
III SEMESTER						
1	DMPB 511	Disaster Management	4			
2	DMPB 512	Design & protection structures	4			
3	DMPB 513	Environmental Impact Assessment	4	DMPB 515		
4	DMPB 514	Disaster prediction & regional forecasting	3	DMPB 516	Coastal & hydrological hazards	3
5	DMPB 519	Field work and Lab V (covering courses 511, 512)	1+1= 2	DMPB 517	Industrial hazards mitigation	3
6	DMPB 520	Field work and Lab VI (covering courses 513, 514)	1+1= 2	DMPB 518	Earthquake seismology & Internal structure of the Earth	3
IV SEMESTER						
1	DMPB 521	Project work	4			
		Total	**63**			**12**

Grand Total: Hard Core (63) + Soft core (9) = 72

FIRST SEMESTER

DMPB – 411 - OCEANOGRAPHY

Unit I **8Hours**

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

Unit II **10Hours**

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 **10Hours**

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 **10Hours**

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 **10Hours**

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:

1. Tom Garrison, 2008, Essentials of Oceanography, Daya publishing house - 434p
2. Thurman, Harold., 2007.6th edition, Introduction to Oceanography., Prentice Hall Inc., New Jersey.
3. Millero F.J, 2002. Chemical Oceanography, CRC press

Reference Books:

1. E.J.W. Jones, 2009, Marine geophysics, Wiley, p.466.
2. Paul pinet, 2009,Oceanography, West publishing company, p320.
3. Methias tonczah, J.Stuart Godfrey, 2009, Regional Oceanography, Daya publishing house, p.390.
4. Grant Gross. M., 2005 Oceanography: A view of the earth (sixth edition), Prentice Hall Inc. New Jersey
5. Mallik, 2008, Marine Geology, New academy publisher, p.457.
6. Pilson, M.E.Q., 2009, seventh edition, An Introduction to the chemistry of the sea, Prentice Hall Inc., New Jersey.
7. Mark W. Denny – 2008, How the ocean works: an introduction to oceanography, Cambridge, 320p.

DMPB – 412 - COMPOSITION AND CLASSIFICATION OF THE SOLID EARTH AND ATMOSPHERE

Unit I **10 hours**

Rocks and Earth structure: Three Classes of rocks – Igneous, Sedimentary and Metamorphic rocks, Rock distribution in the Earth, Earth Structure and Petro -tectonic Assemblages, **Asthenosphere**, Moho, Thermal gradient lithosphere . Igneous Rocks: Volcanic rock- Basaltic lava, Pyroclastic rocks Intrusive rocks- Granite, Granodiorides and related rocks, and Carbonotites

Unit II **10 hours**

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 **10 hours**

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 **10 hours**

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 **8 hours**

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:

1. Petrology: The study of Igneous, Sedimentary & Metamorphic Rock, Second Edition by Loren A. Raymond, Waveland Pr.Inc; 2nd Edition, 2007.
2. Sam Boggs Jr. **Principles of Sedimentology and Stratigraphy (4th Edition)** Prentice Hall; 4 edition (July 10, 2005)
3. Dexter Perkins, Minerals in Thin Section; Prentice Hall, 2nd edition, 2003.

DMPB – 413 - COASTAL GEOMORPHOLOGY

Unit I **10 hours**

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 **10 hours**

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 **10 hours**

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 **8 hours**

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

Unit V **10 hours**

Coastal issues, Applied coastal geomorphology

Sea wall rise –storm hazards –coastal erosion – wetlands, estuary, land reclamation – subsidence of coastal aquifers – salt water intrusion

Reference:

1. Robin Davidson-Arnott, **Introduction to Coastal Processes and Geomorphology;** Cambridge University Press; 1 edition (January 25, 2010).

2. Gerhard Masselink, **An Introduction to Coastal Processes and Geomorphology;** A Hodder Arnold Publication (August 14, 2003).
3. Kenneth Pye, **Coastal and Estuarine Environments: Sedimentology, Geomorphology and Geoarchaeology; :** Geological Society of London (December 1, 2000).
4. M. L. Martínez, **Coastal Dunes: Ecology and Conservation;** Springer (December 12, 2007).
5. Burbank, **Tectonic Geomorphology;** John Wiley & Sons, Inc.; 2 edition (October 2011).
6. James S. Monroe, **The Changing Earth: Exploring Geology and Evolution;** Brooks Cole; 006 edition (July 22, 2011).

DMPB - 416 - CRUSTAL DEFORMITY STRUCTURES AND GEODYNAMICS

UNIT I **8 hours**

Crustal Deformation: Stress – compression, tensional, and shear. Strain: Elastic deformation, plastic deformation, ductile, brittle. Strike, dip. Folded structure: Limb, axial plane, fold axis. Types of folds: monoclines, anticlines, synclines, symmetrical, asymmetrical, overturned and recumbent folds

UNIT II **6hours**

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 **8 hours**

The basic concept of Plate Tectonics – Divergent or Constructive Margins – Ocean Floor spreading and , Magnetic Anomalies, The shape of spreading ridge. Conservative Margins .Destructive Margins: – i) Ocean – Ocean Convergent Margins ii) Subduction Zones – Ocean – Continent Convergent Margins. iii) Continent – Continent Convergent Margins.

UNIT IV **8 hours**

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 **6 hours**

Volcanoes, Temperature content and Viscosity of Magmas. Volcanic landforms, Cluster cones, Strato Volcanoes, Shield Volcanoes. Eruptive Styles Calderas – Volcanisms and Plate Tectonics, Plate – Tectonics setting of Volcanoes. Volcanism at subduction zones, hotspot, Volcanism at continental hotspot.

Text Books;

1. Donald.L.Turcotte, Geodynamics, Cambridge university Press; 2nd edition (2002)
2. Kurt Stuwe, Geodynamics in the lithosphere: An Introduction, Springer; 2nd edition (2007)

References:

1. Scarth, A. 1994. Volcanoes. UCL Press, London.
2. J.A.Bourne. Crustal Structures and Mineral Deposits: E.S.T.O'driscoll's Contribution to Mineral Exploration, Rosenburg Publishing (2007)
3. Kearey, P., and Vine, F. J. 1996. Global tectonics, 2nd ed. Blackwell Science Ltd., Oxford, UK.
4. Gubbins, D. 1990. Seismology and plate tectonics. Cambridge University Press.
5. Bolt, B. A. 1999. Earthquakes, 4th ed. Freeman, New York. BP statistical review of world energy. 1997. Group Media and Publications, BP Co., plc.

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,
2. Measuring devices 2: Current meter, Echo Sounder, Hydrophone. Petersen grab, Vertical gravity corer.
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:

1. Edward A. Keller and Robert .H. Blodgett. 2008. Natural hazards. Pearson Prentice hall. 488 p.
2. Donald Hyndman and David Hyndman. 2009. Natural hazards and disasters. Brooks/cole. 555 p.

References Books:

1. Goel. S.L. Disaster administration and management. 2007. Deep & Deep publication pvt.Ltd. 626 p.
2. Srivastava, H.N and Gupta, G.D.2006. Management of natural disasters in developing countries. Daya publication. 201 p.
3. Bryant Edwards 2005. Natural hazard , Cambridge university press UK.
4. UNDRO mitigation natural disaster: Phenomena, effect and options. United Nations, New York. 1991.

DMPB – 422 - APPLICATION OF GEOPHYSICAL TECHNIQUES FOR MICROZONATION AND NATURAL HAZARD IDENTIFICATION

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**

Electrical Resistivity Technique: – principle; concept of depth penetration, Wenner – Slumberger electrode configurations – Apparent resistivity. Resistivity profiling – Vertical Electrical Sounding – field procedure, interpretation. Electrical resistivity imaging for mapping of bed rocks and delineation of fault structure.

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 **10hours**

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:

1. **H. Robert Burger, Introduction to Applied Geophysics: Exploring the Shallow Subsurface;** W. W. Norton & Company (July 6, 2006).
2. Griffiths, D. H., and King, R. F. 1981. Applied geophysics for geologists and engineers, 2nd ed. Pergamon, Oxford, UK.
3. Hailwood, E. A. 1989. Magnetostratigraphy. Blackwell scientific, Oxford, UK.
4. Kasahara, K. 1981. Earthquakes mechanisms. Cambridge University Press, Cambridge, UK.
5. Parasnis, D. S. 1997. Principles of applied geophysics, 4th ed. Chapman and Hall,

DMPB - 423 - REMOTE SENSING

Unit I **8 Hours**

Aerial photography, advantages, limitations, geometric characters – film, spectral sensitivity of Black and White films, color film, color infra red film - filter – Aerial film cameras, single lens frame camera, panoramic cameras, film resolution, electronic imaging, aerial videography, multi band imaging,. Elements of aerial photo interpretation, Preparation of photogeological map.

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:

1. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman, 2007, Remote sensing and image interpretation, Fifth edition, Wiley student edition.

2. Agarwal, C.S. and Garg, P.K. 2000, Textbook on remote sensing in natural resources monitoring and management, Wheeler Publishing, A division of A.H.Wheeler & Co. Ltd., New Delhi.
3. Ravi P.Gupta, 2008, Remote sensing Geology, springer, 2nd edition. P.325
4. John R Jensen 2007, Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall, New Jersey, p309.
5. George Joseph, 2007, Fundamentals of remote sensing, University press, p490.
6. Agarwal, C.S. and Garg, P.K. 2000, Textbook on remote sensing in natural resources monitoring and management, Wheeler Publishing, A division of A.H.Wheeler & Co. Ltd., New Delhi

Reference Books

1. Seelye Martin, 2004, An introduction to Ocean Remote sensing, Cambridge

2. Lee-Lueng Fu Anny Cazenave, 2010, Satellite altimetry and earth sciences, Academic press, International geophysics series, p.432.
3. John. R. Schott, 2007, Remote sensing the image chain approach, Oxford university press, p.394.

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**

Overview of GIS software, introduction about ARCGIS, Arcmap, Arccatalog, Arctoolbox, 3D analyst, ARCGIS environment, ARCGIS extension, ArcIMS, ArcSDE, ArcGIS server, Developer GIS, ArcGIS engine – Mobile GIS. Query based information retrieval. webGIS, online GIS and its applications. Development of GIS based decision support for disaster risk reduction. Open source. GIS for natural disaster management. Guidelines for geospatial preparedness,

Text Books:

1. P.A. Burrough, 2007, Principles of Geographical Information System for Land Resource Assessment, Oxford University Press, p.345.
2. Tor Bernhardsen, 2009, Geographic information system an introduction, 3rd edition, Wiley student edition, p.428
3. P.A. Longley, M.F. Goodchild, D.J. Manguire, D.W. Rhino, Geographical Information System, Volume I: Principal and Technical Issues, Volume II: Management Issues and Applications, John Wiley & Sons, p432.
4. Ian Heywood, 2006, An introduction to GIS, Prentice Hall, 464p.
5. Paul A. Longley, 2010, Geographic Information Systems and Sciences, John Wiley and Sons Ltd, 536p.

6. Michael f. Goodchild, 2005, Geographical Information Systems, principles, techniques, management and applications, John Wiley & Sons Inc., 404p
7. Andrew Skidmore,2008, Environmental modeling with GIS and remote sensing, Taylor & Francis
8. George B Korte, 2007, The GIS Book On Word Press, Thomson Learning, Inc.

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

3. Identification of landslide: Landslide Prone Zone and Slope stability using GPR and Resistivity Images.
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**.

24 hours

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 stereo scope, 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)

THIRD SEMESTER

DMPB – 511 - DISASTER MANAGEMENT

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:

1. Damon P. Coppola. 2011. Introduction to International Disaster Management. Elsevier publications.
2. Jack Pinkowski. 2008. Disaster Management Handbook. CRC Publication. 628 p.

Reference books

1. Bryant Edwards 2005: Natural hazard, Cambridge University press UK.
2. Sinha. P.C 2011. Introduction to disaster Management. Anmol publication. 368 p.
3. Ghosh, G.K. Disaster Management, Macmillan, New Delhi
4. Sathis Modh, Introduction to Disaster Management, Macmillan, New Delhi
5. Sharma, R.K. & Sharma, G 2005 (ed) Natural disaster APH publishing corporations, 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:

1. Yousef Bozorgnia, Vitelmov Bertero, 2008, Earth quake engineering, CRC press. P456.
2. Wai-Fah Cheu, Charles Scawthorn, 2009, Earth quake engineering, CRC press. P. 34-19.
3. Williams, Martin, 2010, Structures: Theory and analysis. Palgrave Macmillan, 448p.
4. Chopra, Anil.K, 2000. Dynamics of structures: Theory and applications to earthquake engineering. Pearson Higher Education, 844p.

5. Coull. Alex. Stafford Smith and Bryan, 1991. Structural analysis and design of high rise building. Jhon Wiley and Sons. Ltd. 558p.
6. Priestely, M.J.N. and Paulay. Tom, 1992. Reinforced concrete and masonary buildings. John Wiley and Sons Ltd., 768p.
7. Berqado, D.T., Balasubramanian, A.S. and Alfaro, M.C. 1994. Improvement techniques of soft ground in subsiding and lowland environment. Swets & Zeitkinger Publishers, 232p.
8. Chen. W.F..,Lui. E.M., 2006 Earthquake engineering for structural design, Taylor & Francis,

DMPB- 513 – ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Unit 1 **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**

Impact assessment Procedure; Application of matrices, Network and overlay maps, data collection, Environmental evaluation system – impact prediction – evaluation and mitigation – assessment of impact on physical, biological and socio-economical environment.

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 **8hours**

Environmental impact statement and environmental management plan ISO 14000 - EIA guidelines 1994.

Text Books:

1. Charles H. Eccleston. 2011. Environmental Impact Assessment- A guide to best professional. 290 p.
2. Peter Morris and Riki Therivel, 2008. Methods of Environmental Impact Assessment. Rutledge publisher, 512 p.

References:

1. Glasson, Riki Therivel and Andrew Chadwick. 2005. Environmental Impact Assessment. Routledge publisher, 423 p.
2. Barthwal R R. 2002. Environmental Impact Assessment. New Age International publisher, 354 p.
3. Betty Bowers Marriott, 1997, Environmental Impact Assessment: A Practical Guide, McGraw Hill.
4. Canter L., 1995, Environmental Impact Assessment, McGraw Hill.
5. Kulkarni V.S., Kaul N, Trivedi R.K., "**Handbook of Environmental Impact Assessment**".
6. Peter Morris & Riki Therivel, (2001). "**Methods of Environmental Impact Assessment**" Routledge.

DMPB – 514 DISASTER PREDICTIONS AND REGIONAL FORECASTING

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.

UNITII **8 Hours**

Models and their Utilization: Digital Elevation Model, Flood Forecast Models, Flood Stimulation Operations – Hazard Zoning Operations – Coastal Erosion Monitoring Airborne Scanning Laser Altimetry , LiDAR Systems.

UNIT III **8 Hours**

Tools for Hazards Prediction and Forecasting – Decision Support Centre (DSC) National Emergency Operation Centre (NEOC) – Virtual Private Network (VPN) National Emergency Communication Network – (NECN) Early Warning Systems (EWS) for Hazards.

UNIT- IV **6 Hours**

Early Warning Systems (EWS). Tsunami Warning Systems (TWS) – principles –procedures – sub systems communication Equipments – user agencies dissemination of information – countries involved and beneficiaries.

UNIT-V **6 Hours**

Cyclone Warning System (CWS) Cyclone Surveillance Radars Satellite Pictures – Advance very High Resolution Radio-meter (A.V.H.R.R.) – Tiros Information Processor (T.I.P. data) – INSAT-LB – Meteorological Data Utilisation Centre (M.D.U.C.).

Text Books:

1. Katharine Anderson, Predicting the Weather: Victorians and the Science of Meteorology, University Chicago Press, P.182.
2. Met Monograph No. Synoptic Meteorology 5/2007: Probable Maximum Storm Surge Heights for the Maritime Districts of India. Issued by the Additional Director General of Meteorology (Research) Pune 411 005.

Reference Books

1. Web materials and different agencies policy plans.

DMPB - 519 - LAB V

(Covering courses 511&512 – Disaster management & Design and Protection structures)

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
6. Groundwater and Geophysical survey and hydrology.
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**

Marine Geology - Origin of Earth and ocean – necessity of marine geological studies – geological oceanography – morphology of sea bed – relief of ocean floor – continental shelf , slope and abyssal plain – submarine canyon – storm surge – mid oceanic ridge – sea mounts – hot spots – theory of isostasy

Unit II **8 hours**

Marine Resources Beach placers – bio resources of sea – petroleum – energy production of the sea – mineral resources of the sea surface ; manganese – phosphatic nodules – authigenic minerals – black smokers – gas hydrates – sand – petroleum – origin , distribution and status of exploration of the resources

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, archealogical , bathymetric and satellite imagery data) – impact of sea level changes in geomorphology and lithology

Unit IV **7 hours**

Marine Instruments

Grab – corer – current meter – dredge – underwater samples – core drilling – under water TV camera – eco sounders – side scanner – gravity meter – magnetometer – seismograph – submergible – SCUBA – marine navigator (GPS) – principle and applications of all the instruments

Unit V **5 hours**

Estuary (origin, classification, circulation) – lagoons – sediments (lithogene-ous, biogeneous , cosmogenous)

Reference:

1. H. Kuenen, **Marine Geology;** Baltzell Press (November 4, 2008)
2. John H. Steele, Steve A. Thorpe, **Marine Geology & Geophysics: A derivative of the Encyclopedia of Ocean Sciences; :** Academic Press; 1 edition (October 27, 2010)
3. Eugen Seibold , **The Sea Floor: An Introduction to Marine Geology ;** Springer; 3rd ed. Softcover of orig. ed. 1996 edition (December 2, 2010)

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, up draughts, 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:

1. Natural hazards. 2005. Edward Bryant. Pbk. ISBN 0521537436.
2. Environmental hazards: assessing risk & reducing disaster (4th edition). 2004. Keith Smith. Routledge. Pbk. ISBN 0415318041
3. Natural disasters. 1998. David Alexander. UCL Press. Pbk. ISBN 1857280946
4. Natural hazards & environmental change. 2002. Bill McGuire, Ian Mason & Chris Kilburn. Arnold press. Pbk. ISBN 0340742208.

Reference Books:

1. The earth: a very short introduction.
2. 2002. Martin Redfern. Pbk. ISBN 0192803077
3. Global tectonics. 1996. Philip Kearney & Fred Vine. Blackwell. Pbk.ISBN 0865429243
4. Geological hazards. 1999. Fred Bell. Spon Press. Hbk. ISBN 0419169709
5. Dangerous earth: an introduction to geological hazards. 1996. Barbara Murck et al. Wiley Press. Pbk. ISBN 0471135658
6. The mathematics of natural catastrophes. 1999 Gordon Woo. Imperial College Press. Hbk. ISBN 1860941826.

DMPB – 425 - CAPABIILTY MODELS OF DISASTER RISK ASSESSMENT

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:

1. Mary. C. Comerio, 1998, Disaster Hits Home: New policy for Urban housing recovery, University of California Press; 326p.
2. Robert A. Stallines, 2001, Methods of Disaster research, Xlibris Corporation, 528p.

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.

UnitII **5 hours**

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

UnitIII **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**

Agricultural and Veterinary hazards; Locust outbreaks and their management. Brown plant hopper attacks in paddy, foreign animal and plant species invasion, monitoring/forecasting. Coconut mite and beetle attack.

Unit V **8 hours**

Salt water intrusion into crop fields. Remedial measures. Bird's Flu epidemics and protection and awareness measures. Foot and mouth/mad cow disease. Educating farmers.

Text Book:

1. Bryant Edwards 2005 : Natural hazard , Cambridge university press UK, 312 p.
2. Peter H. Wald and Gregg M.stave, 2002, Physical and Biological Hazards. 680 p.

Reference books

1. Reena Mohanka, Chowdhary, Singh M.P.2010. Environmental Resources and Biological hazards. A.P.H publication. 384 p.
2. Sharma, R.K. and Sharma, G 2005 (ed) Natural disaster. APH publishing corporations, New Delhi
3. Shaw, Disaster Management, Orient Longman, New Delhi
4. Alexander ,D.1993, Natural disaster, UCL press Ltd; London
5. Bryant Edwards (2005) : Natural hazard , Cambridge university press UK.
6. Gaur, Disaster Management, Authors press, New Delhi
7. Ghosh, G.K. Disaster Management, Macmillan, New Delhi
8. Sathis Modh, Introduction to Disaster Management, Macmillan, New Delhi
9. Singh, Disaster Management, Future challenges, IK International, 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:

1. Levy, John M. 2006. Contemporary Urban Planning Eighth Edition. Upper Saddle River, NJ: Prentice Hall.
2. Duany, Andres, Elizabeth Plater-Zyberk, and Jeff Speck. 2000. Suburban Nation: the Rise of Sprawl and the Decline of the American Dream. New York: North Point Press.
3. Mitchell, Don. 2003. The Right to the City: Social Justice and the Fight for Public Space.

Reference Books:

1. **The Small Town Planning Handbook**, 2nd edition. T. L. Daniels, J.W. Keller, and M. B. Lapping. Chicago, IL: American Planning Association, 1995. This book is available in the NSU bookstore.

2. Several readings will also be required from the following book on reserve in the John Vaughan Library: **The Practice of Local Government Planning**, 2nd edition. Edited by Frank S. So and Judith Getzels. Washington, DC: International City Management Association, 1988.
3. Some readings will probably be assigned from the following book that will be on reserve in the John VaughanLibrary: **ArcGIS and the Digital City: A hands-on approach for local governmen**t. By William E. Huxhold, Eric M. Fowler, and Brian Parr. ESRI Press, 2004.
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 **7 hours**

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 **7 hours**

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 **7 hours**

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 **8 hours**

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 **7 hours**

Dam failures, causes, physical characteristics and locations of occurrence. Mitigation procedures. Droughts: Climatologically and human-induced causes. Identification of water supplies in drought-stricken areas. Methods of rain-water harvesting. Awareness programmes.

Text Book:

1. Norbert P. Psuty and Douglas D. Ofiara. 2002. Coastal Hazard Management. Rutgers university press. 421 p.
2. John Heinz H. 2000. The Hidden coasts of coastal hazards- Implication for Risk Assessment and mitigation. Island Press.209 p.

Reference Books:

1. Sinha, P.C.Hydrological Disasters, 2008, Anmol Publications, New Delhi, 240 p.
2. Bryant Edwards 2005. Natural hazard , Cambridge university press UK, 312 p.

3. Alexander ,D.1993. Natural disaster, UCL press Ltd; London
4. Colline larry R. And scheind Thomas D.(2000) .Disaster management.
5. Central water commission, 1987, Flood atlas of India, CWC New Delhi.
6. Government of India 1997, Vulnerability atlas of India, New Delhi.
7. Mallick, T.K. Marine geology, New Academic publishers.457p**.**
8. Morrisaw M (Ed)(1994): Geomorplogy and natural hazard ,Elsevier, Amsterdam.
9. Sharma, R.K. & Sharma, G (2005) (ed) Natural disaster .APH publishing corporations, new Delhi.
10. Valdiya K .S (1987): Environmental geology, Tata McGraw hill, New Delhi.
11. White, G.F, 1974, Natural Hazards: local, national, global, oxford university press, New York.

DMPB – 417 - INDUSTRIAL HAZARDS MITIGATION

Unit I **6 hours**

Definition – source and types of Industrial hazards – toxic release – type of toxic effects – toxic rate parameters

Unit II **7 hours**

Industrial hazard risk assessment; Hazard identification, probability analysis, consequent analysis, risk analysis. Methods for Industrial hazard risk assessment.

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 **8 hours**

Remote sensing and GIS in industrial hazard risk assessment - Industrial hazard risk assessment and legislation – policies and guidelines – National policy.

Text Books:

1. King R.W and Magid, J. 2009. Industrial hazards and safety handbook. 825 p.
2. Sanjoy Banerjee. 2002. Industrial hazards and plant safety. Taylor and Francis groups. UK, 475 p.

Reference books

1. Braj Kishore and Prasad Singh, 2008, Industrial Disaster Management. Navyug publishers, New Delhi, 288p.
2. Disaster prevention and mitigation 1984. UNDRO publications, Geneva
3. Hohenemser, C, R.W.Kates et al. 1983. The nature of technological hazards, 378-384 p.
4. Alexander D 1993, Natural disasters, UCL press Ltd, London
5. World Disaster Report, 1993, International Fedration of Red Cross
6. Smith, K. (2001). Environmental hazards. Rutledge

DMPB- 418 - EARTHQUAKE SEISMOLOGY AND INTERNAL STRUCTURE OF EARTH

UNIT I **Period 7**

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 **Period 7**

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 **Period 8**

Earthquakes and Seismotectonics: What is an earthquake, locating an earthquake, Fault-Plane Solution and Stresses, The Earthquake stress field and the double couple mechanism? Rupture dimensions and displacement. Measures of earthquake size, intensity, severity of an earthquake and a locality Seismic movement: Size of the earthquake at source. Seismo tectonics, Seismic and aseismic faulting surface waves.

UNIT IV **Period 8**

Magnitude: Measure of Earthquake size, Energies of earthquake. Earthquake damage and its mitigation. Causes of damages, mitigating the damages caused by Earthquakes, Refraction Seismology: Critical refraction and heed ways –The Time – Distance diagrams, Multiple Layers Dipping interfaces, Seismic velocities in rocks, Hidden Layers, Seismic-refraction survey.

UNIT V **Period 6**

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

Books:

1. Looking into the Earth An Introduction to Geological Geophysics: Alan E. Mussett and M. Aftab Khan. Cambridge University Press.
2. Fowter C. M. R. 1990, The Solid Earth: An Introduction to global geophysics: Cambridge University Press.
3. Gubbins D. 1990: Seismology and Plate tectonics. Cambridge University Press.
4. Park, R. G. 1988. Geological Structure and Moving Plates. Blackie, Glasgow.
5. Olsen, K. H. 1995. Continental Rift, Structure Evolution and tectonics. Elsevier, Amsterdam