

5. Cluster analysis, factor analysis and contouring.
6. Use of application software (MS Excel, SPSS, Minitab etc.) for graphical representation of statistical data and construction of bar diagrams, pie diagrams, rose diagrams histograms, scatter plots etc.
7. Programming languages and operating systems. Power Point slide preparation.
8. Computer aided design and graphics.
9. Components of a computer (hardware and software), Input-output devices (storage devices). Evolution of computers. Principles of data processing: Word processing,
10. Programming languages and operating systems. Flow chart, Algorithm.
11. Interactive sessions of teaching to enhance students-teacher interactions through hands-on demonstrations and exercises in the recent advancement of the subject related to the curriculum.

MGE 457: GEOSCIENCES (Open Elective Paper)

Skills, employability and entrepreneurship: This paper is useful to the sister departments of the Earth Science, such as chemistry, physics, life sciences, statistics, computer as well as computing sciences. Usually science students other than earth science qualify NET exams/interviews in the institutes join earth science related organizations. They learn earth science in their area of research. However, with the knowledge of this subject (earth science), students can perform better in their career thereby utilizing the intension of studying the interdisciplinary science. Students have employability in many branches of science in different government organizations and MNCs. Students can start their own entrepreneurship.

Unit 1	Introduction to Geology, Earth and its environment - lithosphere, hydrosphere and atmosphere.	6 hrs
Unit 2	Geological time scale. Origin and evolution of life, fossils, fossilization and their applications.	6 hrs
Unit 3	Geological Agents and hazards: Weathering, Erosion, Transportation and Deposition. Volcanoes, Earthquake, Landslide, Salt water intrusion, Floods and droughts.	6 hrs
Unit 4	Geomorphology: Description of Earth surface features. Landforms, Physical divisions of India. Structure and composition of the Earth's interior: Crust, Mantle and Core.	6 hrs
Unit 5	Structural Geology: Primary structures, secondary structures - folds, faults, joints and unconformities.	8 hrs
Unit 6	Natural Resources: Renewable and non-renewable resources. Water as a resource. Origin, occurrence and distribution of oil and gas. Minerals, rocks. Soil. Economically and strategically important metallic and non-metallic mineral deposits of India. Interactive sessions of teaching to enhance students-teacher interactions through hands-on demonstrations and exercises in the recent advancement of the subject related to the curriculum.	8 hrs

List of References:

1. Fundamentals of Historical Geology and Srtatigraphy of India, Ravindrakumar New Age International Pub.

2. Principles of Paleontology – Raup and Stanley – CBS Publications
3. Principles of Invertebrate Paleontology – Shrock and Twenhofel – CBS
4. Fossil Invertebrates, Cambridge Univ.- Lehmann, U and Hilimer, G. (1983)
5. Micropalaeontology, Graham and Trotman - Bignot, G. (1985)
6. An introduction to Paleobotany - Arnold, Chester R
7. Field Geology – McGraw Hill Book Co. - Lahee, F.H. (1961)
8. Structural Geology – 3rd edition, Prentice Hall - Billings M.P. (1977)
9. Stratigraphy and Sedimentation, W.H. Freeman – Krumbein and Sloss (1963)
10. Economic Mineral Deposits – Bateman
11. India's Mineral Wealth - Oxford Univ. Press - Brown and Dey (1975)
12. Industrial Minerals and Rocks of India - Allied Publishers - Deb, S. (1987).
13. Hydrogeology – K. R. Karanth – Tata McGraw Hill Publishing Co. Ltd.
14. Groundwater – H. M. Raghunath – Wiley Eastern Limited
15. Elements of Hydrology – V. P. Singh
16. Courses in Mining Geology – R.N.P. Arogyaswamy, Oxford and IBH Publishing Co.

THIRD SEMESTER

Skills, employability and entrepreneurship: This semester is quite unique opportunity for students not only to know about the oceans as they cover 71% of the earth surface, but explore further living and non-living mineral resources, in the scenario of depletion of continental resources. Students have chance to go on ocean expedition and exit with course have skills to work in organizations related to ocean and well as Navy. They will be exposed to start their own entrepreneurship. Students are encouraged to undergo internships after the regular offline classes and attend the webinars related to the oceans.

MGH 501: OCEANOGRAPHY – I (PHYSICAL AND CHEMICAL)

Skills, employability and entrepreneurship: These are similar to the above mentioned ones with an emphasis on the physics and chemistry of the oceans. Students have chance to go on ocean expedition and exit with course have skills to work in organizations related to ocean and well as Navy including the R & D Labs. and educational institutions.

PHYSICAL OCEANOGRAPHY

Unit 1	Wind generated waves in the oceans; their characteristics; shallow and deep water waves. Propagation, refraction, reflection and diffraction of waves. Wave spectrum, principles of wave forecasting. Mixing processes in the oceans; characteristics of important water masses. Tide-producing forces and their magnitudes; prediction of tides by the harmonic method; tides and tidal currents in shallow seas and estuaries.	6 hrs
Unit 2	Factors influencing coastal processes; transformation of waves in shallow water; effects of stratification; effect of bottom friction, littoral currents; wave action on sediment movement; rip currents; beach stability, ocean beach nourishment; harbour resonance; seiches; tsunami; interaction of waves with structures.	6 hrs
Unit 3	The global wind system; action of wind on ocean surface; Ekman's theory; Sverdrup, Stommel and Munk's theories; upwelling and sinking with special reference to the Indian ocean. Inertial currents; divergences and convergences; geostrophic motion; barotropic and baroclinic	6 hrs