EGE 5103. Palaeontology and Stratigraphy (4 credits)

Unit - 1

Life during the Precambrian, Diversification of life. Evolution of life during the Palaeozoic, Mesozoic and Cenozoic eras. Cambrian explosion. Fossil record and modes of evolution: Microevolution, Macroevolution and Tree of life. Theory of organic evolution and the factors in the Darwinian theory. Theory of Punctuated Equilibria. Origin of life: extra-terrestrial and terrestrial. Miller's experiment. Mass extinction and its causes. Use of fossils in palaeoclimatic, paleoecological and palaeogeographic studies. Major fossil discoveries from India.

Unit - 2

Micropalaeontology: scope and subdivisions - types, extraction of microfossils from sediments and sedimentary rocks. Foraminifera: their palaeoecology and application in paleoclimate, paleoceanography and biostratigraphy. Radiolaria, Diatoms, Ostracoda, Pteropods, Cocolithophores, Stromatolites and Conodonts – morphology, classification and importance. Palynology: General morphology of spores and pollen and their applications. Palaeobotany: Plant life through geological ages. Gondwana plant fossils. Application of microfossils in petroleum exploration. General characteristics, geologic history, classification and evolution of Pisces, Amphibians, Reptiles, Birds and Mammals (Elephant, Horse and Human being). Human fossils from different parts of the world.

Unit – 3

Development of Stratigraphy: Contributions of the pioneers of Stratigraphy, Major incidents in the Earth's History. Stratotype: Unit, Boundary, Holo-, Hypo-, Para-, Neo-, Lecto- stratotypes. Requirements for stratotypes. Establishment of stratigraphic units: Procedures for the establishment and description of surface and subsurface stratigraphic units.

Lithostratigraphy: Procedures for establishing, extending and naming of Lithostratigraphic units. Revision of Lithostratigraphic units. Biostratigraphy: Significance of fossils, Nature of biostratigraphic units – Life communities and Death assemblages. Procedures for establishing and extending biostratigraphic units, Revision of biostratigraphic units. Chronostratigraphy: Formal and Informal chronostratigraphic units, Procedures for establishing and naming of chronostratigraphic units. Sequence Stratigraphy: Stratigraphic Architecture, Depositional systems and systems tracts, Sequence Boundaries. Fluvial, Lacustrine, Eolian, Marginal marine and Shallow Marine, Deltaic and Deep Marine siliciclastic Sequences.

Unit – 4

The concept of the Precambrian. Distinguishing features and classification of the Precambrian. The Problem of the base of the Cambrian. Precambrian stromatolites, their status as time markers and classification of the Late Proterozoic. Distribution of Precambrian rocks in India. Indian Standard stratigraphic column, hiatuses and breaks. Models for the evolution of Precambrian crust. Shields - cratons and mobile belts. Low-grade and high-grade terrains. Precambrian shield areas. Precambrians of southern India. Major Phanerozoic Basins in India: General description, age, development, evolution, stratigraphy and classification of the Gondwana, Kaveri, Kerala and Cambay Basins. Paleogeography and major events during different periods. Age problems in stratigraphy.

References

- Benton, J.M. and Harper (2009) Introduction to palaeobiology and the fossil record, Wiley-Blackwell, 608p.
- Benton, M.J (2000). Vertebrate Palaeontology, Blackwell Science, 269p.
- Black, R.M (1989) The elements of palaeontology, Cambridge University Press, 420p
- Brasier. M.D (1980) Microfossils, George Allen and Unwin Ltd, 193p.
- Clarkson, E.N.K (1998). Invertebrate Palaeontology and Evolution, ELBS Publishers. 468p.
- Glaessner,M.F. Principles of Micropalaeontolgy, Hafner Publishing Company, 296p.
- Lehmann.U and Hilimer, G (1983) Fossil Invertebrates, Cambridge University, 350p
- Porthero, D.R. (2004) Bringing fossil to life- An Introduction to Paleontology Mc Graw Hill, 512p.
- Pough.H. F, Heiser, J.B. and McFarland, W.N. (1996). Vertebrate Life, Prentice hall, 720p.
- Raup D.M. and Stanley .S (1985) Principles of Palaeontology, 481p.
- Ray, A.K (2008). Fossils in earth Sciences, Prentice Hall of India Private Limited, 444p.
- Shrock, R.R., Twenhofel, W.H (1953). Principles of Invertebrate Palaeontology, Mc Graw Hill, 816p.
- Balasubrahmanyan, M. N. (2006), Geology and Tectonics of India: An Overview, IAGR Memoir No.9, 204p.
- Benton, M J and David A.T. Harper (2013), Introduction to palaeobiology and the fossil record. Wiley-Blackwell, 608p.
- Brookfield, E B. (2004), Principles of Stratigraphy, Blackwell Publishing Ltd, 340p.
- Claude, C. and Albritton J. (1995), Catastrophic Episodes in Earth History, Chapman & Hall, 221p.
- Donovan, S K (Ed.), (1989). Mass Extinctions – Processes and Evidence, Belhaven Press, 266p.
- Gradstein, F M, Ogg, J G, Schmitz, M D and Ogg, G M. The Geological Time Scale 2012. Vol I and Vol II, Elsevier, Amsterdam.
- Hedberg, H.D. (Ed.), International Stratigraphic Guide - International Subcommission on Stratigraphic Classification of IUGS Commission on Stratigraphy.
- Kumar, R, (1985), Fundamentals of Historical Geology and stratigraphy of India, Wiley Eastern Ltd., New Delhi, 254p.
- Lemon, R.R. (1990), Principles of Stratigraphy, Merrill Publishing Company, 559p.
- Miall, A D (2000). Principles of Sedimentary Basin Analysis, Springer Verlag.
- Naganna, C. (Ed.), (1975), Studies in Precambrians, Bangalore University, 291p.
- Naqvi, S. M., Mahmood, S. and Rogers,J.W. (1983), Precambrian Geology of India., Oxford University Press, 240p.
- Naqvi, S.M. and Rogers, J.W. (Eds.) (1987), Precambrian of South India, Geological Society of India, 575p.
- Pichamuthu, C.S. (1985), Archaean Geology, Indian Soc. of Earth Scientists, Oxford and IBH Publishing Co., New Delhi, vol.14, 221p
- Ramakrishnan, M. and Vaidyanathan, R. (2008), Geology of India. Geological Society of India, Bangalore, Vol. 1 & 2.
- Schoch, R.M. and Reinhold, V.N. (1969), Stratigraphy -Principles and Methods, New York, 375p.
- Spencer, E W (1962) Basic concepts of Historical geology, Oxford IBH, New Delhi

- Stanley S M (2005) Earth system history, II Edn., W H freeman & Co., New York
- Weller, Marvin, J. (1960), Stratigraphic principles and practice, Harper and Brothers, New York, 725 p.