MANGALORE UNIVERSITY

DEPARTMENT OF MARINE GEOLOGY

MGH 501: OCEANOGRAPHY – I

Course Outcome:

CO1: Attain knowledge of the physics and chemistry of the oceans, atmospheric and oceanic circulation, climate and weather etc.

CO2: Understand 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.

CO3: Describe the principles involved in the generation of waves and tides and evaluate their effects on coastal processes and marine ecosystems.

CO4: Able to know various principles and processes regulating the composition of seawater – primary and secondary inputs. Rivers, atmosphere, hydrothermal and diagenesis

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 conditions; oceanic eddies, relationship between density, pressure and dynamic topography; relative and slope currents.	6 hrs

Unit 4	Wind driven coastal currents; typical scales of motion in the ocean. Characteristics of the global conveyor belt circulation and its causes. Formation of subtropical gyres; western boundary currents; equatorial current systems; El Nino and La Nina; monsoonal winds and currents over the North Indian Ocean; Somali current; Upwelling process in the Arabian Sea. Estuaries: classification and nomenclature; estuarine circulation and mixing; depth-averaged and breadth-averaged models; sedimentation in estuaries; salinity intrusion in estuaries; effect of stratification; coastal pollution; mixing and dispersal of pollutants in estuaries and near-shore areas.	8 hrs

Chemical Oceanography

Unit 5	Introduction to Chemical Oceanography: Principles and processes regulating the composition of seawater – primary and secondary inputs. Rivers, atmosphere, hydrothermal and diagenesis.	6 hrs
Unit 6	Constancy of ionic composition of seawater. Composition of seawater – Classification of elements based on their distribution; major and minor constituents; behavior of elements; chemical exchanges across river-sea, particulate-dissolved and sediment-water interfaces.	6 hrs
Unit 7	Distribution of radionuclides and gases in the oceans for understanding water column and sedimentary particles scavenging in the oceans. Residence times of elements in seawater and processes regulating it.	6 hrs
Unit 8	Chemical and biological interactions – Ionic interactions; cycling and air-sea exchange of important biogenic dissolved gases; carbon dioxide-carbonate system; alkalinity and control of pH; abiotic and biotic controls of trace elements in the ocean; biological pump and controls on atmospheric composition.	8 hrs

List of References:

1. Principles of Oceanography - M. Grant Gross.
2. Oceanography – J.J. Bhat.
3. The Open University Set Book (Second Edition) 314p.
4. Pinet P. R. (1992) Oceanography: An introduction to the Planet Oceanus, West Publ., Co. 571p.
5. Emerson, E and Hedges, J. (2008) Chemical Oceanography and the Marine Carbon Cycle. Cambridge University Press.

6. Riley, J. P. and Chester, R. 1971. Introduction to Marine Chemistry, Academic Press,
7. Chemical Oceanography, Vol. 1- 10 (2nd Ed.) - J. P. Riley and G. Skirrow, eds, Academic Press (1975–1989).

8. Fasham, Michael J.R. (2003) Ocean Biogeochemistry. The Role of the Ocean Carbon.
9. Cycle in Global Change Series.
10. Komar, P. D., (1976) Beach Processes and Sedimentation, Prentice-Hall. 429p.
11. Reddy M.P.M. (2001) Descriptive Physical Oceanography, A ABalkema Press, 440p.

12. Shepard, F.P. (1963), Submarine Geology. 2nd. Ed. New York: Harper Row.557p.
13. Shepard, F.P. (1937), Retreived classification of marine shoreline. J. Geology 45: 602-24.
14. **Schulz**, H.D. and **Zabel**, M. (2006) Marine Geochemistry. Springer. 221p.
15. Coastal Engineering Processes: Dominic Reeve, Andrew Chadwick and Chris Fleming - Allied Publishers
16. Marines on the Beach: Christopher Paul - Allied Publishers. .
17. Coastal Processes with Engineering Applications: Robert A. Darylampe - Limited.
18. The Indian Ocean Tsunami: Karon Pradhyumna and Subbiah Shanmugham- Foundation.
19. Coastal Zone Management: United Nations Convention on Law of the Sea-Uncclos III: Ar.DushyantKamat - Jnanadha Prakash.
20. Coastal Hydrodynamics: J. S. Mani - PHI Learning Pvt Ltd.
21. Ocean Energy: R. H. Charlies & C. W. Finkl - Springer.
22. Coastal & Marine: Geospatial Tech David R. Green – Springer.
23. Glossary of Geoscience and Oceanography: Tanmaya Rudra - JnanadhaPrakashana.
24. Understanding Sea Level Rise and Variability: Church John A. - John Velly and sons.
25. Coasts, Marine Structures and Breakwaters: Adapting to change: Allsop N. W. H. - Telford, Thomas.
26. Indian Ocean Studies Cultural, Social & Political Perspectives: Shanta Murthi and Jamal Shraf - Routledge.