

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI - 627 012

CENTRE FOR GEOTECHNOLOGY

UNIVERSITY DEPARTMENT

M.Phil. Geomarine Technology (CBCS)

(2016 – 2017 Onwards)

Eligibility for Admission :

Master degree in Geology/Applied Geology /Applied Geosciences/Earth Sciences/ Geo-Informatics /Marine Geology/ Geophysics/ Life Sciences/ Remote sensing &GIS/Oceanography/Physics/Chemistry/Mathematics/Geography/Physical ceanography/ Marine Science & Technology/ Ocean Science & Technology/ Marine Biology/Disaster Management or Equivalents

(or)

Any master degree in Engineering

Course Structure

SL.No	Se mes ter	Subject	Credits	Hours /week	Marks			Passing Minimum	
					Int.	Ext.	Tot	Ext.	Tot.
1	I	Core -I (Theory): Research Methodology	8	8	25	75	100	38	50
2	I	Core – I (Theory) : Marine Geosciences	8	8	25	75	100	38	50
3	I	Elective –I (Theory): Marine Georesources & Geotechnology	8	8	25	75	100	38	50
4	II	Project and Viva-voce	16	-	25	75	100	38	50
Total			40	-	-	-	400	-	-

Research Methodology

Unit I : Principles and practices of statistical methods in Geosciences/ Biosciences in resesarch – Collection of data – Presentation of data - Analysis of data (Mean – Mode – Median- Standard deviation- Skewness-Kurtosis). Testing hypothesis- Analysis of variance – correlation- Regression – Factor analysis.

Unit II : Research – Definition – Scientific method - bias and prejudice in scientific research- Hypothesis, theory and scientific law- Research design – preparation of research project – report writing.

Unit III : Beach profiling, Current measurement – Wave & tide recorder – prepapration of wave Refraction diagram – Sediment Transport Evaluation –Bottom sediment sampling – Mineral identification including clay minerals – optical, chemical, X-ray diffraction methods, microprobe., etc. Sedimentological analysis – grain size – heavy minerals – coarse fraction analysis – texture of grain size, roundness, shape, sphericity.

Unit IV : Marine Geophysics : Echosounder – Side scan sonar – Position fixing methods at sea. Ground Penetration Radar – Electrical methods – Seismic methods, Magnetic and gravity methods – Radiometric methods : dating analysis – radio carbon, radiometric, pottasium – argon dating, thermoluminescence, fission track dating, isotope dating, tree ring dating, etc

Unit V : Basic principles of Remote Sensing – Classical Photometry – Satellite Imageries – Radar – Application of Earth resources mapping – GIS: Fundamentals – Data acquisition- Data Processing – Analysis- Application

Reference:

1. Mishra R. P (1989) – Research Methodology, Concept Publishing Co, NewDelhi
2. Jones , E.J.W(1999). Marine Geophysics, John Wiley and Sons.
3. Reynolds , J.M (1997) An introduction to Applied and Environmental Geophysics
4. Defant A (1961) Physical Oceanography, Vol. 1, Pergamon Press, Oxford
5. Davis A.C (1973) Statistics and Data Analysis in Geology, Wiley
6. Langeraar W. Surveying and Charting of the seas, Elseiver
7. Telford, W.M, Goldart L.P, Sherriff R. E and Keys, D.A (1981). Applied Geophysics, Cambridge University Press, Cambridge.
8. Robert G.Reeves – Manual of Remote Sensing

Marine Geosciences

Unit I: Oceans and Oceanography: world ocean, origin, history of oceanography, challenges. Ocean crust and bathymetry: layered Earth, isostatic equilibrium, continental margins, ocean basins. Plate tectonics: sea floor spreading, convection, paleomagnetism, hot spots. Plate boundaries: mid-oceanic ridges, subduction zones, transforms.

Unit II : Marine sediments; sizes, Stokes law, terrigenous, calcareous and siliceous- Coastal sediment transport -limits for littoral drift, suspended and bed load movement, long shore sediment transport rate. Sea water properties; heat, temperature, density, light, sound- chemistry of sea water; salinity, steady state, residence time, inputs and outputs. Biogeochemical cycles; photosynthesis, respiration, redfield ratios, nitrogen, phosphorus, oxygen- Carbon cycle; fluxes, DIC, alkalinity, pH.

Unit III : Waves at sea; wave forces, deep vs shallow, wind waves, sea state- Waves at the shore; breaking, refraction, seiche, tsunami- Theories of wave generation. Wave prediction – SMB and PNJ methods. Tides; Tide generating forces, theories of tide, tide analysis and prediction, Harmonic analysis and Fourier spectrum analysis. Tides in estuaries and ocean regions. Amphidromic points – Tidal bores and tidal currents.

Unit IV : Global atmospheric circulation; heat transport, coriolis effect, atmospheric cells- Upper ocean circulation; Ekman transport, geostrophy, gyres. Upwelling and El Nino; Coastal and equatorial upwelling, ENSO dynamics. Deep ocean circulation ; vertical structure, thermohaline flow , heat transport.

Unit V : Life in the sea; classification , adaptations, environments- primary producers : production, phytoplankton, seaweeds, seasonal cycles – Pelagic marine heterotrophs; energy & mass transfer, zooplanktons, squid, fishes – fishes and cetaceans; fish classes, toothed whales, baleen whales – Benthic marine communities; ecology, rocky vs sandy shores. Marine resources; Law of the sea, fossil fuels, direct energy, fisheries – Marine pollution; toxicity, oil, sewage, eutrophication, plastics – Global warming and the ocean; greenhouse effect, ocean warming, sea level rise, acidification, carbon sequestration.

Reference :

1. Pickar,G.L. and W.J.Emergy, 1995. Descriptive Physical Oceanography – an Introduction, Pergammon Press, London
2. Neshyba, S. 1987. Oceanography: Perspectives on the fluid earth. John Wiley & Sons, New York
3. McCormick,J.M. and J.V.Thiruvathakal, 1976. Elements of Oceanography. W.B.Saunders, Philadelphia.
4. Defant , A(1961) – Physical oceanography vol 1,Pergamon Press, Oxford
5. Goss, M.G (1982) – Oceanography: A view of the Earth, 3rd edition. Prentice Hall, Englewood Cliffs. N.J
6. Kinsman. B., 1965, Wind waves, their generation and propagation of ocean waves, Dover Phoenix edition Englewood cliffs publisher, N.J: prentice- hall.
7. Kuenen, P.H- Marine Geology – John Wiley
8. Ramming H.G and Kowalik Z – Numerical modelling of marine hydrodynamics- Elsevier- New York
9. Kamenkovich V.M- Fundamentals of Ocean dynamics, Elseiver
10. Carter R.W.G (1988) Coastal Environment. Accademic Press, London
11. Herbich, John. B (1999) - Hand book of coastal engineering, McGraw Hill
12. Short A.D – Handbook of Beach and shoreface morphodynamics, Wiley Publication
13. Pethic J (1985) An Introduction to Coastal Geomorphology – Arnold- Heinemann, London
14. Komar .P.D (1976) Beach Processes and Sedimentation – Endlewood Cliffs, New Jersey, Printice Hall
15. Garrison. T. (2001) – Oceanography an introduction to marine sciences, 4th Edition. Brooks/ Cole., Pacific Grove, CA

Marine Georesources & Geotechnology

Unit I : Non-living marine resources: Renewable vs. Non-Renewable Resources – Marine minerals – Placer deposits hydrocarbon deposits . Hydroinformation systems applied to mining – Tools – Techniques – Numerical methods – coastal structures – coastal erosion and protection measures- coastal hazards- Cliff slumping – Marine pollution – Marine Geophysical Technology: Autonomous Under water Vehicle (AUV) Ocean bottom features by swath bathymetry.

Unit II : Offshore Mining act in India – Law and regulation of coastal zone management, mining – private and public interest in coastal sand and resources – Distribution of marine minerals along the Indian Coasts; Marine geo-physical technology; prospecting for oil-bearing strata; natural gas and oil traps. Mining operation – Seabed mining - Dredging operation – Coastal Zone management on mining.

Unit III : Energy from oceans - Tides, Waves, Currents, Salinity and thermal gradients with special reference to Indian coast - Energy converters for extraction of ocean energy - Design principles of wave power, tidal power and OTEC system – EIA studies on Coastal and Marine mining – EIA methods of processing plants – EIA models.

Unit IV : Marine Resources : Marine living Resources :- Energy, Food, Pharmaceuticals etc from coast, shelf, slope and deep sea.

Unit V : Use of Microwave data – CZCS studies – chlorophyll production index – various sensors used for coastal application – physical oceanographic parameter estimation – sea surface temperature – significant wave height – wind speed and direction – Oceanic circulation – Tidal variation – sea level rise – coastal Bathymetry- Gas hydrates; Importance of gas hydrates; Various hydrate structures. Hydrate formation conditions; Gas hydrates and oil and Petroleum Industries; Gas hydrates in drilling operations; Gas hydrates in oil and gas production and transportation

Reference:

1. Gaudin, A.M.- Principles of Mineral dressing.
2. William C. Peter- Progressing Mining Geology
3. Emery K.O & Skinner B.J. Mineral deposits of deep ocean floors
4. Victor Rajamanickam. G (2001) Handbook of Placer deposits, New Academic Publishers, Delhi
5. Lalicker C.G- Principles of Petroleum Geology
6. North F.K (1985)- Petroleum Geology- Allen and unwin Boston.
7. Reedman J.H- Techniques in Mineral Exploration, Allied scientific Publishers
8. ArogyasamyR.N.P- Courses in Mining Geology, Oxford & IBH Publishing & Co
9. Ghosh A.K and Ranadher M (1999) Mineral wealth of the Ocean- Oxford & IBH, New Delhi
10. Brown E.D (1983) Sea-bed energy and mineral resources and the law of the sea. Vol.1
11. Vincent Ellis McKelvey (1986) Subsea mineral resources, Dept. of the Interior, U.S. Geological Survey
12. Cronan D.S (1980) Under water minerals, Academic Press, London
13. Charles K. Paull, William P. Dillon (2001) Natural gas hydrates: occurrence, distribution, and detection, American Geophysical Union
14. West G.M (1992) Engineering the beaches In: M.G. Barret (ed) Coastal zone planning and Management, Thomas Telford.
15. Komar P.D (1976) Beach processes and sedimentation- Endlewood Cliffs, New Jersey, Printice Hall.
16. Ivan Valiela (1984) Marine Ecological processes- Springer-Verlag.
17. Douglas M, Johnson (1976) Marine Policy and the coastal community- Croom Helm-London.
18. United States. Office of Naval Research. Ocean Science and Technology Division (1974) Natural gases in marine sediments, Plenum Press
19. Sanjeev Rajput, Naresh Kumar Thakur (2011) Exploration of Gas Hydrates, Springer.

MSU/2016-17Univ.Dept/M.Phil(Geomarine Tech)/Semester -II /Project

DISSERTATION & VIVA-VOCE