Name of the Programme: M. Sc.Marine Sciences
Course Code: MSC 530
Title of the Course: Geophysical Fluid Dynamics Practical
Number of Credits: 01
Effective from AY: 2022-23

Prerequisites for the course:	Core courses offered in the Semester I.	
Objective:	To acquaint with a hands-on-experience based on learnings in the theory. It involves field-based observations and numerical techniques.	
Content:	1. Kinematics analysis of wind and ocean current – Isotach and isogon analysis and construction of streamline patterns (5 hours; Reference 1) 2. Construction of trajectories of air parcels from successive synoptic charts (5 hours; Reference 1) 3. Computation of divergence and vorticity in horizontal flow (5 hours; Reference 2) 4. Construction of stream lines for simple types of flow (5 hours; Reference 2) 5. Analysis of physical oceanographic parameters of estuarine waters using data of conductivity temperature and depth (CTD) instrument (5 hours; References 1, 3) 6. Analysis of aerosol trajectory using HYSPLIT (HYbrid Single – Particle Lagrangian Integrated Trajectory) model. (5 hours; References 4, 5)	30 hrs.
Pedagogy:	Tutorials/ assignments/ practical/ field study	
References/ Readings:	1.Stewart, R. H. (2008). *Introduction to physical oceanography*. Robert H. Stewart. https://open.umn.edu/opentextbooks/textbooks/20 2.Guide to Wave Analysis and Forecasting. (2018). *World Meteorological Organization (WMO-No. 702).* ISBN 978-92-63-10702-2. www.wmo.int/pages/prog/amp/mmop/documents/WMO%20No%20702/WMO702.pdf ; https://library.wmo.int/doc_num.php?explnum_id=10979 3.Siedler, G., Griffies, S., Gould, J., & Church, J. (2013). *Ocean Circulation and Climate– A 21st Century Perspective.* Academic Press. HYSPLIT- Hybrid Single Particle Lagrangian integrated Trajectory Model, Air Resources Laboratory, http://www.arl.noaa.gov/ . 4.Draxler, R. R., & Hess, G. D. (2020). *Description of the Hysplit_4 Modelling System; NOAA Technical Memorandum ERL ARL- 224. 1997, (Revised 2020).* Silver Spring, Maryland, U.S.A.: Air Resources Laboratory. https://www.arl.noaa.gov/documents/reports/arl-224.pdf 5.Roll, H. U. (1965). Physics of the marine atmosphere. *International Geophysics Series*, Vol. *7*. [Ed.] J. van Miegham. London: Academic Press. 6.Gill, A. E. (1982). *Atmosphere- Ocean Dynamics.* International Geophysics Series, Volume 30. New York: Academic Press.	
Course outcome:	1. To develop an ability to analyse flow patterns and an awareness of HYSPLIT online tool.	