SEMESTER II

Programme: M. Sc. (Marine Sciences)
Course Code: MSC 261 **Title of the Course: Computational Methods in Oceanography**
Number of Credits: 04
Effective from AY: June, 2018-19

Prerequisites for the course:	Degree of Bachelor of Science of this University or an examination of any other University recognized as equivalent.	
Objective:	To impart mathematical, statistical and programming skills that are useful in oceanography	
Content:	Programming FORTRAN (90/95): constants, variables, arithmetic operations, arithmetic expressions – assignment statements – input – output statement - library functions – Hierarchy of operation – mixmode operations- relational operators, precedence of operators. IF-THEN - ELSE statement – ELSEIF structures – NESTED IF blocks – DO LOOP – NESTED DO LOOP – Intrinsic DO LOOP.	12 hours
	Applications of basic Mathematics to oceanography: Indices, Logarithms, linear and parabolic functions – Permutation and combinations – Arithmetic and geometric progression – Differentiation, application of differentiation – Velocity, acceleration, related rates. Application of integration to growth and decay problems - Matrics: addition, subtraction, multiplication, inverse by adjoint method.	12 hours
	Descriptive statistics: population sample – measures of central tendency: Arithmetic , Geometric and Harmonic means, Median and Mode.Measures of dispersion:Range - inter-quartile range, quartile deviation, coefficient of quatilr deviation, mean deviation and standard deviation – skewness, kurtosis – linear correlation, Karl - Pearson's coefficient of correlation, concurrent deviation method, method of least squares (regression) – regression equation.	12 hours
	Introductory probability- Normal and binomial distribution – Inferential statistics: standard error – significance level – hypothesis testing: students t-test: test of significance for attributes, large samples and small samples, Z test, Ψ^2 (chi square) test, F test, Analysis of Variance.	12 hours
Pedagogy:	Lectures/Tutorials/ assignments	
References/ Readings	1. A biologist's basic mathematics, 1983 – Causton, D.R., Edward Arnold, London, Edward Arnold Publishers Ltd. 2. Statistical Methods in Atmospheric Sciences. 2nd edition., 2011 - Daniel S. Wilks, Academic Press 3. Introduction to mathematics for life scientists, 1971 – Batchelet, E., Springer 4. Mathematics for biological sciences, 1980 – Newby J.C., Oxford University Press, U.K. 5. College algebra, 1966 - Bardell, R.H. and Spitzbart, A., Addision-Wesley, Massachusetts, U.S.A. 6. Introduction to algebra, 1966 – Perlis S., Blaisdell Publ. Co., London. 7. Differential equations, 1985 - Wylic, C.R., McGraw Hill Publ., Singapore. 8. Statistics: Theory methods and applications, 1988 – Samchetr, D.C. and Kapoor, V.K., Sultan Chand and Sons, New Delhi. 9. Biometry, 1981 – Sokal, R.R. and Rohlf, F.J. Freeman & Co. San Fransisco.	

10. Statistical methods, 1967 – Snedecore, G.W. and Cochran, W.G., Allied Pacific Pvt. Ltd., Mumbai.
11. Multivariate statistical methods, 1990 – Morrison, D.F., Mc.Graw, Hill Publ., Singapore.
12. Fundamental computer concepts, 1986 - Davis, W.S. Mc.Graw Hill Publ., Singapore.
13. Theory and problems of data processing, 1982 – Lipschutz, M.M. and Lipschutz, S., McGraw Hill Book Co., Singapore.
14. Fortran 77 and numerical methods, 1994 Xavier, C., Wiley-Eastern Ltd., New Age International Ltd., New Delhi.
15. Computer Programming in FORTRAN 90/95, 1997. V. Rajaraman, Prentice Hall of India, New Delhi.
16. FORTRAN 90/95 for Scientists & Engineers, 1998 - S.J. Chapman, Mc-Graw Hill.

Learning Outcomes	Apply techniques of mathematics, statistics in oceanography/meteorology. Acquire computational and programming knowledge to deal with large data sets and generate programs. Plot global ocean/atmosphere data.