Department of Mathematical Sciences

Syllabus for Choice Based Credit Transfer (CBCT) courses offered by the Mathematical Sciences Department

Offered Courses:

Course Code	Course Name	L-T-P	CH	CR	Remark
MS 450	Elementary Mathematics and Statistics	2-1-0	3	3	
MS 451	Probability and statistics	2-1-0	3	3	
MS 452	Mathematical Method	2-1-0	3	3	

MS: Courses offered by the Department of Mathematical Sciences
+ Course for which there is a separate practical unit assigned as Computer Laboratory
L: Lectures T: Tutorials P: Practical CH: Contact Hours (all per week) CR: Credit

MS 450 Elementary Mathematics and Statistics (L3 -T0 -P0 -CH 3 -CR 3)

Unit-1
Real sequences, Cauchy sequence, Cauchy's general principle of convergence; Infinite series, basic properties of infinite series, Simple tests for convergence.

Unit-2
Limit, continuity, differentiability of functions of a single variable; Mean Value Theorems: Rolle's theorem, Taylor's theorem. Fundamental theorems of integral and differential calculus.

Unit-3
First order ordinary differential equations; Second order ordinary differential equations with constant coefficients, Applications of ordinary differential equations.

Unit-4
Algebra of matrices, symmetric, skew symmetric, Hermitian and Skew Hermitian matrices, elementary transformations, reduction to echelon and normal form, System of linear equations, existence and uniqueness of solutions, rank of a matrix.

Unit-5
Statistical methods: frequency distribution, measures of location, dispersion, skewness and Kurtosis.

Unit-6
Principle of least square, co-relation, linear OLS regression.

Textbook(s)

1. Bartle, R. G. and Sherbert, D.R. *Introduction to Real Analysis* (John Wiley and Sons, New Delhi, 2007).
2. Simmons, G.F. *Differential Equations with Applications and Historical Notes* (Tata-McGraw- Hill, New Delhi, 1991).
3. Hoffman, K. and Kunze, R. *Linear Algebra* (Prentice Hall, New Delhi, 2008).

4. Medhi, J. *Statistical methods: An Introductory Text* (New Age International (P) Ltd., New Delhi, 2000).

Reference book(s)

1. Boyce W. E. and Diprima R. C. *Elementary Differental Equations* (John Wiley, India, 2000).
2. Goldberg, R. R. *Methods of Real Analysis* (Oxford and IBH, 1970).
3. Gupta, S. C. and Kapoor, V. K. *Fundamentals of Mathematical Statistics* (S. Chand & Co., 2007).
4. Datta, K. B. *Matrix and Linear Algebra* (Prentice Hall of India, 2000).

MS 451 Probability & Statistics **(L2 -T1 -P0 -CH3 -CR 3)**

Unit-1

Probability definitions, Random variable, Distributions, Expectation.

Unit-2

Conditional probability, Independence, Bay's Theorem, Some standard discrete and contineous probability distributions, their properties and applications.

Unit-3

Characteristic of statistical data and their measures.

Unit-4

Correlation and regression.

Textbook(s)

1. Rohatgi, V. K. *Introduction to Probability and Mathematical Statistics* (Wiley Eastern, New Delhi, 1976).
2. Gupta, S.C. and Kapoor, V.K. *Fundamentals of Mathematical Statistics* (Wiley Eastern, New Delhi,1976).

Reference book(s)

1. Goom, A.M., Gupta, M.K. and Dasgupta, B. *Fundamentals of Statistics*, Vol. I & II,(The World Press Pvt. Ltd., Calcutta, 1994).
2. Medhi, J., *Statistical Methods: An Introductory text* (New Age International (P) Ltd. 2000).

MS 452 Mathematical Methodss **(L2 -T1 -P0 -CH3 -CR 3)**

Unit-1

Calculus of variation: Variational problems with fixed boundaries- Euler's equations for functionals containing first order derivative and one independent variable.

Unit-2

Externals. Functionals dependent on higher order derivatives. Functionals dependent on more than one independent variables. Variational problems in parametric form. Invariance of Euler's equation under co-ordinate transformation.

Unit-3

Variational problems with moving boundaries-Functional dependent on one and two functions. One sided variations. Sufficient conditions for an extremum- Jacobi and Legendre conditions.

Unit-4

Special functions: Series solution of differential equations. Power series method. Bessel and Legendre equations. Bessel and Legendre functions and their properties. Convergence. Recurrence and generating functions.

Textbook(s)

1. Andrews, G.E., Askey, R.A. And Roy, R. *Special Functions* (Cambridge University Press, 1999).
2. Gelfand, I. M. and Fomin,S.V. *Calculus of Variation* (Dover Publications,2000).

Reference book(s)

1. Gupta, A.S. *Calculus of Variations with Applications* (Prentice Hall of India, 1997).