Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for M. Sc. In Applied Mathematics

(Effective from Academic Session 2018-2019)

SECOND SEMESTER

MAM 201: PROBAILITY AND STATISTICS
(40 CLASSESS)

Probability Theory: Joint, marginal and conditional distributions, moments and conditional moments, correlation and regression, transformation of variables, bivariate normal and Dirichlet distribution.
Multivariate distribution: ,t and F distributions. correlation and regression; Multinomial, uniform distribution on bounded subsets of, multivariate normal and Dirichlet distributions, Cauchy distributions. Order statistics.
Chebyshev's Inequality, Convergence in probability, Bernoulli's theorem, Convergence almost surely,weak law of large numbers, Central and De-Moivre Laplace limit theorems.
Statistics: Sampling distribution: ,t and F distributions.
Estimation: Method of moments,maximum likelihood estimation, unbiasedness, consistency, comparing two estimators, confidence interval estimation for mean, difference of means, variance, proportions, sample size problems.
Test of Hypothesis: Neyman-Pearson Lemma, composite hypothesis, comparison of normal populations, large-sample test,test on multinomial distributions, goodness of fit.
Curve fitting and Correlation: Principle of least squares and curve fitting, correlation and regression, scatter diagram,regression lines,bivariate frequency distribution.
Theory of errors: Gauss Postulate of arithmetic mean, normal law, error function. Principle of least squares,confidence interval.

Reference Books:

1. Elements of Probability and Statistics – A.P.Baisnab and M.Jas
2. Probability and Statistics – M.H.Degroof
3. Elementary Probability Theory – Chung
4. Modern Probability Theory and Application – E.Parzen
5. Mathematics of Statistics Vol I & II – J.F.Kenney & E.S.Keeping
6. Introduction to Statistics – R.G.D.Steel
7. The Practice of Business Statistics – Manish Sharma & Amit Gupta

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MAM-202: CLASSICAL MECHANICS
(40 CLASSES)

Generalised coordinates, degrees of freedom, holonomic and non holonomic systems, scleronomic and rhenomic systems, D'Alemberts's Principle, Lagrange's equation, energy equation for conservative fields, cyclic (ignorable) coordinates, generalized potential. Moving coordinate system with relative translational motion. Rotating coordinate system, Coriolis Force and its effect on freely falling particle.
Euler's equation of motion of a rigid body. Eulerian angle.
Calculus of variations and its application for the shortest distance, minimum surface of revolution, Branchistochrone problem, geodesic.
Hamilton's Principle, Principle of least action, Hamilton's equation of motion.
Cannonical coordinates and canonical transformations. Poincare's theorem.

Lagrrange's and Poisson's Brackets. Legendre transformation. Generating functions. Condition of Cannonicality. Hamilton's equation of motion in Poisson bracket.
Hamilton- Jacobi equation. Hamilton's Principle function and characteristic function.
Small oscillation, general case of coupled oscillation. Eigen vectors and eigen frequencies, orthogonality of eigen vectors. Normal coordinates.

Reference Books:

1. A Treatise of Analytical Dynamics of Particles and rigid Bodies- E.T.Whttaker
2. Dynamics- D.T. Greenwood
3. Dynamics-F.Chorlton
4.Classical Mechanics- H.Goldstein
5. Mechanics: Newtonian,Classical,Relativistic Theory,Problems and Application.
6. Engineering Mechanics: D.S. Bedi

MAM 205: OPERATIONS RESEARCH
(40 CLASSESS)

Revised simplex method and algorithm approaches to linear programming problem, dual simplex method, decomposition principle and its use to linear programming for decentralized planning problems.
Bi-Criterion Transportation models, cost and time minimizing transportation problems, trade off ration technique.
Waiting lines- characteristics of a queuing system, arrival and service patterns, single and multiple channel, queue model with Poisson arrival and exponential service times.
Simulatin Modelling: Monte-Carlo Simulation, using random numbers, applications in waiting lines, maintenance and finance areas.
Replacement Models: Different types of replacement models, replacement of assets deteriorating with time; Markov Analysis-Brand Switching analysis, Prediction of market shares for future periods, equilibrium conditions, Uses of Markov analysis. Dynamic Programming: Basic features, Bellman's principle, multi-stage decision process.

Reference Books:

1. Operation Research: H.A. Taha
2. Operation Research: A.Ravindran, D.T.Philips & J.J.Solberg
3. Operation Research:J.K. Sharma
4. Principle of Operation Research: H.W.Wagner
5. Nonlinear and Dynamic Programming: g.Hadley

MAM 204: COMPLEX ANALYSIS
(40 CLASSES)

Complex Integration: Cauchy-Goursat theorem. Cauchy integral formula. Higher order derivatives. Morera's Theorem.Cauchy inequality and Liouville's Theorem. Fundamental Theorem of Algebra.Taylor's Theorem.Maximum Modulus Principle. Convex
function, Hadamard's Three circle theorem. Schwarz Lemma. Laurent's Series.Isolated singularities.Meomorphic functions,Rouche's Theorem,Inverse function theorem, Open mapping theorem.
Residues: Cauchy Residue Theorem, Evaluation of integrals. Branches of mang-valued functions with special reference to argz, logz, and . Branch Points.

Bilinear Transformations: Properties and classification. Definition and examples of conformal mappings.

Reference Books:

1. Complex Variables and Applications – R.V.Churchiv & J.W.Brown
2. Functions of One Complex Variable –J.B.Conway
3. Theory of Functions of One Complex Variable, vol I & II – A.I.Markushivch.
4. Foundation of Complex Analysis – S.Pommusamy
5. The Theory of Function – E.C.Titchmarsh
6. Complex Analysis – S.Lang

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MAM 203: RDBMS
(40 CLASSESS)

Overview of Database Management; Conceptual,logical and Physical Database Design.
Relational Database: Relation, Optimization,Catalog,Base relvars and views,transitions,the suppliers and parts database.
Relational Model: Constraining, referential integrity constraints,update operators on relations,Structural Query Language (SQL),Data Definition Language Commands, Data Manipulation Language Commands, Transaction Control Commands,SQL Command syntax and usage.Basic query block,Querying Data with multiple conditions,Bassic Relational Algebra operations,The Select Operation,Additional Relational operations.
ER – and EER – To Relational Mapping: ER to relational Mapping Algorithm, Summary of mapping for model constructs and constraints, Mapping EEr Model concepts to relation.
Query, Processing and Optimization: Query Processing, Query Optimization, Database tuning
Object Oriented Database Systems : Characteristics of an Objective Relation Database Management System(ORDBMS),Complex Objects,Inheritance,Function Overloading ruls.
Distributed Database: Distributed Database system and Design,Data Fragmentation,Data Replication,Data Allocation,Query Processing in Distributed Databases.
Recovery: Transactions; Transactions -,System and Media Recovery,Two phase Commit.

Reference Books:

1. Database System Concepts – Silberchatz,Korth & Sudarshan
2. Fundamentals of Database Systems – R.Elmasri & S.Navathe
3. Database Design and rlational theory : Normal Forms and All that Jazz – C.J.Date
4. Database Management Systems – R.P. Mahapatra.

MAM 291
OR Lab using C (30 classes)

Linear Programming (Tranportation , Assignment , Duality , Simplex), Revised

Simplex Method, Simulation Method, Queuing Theory, PERT/CPM

MAM 292
RDBMS (30 classes)

Study of commercial DBMS package such as Oracle. Developing database application with Oracle Creation of a database, writing SQL queries and retrieving data, PL/SQL.