NORTH MAHARASHTRA UNIVERSITY, JALGAON

S.Y.B.Sc.

Mathematics Syllabus

(To be implemented from June,1993)

PAPER - I

(CALCULUS OF SEVERAL VARIABLS AND COMPLX VARIABLS)

(First Term)

I. Functions of two or three Variables :
   a) Limit, Continuty and differntiability.
   b) Partial derivatives of higher order.
   c) Young's and Schwartz's Theorems for
      $f_{xy}(a,b) = f_{yx}(a,b)$
   d) Chain rule
   e) Euler's theorem for homogeneous functions, Converse of Euler's theorem.

II. Mean Value theorem, Taylor's Theorem and Maclaurin's theorem for function of two variables

III. Extreme Values :-
   Maxima and Minima, Lagrange's method of undetermined multipliers.

IV. Double and Triple Integrals :-
   Definition of double integral as the limit of sum, Evaluation of double and triple integrals as repeated integrals. Change of order of integration.

(SECOND TERM)

I. Algebra of Complex numbers, Representation of complex numbers as an ordered pair, Modulus and amplitude of a complex number Triangle inequality, Argand's diagrams.

II. De Moiver's theorem for rational indices, n^{th} roots of a complex number.

III. Functions of Complex Variables
   Limit, Continuty, Derivative, Analytic functions, cauchy-Riemann equations.

IV. Elementary Functions :-
   Trignometric, Logarithmic, Exponential and Hyperbolic funotions.

V. Complex Integration :-
   Line Integral, Statement of Cauchy's theorem, Cauchy's

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integral formula, Taylor's and Laurent's Series (Statements only) poles, Residue Cauchy's residue theorem, Contour Integration. (Simple pole only)

REFERENCE BOOKS :

1. Mathematical Analysis S.G.Malik
2. Calculus of Several Variables - Schaum Series.
3. Complex Variables - Churchil
4. Complex Variables - Schaum Series.

PAPER - II

ALGEBRA

(First - Term)

1. Relations : Equivalence - relations, Equivalence classes, congruence relations (modulon) Residue-classes.
2. Binary Operations, Greups, Properties.
3. Subgroups, cuclic groups, cosets, Lagrange's theorem
4. Homonorphism and Insomorphism.
5. Definitions and examples of Ring, commutative ring, Intergral domain, Fields.

SECOND-TERM

(Linear Algebra)

1. Determinant function, evaluating determinants by raw reduction. Properties of the determinant function, Cafactor expansion, Cramer's fule.
2. Real vector spaces : Fuclidean n-space, General vector spaces, Subspaces, Linear Independence, Basis and Dimension, Row and eolumn space, rank finding basis.
3. Linear Transformations : Introduction to Linear transformations Properties of L.T. Kernel and range matnces of L.T.
4. Elgen Values Eigen Vectors, Diagonaligahion.

Text Books

1. First Course in abstract algebra
   J.B. Fraleigh.
1. Elementary Linear Algebra : By Howard-Anton fifth edition
   Chapter 2 : 2.1, 2.2, 2.3, 2.4,
   Chapter 4 : 4.1, 4.2, 4.3, 4.4, 4.5, 4.6,
   Chapter 5 : 5.1, 5.2, 5.4

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Chapter 6 : 6.1, 6.2

REFERENCE BOOK

1. University Algebra : Dr.N.S. Gopalkrushana ,
2. Topic in Algebra : I.N. Heristein.

PAPER III (A)

MATHEMATICAL METHODS

(First Term)

I. Laplace Transform :
Definition of Laplace Transform. Laplace Trans form of elementary functions and validity

($f(t) = 1, e^{kt}$, Coshkt, Sinhkt, Coskt, Sinkt, t^n, $t > 0$, $n > -1$)

Transform of initial value problem, idea of sectionally continuons functions and functions of exponential order, Laplace Transform of derivative, Laplace Transform of real integral.

II. Inverse transform, use of table, partial fractions, step function.

III. Solution of ordinary differential equation by using Laplace Transform.

Solution of the differential equations.

i) $\frac{dx^n}{dt^n} + a \frac{dx^{n-1}}{dt^{n-1}} + \text{--------} \div a_n x = f(t)$

ii) $\frac{dx}{dt} + a_1 x + a_2 \int_0^t x(t)\, dt = f(t),\ t > 0$

Applications, Electrical Circuits, mechanical systems, Electrodynamical equations.

IV. Linear differential equations with constant coefficients :

i) Complementary function

ii) Particular in tegral of $f(D) = x$, where
$x = e^{ax}$, cosax, sinax n^m, $e^{ax}v$, xv
with usual notations.

V. Homogeneous differential equations and reducible to homogeneous differential equation.

(SECOND TERM)

I. Vector functions (One Variable)

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i) Differentiation ii) Algebra of differentiation

iii) Curves in space, Velocity and accelaration

(tangential and normal components)

ii) Vector function of two or three variables

i) Partial differentiation

ii) Algebra of partial differentiation

iii) Differential operators, Scalar field, Vector field, Gradient, properties, Geometrical meaning, Directional derivatives, Divergence and cure and their properties.

III) Vector Integration

Line, Surface and Volume Integrals, Green's Theorem in plane-plane, Guass divergence theorem (without proof) Stoke's theorem (Without Proof)

Reference Books

1) Laplace Transform : Schaum Series
2) Vector Calculus : Schaum Series
3) Vector Calculus : ShantiNarayan.

S.Y.B.Sc. Paper III (B)

(Computational Mathematics)

First Term : Computational Geometry.

CHAPTER I : Two Dimensional Transformations

Introduction, Representation of points, Transformations and Matrices, Transformation of points, Transformation of Straight Lines, Transformation of of Intersecting Lines, Rotation, Reflection, Scaling, Combined Transformations, Transformation of the Unit square, solid Body Transformations, Translations and Homogeneous coordinates, Retation about an Arbitrary point, Reflection through an arbitrary Line, projection A Geometric Interpretation of Homogeneous Co-ordinates. Overall scaling, points at infinity.

CHAPTER II: Three-Dimensional Transformations :

Introduction, Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimeasional Rotation, Three Dimensional Reflection, Three-Dimensional Translation, Multiple Transformations, Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space, Reflection Through an arbitrary plane, Affine and perspective Geometry. Orthographic projections, Axonometric Projections.

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oblique projections, perspective Trans formations (only single point perspective transformation), Techniques for generating perspective views (only single point perspective projection with Translation), Vanishing point.

CHAPTER-III : Plane curves

Introduction, curve representation, Nonparametric curves, parametric curves, parametric representation of a circle, parametric representation of an ellipse, parametric representation of a parabola, parametric representation of a parabola, parametric representation of a Hyperbola, A procedure for using conic sections.

CHAPTER IV.: Space-cureves

Bezier Curves ($n^{=3}$) Page 289 to 296
B-spline curve page 305, 306, 307.
(Introduesion, Properties, No. derivation).

SECOND TERM

1. Solution Non-Linear equations :
   Bisection method, Newtions Raphson method Regula falsi method -
2. Polynomial Interpolation & Extrapolation :
   (a) Finite differences : forward & backward shift operator
   (b) Newton's forward & backward difference Interpolation formula.
   (c) Lagrange's formula for unequal Intervals
3. Solution of ordinary diff. eq^n.
   Taylor's series, Euler's method, Runge-kutta method
4. Solution of simultaneous Linear $Eq^n s$:
   Gauss elimination method, Gauss seidal method
5. Linear Programing :
   Formation of L.P.P. Basic Solution, optimal solution, Graphical method solving L.P. Problem.
6. Simplex Method : Big M. method.

BOOKS RECOMMENDED

1. Mathematical elements for computer graphics (second Edition) by David F Rogers & T Alan Adams.
2. Theory and Problems in Computer Graphics (Schaum series) by R.A. Plastocle Gordonkelley.
3. Numerical Methods by V. Rajaraman
4. Operation Research by He_nely Taha.

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