Veer Narmad South Gujarat University

M. Sc.-II (Tech.)

(Industrial Mathematics with Computer Applications)

w.e.f. July – August 2004

IMCA – 201 Numerical Analysis

	L	P	T	
Total	**4**	**4**	**0**	**8**

- Polynomial Interpolation, Extrapolation, Splines, Spline Interpolation
- Solution of System of Linear Equations: Matrix inversion, Jordan's method, Iterative method, Escalator Method.
- LU and Cholesky factorisations
- Pivoting, Gauss Elimination method
- Jacobi's, Gauss-Seidel method
- Algebraic Eigen Value Problem, Properties of eigen values, eigen vectors, Power method, inverse power method, Given's method, Schur and Gershgorins theorem
- Least square polynomial approximation
- Numerical Solution of ODE: Runge Kutta methods, Milne Simpsons' method.
- System of non-linear equations: Newton Raphson's method..

References:

1. C. E. Froberg: Introduction to Numerical Analysis, Addison Wesley Publishing Company, Sixth Ed., 1981.

2. S. S. Sastri: Introductory Methods of Numerical Analysis, Prentice Hall of India, New Delhi, 1997.

3. Conte S. D. and Carl deboor: Elementary Numerical Analysis: an algorithmic approach, Mc Graw Hill company, Third Ed., 1981.

4. M. K. Jain: Numerical Analysis for Scientists and Engineers, New Age International Ltd. Pub., 1992.

5. E. Hairer, E. P. Norsett and G. Wanner: Solving ordinary differential equations I and II, Springer Series in Computational Mathematics, 8, Springer, Berlin, 1993.

6. S. Balachandra Rao, C. K. Shantha: Numerical Methods with Programs in C++, University Press.

Veer Narmad South Gujarat University

M. Sc.-II (Tech.)

(Industrial Mathematics with Computer Applications)

w.e.f. July – August 2004

IMCA – 202 Functional Analysis

L	P	T	Total
4	0	0	4

- Normed Spaces and Banach Spaces: Vector spaces, Brief introduction to convergence and completeness in R^n. Introduction to basic results of Linear Algebra, Definition of norm and Banach space with illustrations, Properties of normed spaces, Theorem of completion on normed spaces (without proof), Finite dimensional normed spaces and subspaces, Compactness and finite dimension, Riesz lemma, Linear operators and their illustrations, Bounded continuous linear operators and their illustrations, Linear functionals and illustrations, Algebraic dual space and reflexivity, Functionals on finite dimensional spaces, Normed spaces of operators and dual space.

- Inner Product Spaces – Hilbert Space: Inner product space – definition and illustrations, Hilbert space, Properties of inner product spaces, Orthogonal complements and direct sums, Orthogonal sets, sequences and related series, Total orthonormal sets and sequences, Functionals on Hilbert spaces, Riesz's theorem, Sequilinear form and Riesz representation theorem, Hilbert adjoint operator and its properties, Self adjoint, unitory and normal operators.

- Contraction Mapping Principle: Banach fixed-point theorem, Application of Banach fixed-point theorem to system of linear equations, differential equations and integral equations.

References:

1. Erwin Kreyszig: Introduction to Functional Analysis with Applications, John Wiley & Sons, 1978.

2. B. V. Limaye: Functional Analysis, 2nd ed. New-Age Int. Pvt. Ltd.

3. G. F. Simmons: Introduction to Topology and Modern Analysis, McGraw Hill Book Co.

4. Koffman and Patric: Functional Analysis.

5. A. H. Siddiqui: Functional Analysis, Prentice Hall of India.

6. Sudarshan Nanda: Functional Analysis, Wiley Eastern Pvt. Ltd.

7. M. M. Day: Normed Linear Spaces, 3rd ed., Springer-Verlag, 1973.

Veer Narmad South Gujarat University

M. Sc.-II (Tech.)

(Industrial Mathematics with Computer Applications)

w.e.f. July – August 2004

IMCA – 203 Introductory Physics and Mechanics

L	P	T	Total
4	0	0	4

- Fluids: Definition, Density, Pressure, Pascal Principle, Buoyant force, Archimedes Principle, Streamlines, Equation of Continuity, Bernoullie's Equation
- Oscillations and Wave Theory: SHM, Damped SHM, Resonance, Simple Pendulum, Types of Waves, Wavelength, Frequency, Period, Angular frequency, Superposition of waves, Sound Waves, Doppler Effect.
- Thermodynamics: Zeroth Law, Kelven and Fahrenheit Scales, Thermal Expansion, Specific Heat, First law of themodynamics, Conduction, convection, radiation, Kinetic theorey of gases and second law of thermodynamics, Entropy, Ideal gases.
- Electromagnetism: Charge, Conductor, Insulator, Coulomb's law, Electric dipole, Gauss law, Electric potential, Capacitance, Semiconductors, Super conductors, Resistance Ohms Laws, RC Circuit, Ameter, Voltmeter, power, emf, energy, Kirchoff's laws, Magnetic field, Torque, Solenoids, Faraday's law, Lenz's law, Inductance, Paramagnetism, diamagnetism, ferromagnetism, Maxwell's equations
- Optics: Plane mirrors, spherical mirrors, thin lenses, Wave optics, diffraction and interference.
- Mechanics: Measurement, Motion in one and two dimension, Equations of motion, Projectile Motion, Newton's laws of motion, Friction and Centripetal forces, Kinetic Energy and work done, Conservation of energy, System of Particles, Linear momentum, Impulse, Collision in two dimension, Rotational motion, Angular displacement, Torque, Elasticity, Kepler's laws of Planets and satellites.

References:

1. D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, Sixth Ed. John Wiley & Sons, New York, 1998.

2. J. B. Serway, Fundamental of Physics.

Veer Narmad South Gujarat University

M. Sc.-II (Tech.)

(Industrial Mathematics with Computer Applications)

w.e.f. July – August 2004

IMCA – 204 Fourier Analysis

	L	P	T	
Total	**4**	**0**	**0**	**4**

- Periodic Functions
- Trigonometric Series, Fourier Series
- Useful Integrals
- Determinations of Fourier Coefficients (Eulers' Formulae)
- Functions defined in two or more sub-ranges
- Functions having arbitrary period
- Even & Odd Functions
- Half range Expansions
- Change of Interval and functions having arbitrary period
- Practical Harmonic Analysis

References:

1. Erwin Kreszig: Engineering Mathematics
2. H. K. Dass, Advanced Engineering Mathematics, S. Chand and Company Ltd., New Delhi.
3. P. P. Gupta, Engineering Mathematics, Krishna Prakashan Media (P) Ltd., Meerut.

Veer Narmad South Gujarat University

M. Sc.-II (Tech.)

(Industrial Mathematics with Computer Applications)

w.e.f. July – August 2004

IMCA – 205 Partial Differential Equations

	L	P	T	
Total	**4**	**0**	**0**	**4**

- Introduction to PDE
- Methods of Solving PDE of the type $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$
- PDEqns. Of the first order
- Nonlinear PDE of first order
- Compatible systems of first order equations
- Charpit's, Jacobi's methods
- Second order PDE in Physics
- PDE of 2^{nd} order, Origin, Classification: Parabolic, Elliptic and Hyperbolic PDE.
- Heat, Wave and Laplace's Equations, Solutions by Separation of Variables.

References:

1. Ian Sneddon: Elements of Partial Differential Equations, McGraw Hill Int. Ed.
2. Copson: Introduction to Partial Differential Equations,
3. L. C. Evans: Partial Differential Equations, Graduate Studies in Mathematics, Vol. 19, AMS, 1988.
4. F. John: Partial Differential Equations.
5. Strauss W. A.: Partial Differential Equations, An Introduction, John Wiley and Sons.
6. Renardy and Rogers: An Introduction to Partial Differential Equations, Springer-Verlag.
7. B. Folland: An Introduction to Partial Differential Equations.
8. M. Junk: Analytical and Numerical Methods for Partial Differential Equations, Lecture Notes, University of Kaiserslautern, 1999.

Veer Narmad South Gujarat University

M. Sc.-II (Tech.)

(Industrial Mathematics with Computer Applications)

w.e.f. July – August 2004

IMCA – 206 Object Oriented Programming with C++

L	P	T	Total
4	4	0	8

- An overview of C++ Programming
- What is Object Oriented Programming?
- Classes and Objects
- Arrays, Pointers and References
- Functions and Operator Overloading
- Inheritance
- Virtual Functions and Polymorphism
- The C++ I/O System Basics
- C++ File I/O
- Array Based I/O
- Templates
- Some C++ Applications

References:

1. Pohl: C++ for Fortran Programmers, Addison Wesley
2. Heller: The C++ Training Guide, AP Professional
3. Herbert Schildt: C++ Complete reference, Tata McGraw Hill
4. Steve Oualline: Practical C++ Programming, Oreilly
5. Balagurusamy: Object-Oriented Programming with C++, Tata McGraw Hill.

Veer Narmad South Gujarat University

M. Sc.-II (Tech.)

(Industrial Mathematics with Computer Applications)

w.e.f. July – August 2004

IMCA – 207 Practicals

L	P	T	Total
0	4	0	4

- C++ Programming Exercises
- Practicals related to Numerical Methods
- Matlab Exercises for Numerical Computations