VEER NARMAD SOUTH GUJARAT UNIVERSITY
M. Sc. (Part – I) (Tech)

Industrial Mathematics with Computer Applications
w.e.f. July – August 2004

IMCA – 101 Real Analysis

L	P	T	Total
4	0	0	4

- Sequences and series of real and natural numbers.
- Riemann Integration
- Convergence of Improper Integrals
- Various tests for convergence
- Sequences and series of functions of real variables
- Monotonicity
- Introduction to Measure Theory
- Outer and Inner Measure
- Measurable functions
- L^p Space, Minkowski, Holder Inequality
- Convergence and completeness.

References:

1. R. Goldberg: Real Analysis
2. S. C. Malik: Mathematical Analysis
3. W. Rudin: Principles of Mathematical Analysis, McGraw Hill International.
4. T. M. Apostol: Mathematical Analysis, Narosa Publishing House.
5. H. L. Royden: Real Analysis, Macmillan Pub. Co. Inc. New York.
6. A. Friedman, Foundations of Modern Analysis, Holt, Rinehart and Winston, Inc. NY.
7. Serge Lang: Analysis I and II, Addison-Wesley Pub. Company Inc.
8. G. De. Bara: Measure Theory and Integration, Wiley Eastern Limited.

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IMCA – 102 Complex Analysis

L	P	T	Total
4	0	0	4

- Analytic Functions
- Cauchy-Riemann Equations
- Multi-valued functions
- Complex Integration
- Cauchy's theorem, Cauchy Integral Formula
- Liouvilles', Morera, Maximum Modulus theorems
- Power Series representation (Taylor and Laurent series)
- Singularaties, Residue, Residue theorem
- Calculus of residues
- Conformal transformation
- Bilinear transformation
- Schwarz-Christoffel transformation.

References:

1. S. Lang, Complex Analysis, Addison Wesley, 1997.
2. S. Ponnuswamy, Foundations of Complex Analysis, Narosa Publishing House, 1997.
3. H. A. Priestly, Introduction to Complex Analysis, Clarendon Press, Oxford, 1990.
4. J. B. Conway, Functions of one Complex variable, Springer-Verlag, International Student Edition, Narosa Publishing House, 1980.
5. L. V. Ahlfors, Complex Analysis, McGraw-Hill, 1979.
6. Mark J. Ablowitz and A. S. Fokas, Complex Variables: Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
7. Walter Rudin, Real and Complex Analysis, McGraw-Hill Book Co., 1966.
8. W. A. Veech, A Second Course in Complex Analysis, W. A. Benjamin, 1967.

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IMCA – 103 Applied Linear Algebra

L	P	T	Total
4	0	0	4

- Introduction to Vector Spaces
- Linear Operators: Definition, Null space and Range, Rank-Nullity theorem, Operator inverse, Application to matrix theory, Computation of range and null spaces of a matrix, Matrix of an operator, Operator algebra, Change of basis, Similar matrices and applications.
- Inner Product Spaces: Definitions and examples, Norms, Orthogonal sets, Fourier coefficients and Parseval's identity, Gram-Schmidt process and QR factorisation.
- Diagonalizable Linear Operators: Definition of Eigenvalues and Eigenvectors, Spectrum and eigen spaces of an operator, Properties of characteristic polynomial, Geometric and algebraic multiplicities, Linear operator with an eigen basis, Functions of diagonalizable operators, First order matrix differential equations, Estimate of eigen values, Gershgorin's theorems, Rayleigh Quotient.

References:

1. Linear Algebra with Applications by J. T. Scheick. McGraw Hill, International Edition, 1997.
2. Matrix Algebra by S. Biswas. New age Int. Pub. 2nd ed. 1997.
3. Linear Algebra by A. R. Rao & P. Bhima Shankaram. Tata McGraw Hill Pub. Co. Ltd. New Delhi. 1996.
4. Principles and Techniques of Applied Mathematics by B. Friedman. Dover, 1990, NY.
5. Theory of Matrices with Applications by P. Lancaster & M. Tismenetsky. Academic Press, 1985, 2nd ed. NY.

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IMCA – 104 Ordinary Differential Equations

L	P	T	Total
4	0	0	4

- Linear Dependence, Independence, Wronskian
- The Power Series Method (PSM)
- Theoretical basis of the PSM
- Legendre's equation, Legendre Polynomials
- Extended PSM, Indicial Equation
- Bessel's equation, Bessel's function of First kind
- Bessel's functions of Second kind
- Orthogonal sets of functions
- Sturm-Liouville Problem
- Orthogonality of Legendre's Polynomials and Bessel's functions.

References:

1. S. G. Deo & V. Raghvendra, Ordinary Differential Equations.
2. G. F. Simmons: Ordinary Differential Equations.
3. P. Hartman: Ordinary Differential Equations, John Wiley.
4. W. T. Reid: Ordinary Differential Equations, John Wiley and Sons, NY.
5. E. A. Coddington and N. Levinson, Theory of Ordinary Differential Equations, McGraw Hill, NY.
6. S. L. Ross: Differential Equations, Blaisdell Publishing Company.
7. Saber N. Elaydi: An Introduction to Differential Equations, Springer-Verlag.

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IMCA – 105 Operating Systems and Fundamentals of Computer Programming

L	P	T	Total
4	0	0	4

- Introduction to Computing System
- Operating Systems: Windows, DOS, Unix, Linux
- Introduction to Office
- Some useful commands: Files copying, deleting, printing
- Getting started with C
- Components of C Program
- Storing data: variables and constants
- Statements, expressions and operators
- Basic program controls
- Fundamental of I/O
- Understanding Pointers
- Advanced Program Controls

References:

1. Steve Oualline: Practical C Programming, Oreilly.
2. Peter Aitken & L. Jones: Teach Yourself C, Techmedia
3. Samuel P. Harkison and Gly L. Steele Jr.: C – A reference Manual, Prentice Hall.
4. Brian W. Kernighan & Dennis M. Ritchie: The C Programme Language, Prentice Hall.
5. Peter A. Darnella dn Philip E. Margolis: C – A Software Engineering Approach, Narosa Publishing House.

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IMCA – 106 Scientific Softwares (MATLAB)

L	P	T	Total
4	0	0	4

- Introduction to MATLAB, Matlab Windows, Symbolic Calculations, Basic Features
- Files and Directory management, File I/O operations
- Working with Arrays of Numbers
- Matrices and Vectors, Operations on Matrices
- Arithmetic, Relational, Logical, operations, Elementary math functions
- Script and Functions, Subfunctions
- Applications in Linear Algebra, Curve Fitting and Interpolation, Numerical Integration, Ordinary Differential Equations
- 2-D, 3-D Graphics

References:

1. Rudra Pratap, Getting Started with MATLAB – A Quick Introduction for Scientists and Engineers, Oxford University Press, 2004.
2. Duane Hanselman and Bruce Littlefied, Mastering Matlab, A Comprehensive tutorial and reference.
3. Delores M. Etter, Engineering Problem Solving with Matlab, Prentice Hall, 1993.
4. Gustafsson and Bergman, Matlab for Engineers Explained, Springer, 2003.

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IMCA – 107 Practicals

L	P	T	Total
0	4	0	4

- Numerical and Mathematical computation with Matlab and its applications in Linear Algebra, Solution of Ordinary Differential Equations, Some problems of complex numbers, etc.
- C Programming Exercises
- Exercises related to Operating Systems and Office.