

First year B.Sc mathematics Syllabus of Paper - I

Semester - I

DIFFERENTIAL EQUATIONS

UNIT - I: (12 hours), Differential equations of first order and first degree

Linear differential equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables; Simultaneous differential equations; Orthogonal Trajectories.

UNIT - II : (12 hrs), Differential equations of the first order but not of the first degree:

Equations solvable for p ; Equations solvable for y ; Equations solvable for x ; Equations that do not contain x (or y); Equations of the first degree in x and y - Clairaut's Equation.

UNIT - III: (12 hours) Higher order linear differential equations

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non homogeneous linear differential equations with constant coefficients by means of polynomial operators.

UNIT - IV: (12 hours) Higher order linear differential equations

Method of variation of parameters; Linear differential equations with non-constant coefficients; The Cauchy-Euler equation, System of Linear Differential Equations.

UNIT - V: Partial Differential Equations-I

Formation of partial differential equations- Equations of first order – Lagrange's Linear Equation- Charpit's method- Standard types of first order non linear partial differential equations.

Prescribed Text book: Scope and treatment as in Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd. New Delhi-Second edition: Sections: - 2.5 to 2.9, 3.1, 3.2, 4.2, 5.2 to 5.7, 7.3, 7.4.

I.N.Sneddon: An Introduction to partial differential equations (Mc Graw Hill-2000)

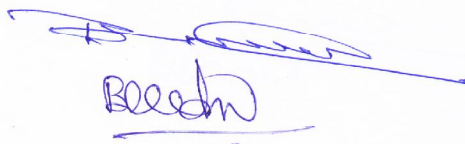
Reference Book:

1. V.Krishna Murthy & others "A text book of Mathematics for BA/BSc Vol 1 S.Chand & Company, New Delhi

2 Rai Singhania, "Ordinary and Partial Differential Equations", S.Chand & Company, New Delhi

Reference Book: P.K. Jain and Khaleel Ahmed, "A Text Book of Analytical Geometry of Three Dimensions", Wiley Eastern Ltd., 1999.

Differential Equations with applications and programs- S. Balachandra Rao & HR anuradha- universities Press



Syllabus of B.Sc mathematics I Paper

Semester - II

SOLID GEOMETRY

Unit – I (12 hrs) : The Plane

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

Unit – II (12 hrs) : The Line:

Equations of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of a straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line; Intersection of three planes; Triangular Prism.

Unit – III (12 hrs) : Sphere:

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a plane; Conjugate points; Conjugate planes; Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified form of the equation of two spheres.

Unit – IV (12 hrs) : Cones

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; Enveloping cone of a sphere; Equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone; Condition that a cone may have three mutually perpendicular generators; Intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex; Right circular cone; Equation of the right circular cone with a given vertex; axis and semi-vertical angle.

Unit – V (12 hrs) Cylinders and Conicoids:

Definition of a cylinder; Equation to the cylinder whose generators intersect a given conic and are parallel to a given line; Enveloping cylinder of a sphere; The right circular cylinder; Equation of the right circular cylinder with a given axis and radius.

The general equation of the second degree and the various surfaces represented by it, shapes of some surfaces, Nature of Ellipsoid, Nature of Hyperboloid of one sheet.

Prescribed Text book: Scope as in *Analytical Solid Geometry* by Shanti Narayan and P.K. Mittal, Published by S. Chand & Company Ltd. Seventeenth edition:


Sections:-2.4, 2.7, 2.9, 3.1 to 3.8, 6.1 to 6.9, 7.1 to 7.8, 8.1, 8.2, 8.6

Reference Book:

1. V.Krishna Murthy & others "A text book of Mathematics for BA/BSc Vol 1 S.Chand & Company, New Delhi

2. P.K. Jain and Khaleel Ahmed, "A Text Book of Analytical Geometry of Three Dimensions", Wiley Eastern Ltd., 1999.

Note: Concentrate on Problematic parts in all above units



Second year B.Sc mathematics Syllabus of Paper - II

Semester - III

ABSTRACT ALGEBRA

Unit - I (12 hrs) GROUPS

Binary operation – definition and properties; **Groups** – definition and elementary properties; finite groups and group composition tables; Sub groups cyclic subgroups; cosets; Lagrange's Theorem;

Unit - II (12 hrs) Normal subgroups

Normal subgroups – factor groups and simple groups; Criteria for the existence of a coset group, inner automorphisms and normal subgroups, factor groups and simple groups.

Homomorphism – Definition and elementary properties; **Isomorphism** – definition and elementary properties; fundamental theorem of homomorphisms and applications;

Unit - III (12 hrs) permutations and cyclic GROUPS

functions and permutations; groups of permutations; cycles and cyclic notation; even and odd permutations; The alternating groups; Cayley's theorem.

Cyclic groups – elementary properties. The classification and cyclic groups, sub groups of finite cyclic groups.

Unit - IV (12 hrs) RINGS-I

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring, some non commutative rings, examples; Subrings; Ideals, Definition and elementary properties, Ideal Generated by a Subset of Ring; Principal Ideal Ring, prime and Maximal ideals,

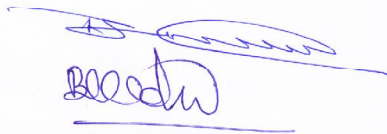
Unit - V (12 hrs) RINGS-II

Quotient Rings; Homomorphism (all topics over IIM) and Embedding of rings; Euclidean rings and Factorisation Theorem, Greatest Common Divisor, Prime Element, Polynomial Rings, Degree of a Polynomial, Division Algorithm. Prime fields.

TEXT BOOKS

1. ABSTRACT ALGEBRA

- i) "First Course in Abstract Algebra" by J. Fraleigh Published by Narosa Publishing House
(Chapters: 1 to 7, 11 to 13, 23, 24.1 to 24.3, 25.1, 25.4, 29 to 31)



Second year B.Sc mathematics Syllabus of Paper - II

Semester - IV

REAL ANALYSIS

Unit - I (12 hrs) REAL NUMBERS

The algebraic and order properties of \mathbb{R} absolute value and real line, Completeness property of \mathbb{R} , applications of supreme property; intervals

Sequences: Sequences and their limits, Range and Boundedness of Sequence, Limit of a sequence and Convergent Sequence, Theorem on Limits, The Cauchy's criterion, properly divergent sequences, Monotone sequences, Limit Point of Sequence, subsequences and the Bolzano-weierstrass theorem, Cauchy Sequences, Cauchy's first and second theorems on limits for sequences, Cesaro's theorem.

Unit - II (12 hrs) REAL NUMBERS

Series: Introduction to series, convergence of series. Cauchy's general principle for convergence tests for convergence of series. Series of Non-Negative Terms,

1. P-test
2. Canchy's n^{th} root test or Root Test
3. D "Alemberts" Test or Ratio test
Chauchys Condensation Test
4. Integral Test
Alternating Series
5. Leibnitz test

Absolute convergence and conditional convergence, semi convergence

Unit - III (12 hrs) REAL NUMBERS

Limits: Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity.

Continuous functions: Continuous functions. Combinations of continuous functions. , Continuous Functions on intervals, uniform continuity.

Unit -IV (12 hrs) DIFFERENTIATION

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value theorems, Indeterminate forms-L' Hospital's Rules, Generalised Mean value Theorems-Taylor's theorem, Maclaurins Theorem, Expansion of functions with different forms of remainders, Taylor's Maclaurins Series, power series representation of functions.

Unit -V (12 hrs) INTEGRATION

Riemann Integration: Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for \mathbb{R} - integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

TEXT BOOKS

REAL NUMBERS

"Introduction to Real Analysis" by RABERT g BARTELY and D.R.SHERBART
Published by John Wiley. (Chapters 3.1 to 3.7, 5.1 to 5.4, 6.1 to 6.4, 7.1 to 7.3, 9.1 to 9.3)

REFERENCE:

A Text Book of B.Sc mathematics by B.V.S.S Sarma and Published by S.Chand & Company.



Third year B.Sc mathematics Syllabus of Paper - III

Semester - V

LINEAR ALGEBRA

Unit-I: (12 Hours) Vector spaces

Vector spaces, General properties of vector spaces, n-dimensional vectors, addition and scalar multiplication of vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of vectors, Linear span, Linear independence and dependence of vectors,

Unit-II:(12 Hours) Vector spaces

Basis of vector space, Finite dimensional vector spaces, Basis extension, coordinates, Dimension of a vector space, Dimension of a subspace, Quotient space and set, Dimension of Quotientspace,

Unit – III (12 Hours) Linear transformations,

Linear transformations, linear operators, Properties of LT, Sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and nullity of linear transformations, Linear transformations as vectors, Vector Space Isomorphism, fundamental theorem of Homomorphism, singular non- singular Transformations, Inverse function, Matrix of Linear transformation.

Unit-IV: (12 Hours) Matrix

Matrices, Elementary properties of matrices, Inverse matrices, Rank of matrix, Linear equations characteristic Roots, characteristic values & vectors of square matrix, Cayley – Hamilton theorem.

Unit-V: (12 Hours) Inner product space

Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, complete orthonormal set, Gram - Schmidt orthogonalisation process. Bessel's inequality.

Prescribed text book: Linear Algebra by J.N.Sharma and A.R.Vasista, Krishna PrakashamMandir, Meerut-250002. Matrices by Shanti Narayana (S.Chand Publications)

Reference Books: 1.Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson Education (low priced edition), New Delhi

2. Linear Algebra by Stephen H. Friedberg et al Prentice Hall of India Pvt. Ltd. 4th edition 2007



S.V. UNIVERSITY: TIRUPATI

B.A/B.Sc. MATHEMATICS SYLLABUS

SEMISTER-VII

GRAPH THEORY / FOURIER SERIES/VECTOR calculus

TOTAL 60 HOURS PER WEEK FOUR HOURSTHEORY AND THREE HOURS PRACTICALS (4+3 CREDITS)

UNIT-I (12 HOURS) GRAPH THEORY-I

Basic concepts, Isomorphisms and Sub graphs, Trees and their properties, Spanning Trees, Directed Trees, Binary Trees.

UNIT-II (12 HOURS) GRAPH THEORY-II

Planar graphs, Euler's formula, Multi graphs and Euler Circuits, Hamiltonian graphs, Chromatic numbers. Four – Color problem.

UNIT-III (12 HOURS) FOURIER SERIES

Fourier series, Theorems, Dirichlet's conditions, Fourier series for even and odd functions, Half range Fourier series, Other forms of Fourier series.

Unit-IV (12 hrs) VECTOR DIFFERENTIATION

Vector differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae involving these operators.

UNIT-V (12 HOURS) VECTOR INTEGRATION

Line integral, Surface integral, Volume integral with examples, Vector integration, Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Prescribed text Book:

S. Arumugham & S. Ramachandran : *Invitation to Graph Theory*, Scitech Publications, Chennai-17.

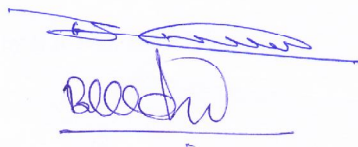
Scope as in *Integral transforms* by A.R. Vasishtha & Dr. R.K. Gupta Published by Krishna Prakashan Media Pvt. Ltd. Meerut.

Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

A Course of Mathematical Analysis by Shanthi Narayana and P.K. Mittal, S. Chand Publications.

Discrete Mathematical Structures with Applications to Combinatorics by V. Ramaswamy, Universities Press.

An introduction to Graph Theory by S.Pirzada, Universities Press.



Final yr B.Sc Mathematics: Paper IV (Elective - 1)
NUMERICAL ANALYSIS SEMISTER -6

60 hrs
(3 hrs/ week)

UNIT-I: (12 hours)

Errors in Numerical computations: Numbers and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

Solution of Algebraic and Transcendental Equations: The bisection method, The iteration method, The method of false position, Newton-Raphson method, Generalized Newton's method, Ramanujan's Method, Muller's method, The Quotient-Difference method.

UNIT-II: (12 hours) Interpolation

Interpolation: Errors in polynomial interpolation, Finite Differences, Forward differences, Backward differences, Central Differences, Symbolic relations, Detection of errors by use of Difference Tables, Differences of a polynomial, Newton's formulae for interpolation,

UNIT-III: (12 hours) Interpolation

Central Difference Interpolation Formulae, Gauss's central difference formulae, Stirling's central difference formula, Bessel's Formula, Everett's Formula. Relation between Bessel's and Everett's Formulae.

UNIT-IV: (12 hours) Interpolation

Interpolation with unevenly spaced points, Lagrange's formula, Error in Lagrange's formula, Derivation of governing equations, End conditions, Divided differences and their properties, Newton's general interpolation Formula, Inverse Interpolation, Method of Successive approximations.

UNIT-V (12 Hours)

Curve Fitting: Least-Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting, Curve fitting by a sum of exponentials, approximation of functions, Chebyshev polynomials, Economization of power series.

Prescribed text Book: Scope as in Introductory Methods of Numerical Analysis by S.S.Sastry, Prentice Hall India (Latest Edition.).

Reference Books:

1. G.Sankar Rao New Age International Publishers, New – Hyderabad.
2. Finite Differences and Numerical Analysis by H.C. Saxena S. Chand and Company, New Delhi.
3. Numerical methods for Scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K.Jain



Final yrB.ScMathematics: Paper IV (Elective - 1)
NUMERICAL ANALYSIS SEMISTER -8

60 hrs
(3 hrs/ week)

UNIT-I: (12 hours)

Numerical Differentiation and Numerical Integration : Numerical differentiation, Errors in numerical differentiation, Maximum and minimum values of a tabulated function, Numerical integration, Trapezoidal rule, Simpson's 1/3 -rule, Simpson's 3/8 -rule, Boole's and Weddle's rules, Romberg Integration, Euler-Maclaurin Formula, Gaussian Integration, Numerical Evaluation of Singular Integrals, Trapezoidal Rule,

UNIT-II: (12 hours)

Matrices and Linear Systems of Equations

Basic Definition, Matrix Operations, Transpose and Rank of a Matrix, Consistency of a Linear System of Equations, So Inverse of Matrix, Linear systems of equations, Solution of linear systems – Direct methods, Matrix inversion method, Gaussian elimination methods, Method of factorization, Solution of Tridiagonal System, Ill-conditioned linear systems. Iterative methods: Jacobi's method, Gauss-siedal method,

UNIT-III(12 Hours)

Numerical solution of ordinary differential equations : Introduction, Solution by Taylor's Series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge – Kutta methods, Predictor – Corrector methods, Adams-Moulton Method, Milne's method. Simultaneous and Higher Order Equations, Boundary value problems, Finite-Difference Method,

UNIT-IV(12 Hours)

Numerical solution of Partial differential equations : introduction, Finite-Difference approximations to Derivatives, Laplace's Equation, Jacobi's method, Gauss-Seidal method, Successive over-Relaxation or S.O.R method, Iterative methods for the solution of equations.

UNIT-V (12 Hours)

Numerical solution of integralequations :introduction, finite difference methods, chebyshev series method, method of invariant inbedding, method using generalized quadrature, A method for degenerate kernels.

Prescribed text Book: Scope as in Introductory Methods of Numerical Analysis by S.S.Sastry, Prentice Hall India (Latest Edition.).

Reference Books:

1. G.Sankar Rao New Age International Publishers, New – Hyderabad.
2. Finite Differences and Numerical Analysis by H.C. Saxena S. Chand and Company, New Delhi.
3. Numerical methods for Scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K.Jain



Mathematics: Paper IV (Elective – 2)
Number Theory
Semester – 6

UNIT-I

Divisibility, Greatest common divisor, Euclidean Algorithm, The Fundamental Theorem of arithmetic, congruences, Special divisibility tests, Chinese remainder theorem, Fermat's little theorem, Wilson's theorem, residue classes and reduced residue classes,

UNIT-II

Euler's theorem, An Application to cryptography, (n) , Mobius inversion Formula, The greatest integer function, $\mu(n)$, $\sigma(n)$, $d(n)$, ϕ Arithmetic functions perfect numbers, Mersenne primes and Fermat numbers. Primitive roots and indices. Quadratic residues,

UNIT-III

Legendre symbol, Quadratic reciprocity law, Jacobi symbol, Binary quadratic forms and their reduction, sums of two and four squares, positive definite binary quadratic forms, Diophantine equations $ax + by = c$, $x^2 + y^2 = z^2$, $x^4 + y^4 = z^2$. Farey sequences, Continued fractions, Approximation of reals by rationals, Pell's equations, Minkowski's theorem in Geometry of Numbers and its applications.

UNIT-IV

Order of magnitude and average order of arithmetic functions, Euler summation formula, Abel's Identity, Elementary results on distribution of primes. Congruences Elementary properties of prime numbers • Residue classes and Euler's function • Linear congruences and congruences of higher degree •

UNIT-V

Congruences with prime moduli • The theorems of Fermat, Euler and Wilson • Number-Theoretic Functions 22 Möbius function • The function $[x]$, The symbols O and their basic properties •



Mathematics: Paper IV (Elective – 2)

Number Theory

Semester – 8

UNIT-I

Primitive roots and indices Integers belonging to a given exponent (mod p)• Primitive roots and composite moduli• Determination of integers having primitive roots• Indices, Solutions of Higher Congruences by Indices•

UNIT-II

Diophantine Equations Equations and Fermat's conjecture for $n = 2$, $n = 4$ • Quadratic Residues Composite moduli, Legendre symbol• Law of quadratic reciprocity•

UNIT-III

The Jacobi symbol• Algebraic Number Theory Polynomials over a field• Divisibility properties of polynomials• Gauss's lemma• The Eisenstein's irreducibility criterion• Symmetric polynomials•

UNIT-IV

Extensions of a field• Algebraic and transcendental numbers• Bases and finite extensions, Properties of finite extensions• Conjugates and discriminants• Algebraic integers in a quadratic field,

UNIT-V

Integral bases• Units and primes in a quadratic field• Ideals, Arithmetic of ideals in an algebraic number field• The norm of an ideal, Prime ideals•

[Scope as in 6 & 7 of 'Introduction to the Theory of Numbers', 5th Edition, by Niven, Zuckerman & Montgomery.]

[Scope as in Chapters 2-8, 10 of 'Elementary Number Theory', 2nd Edition, by David M. Burton, Chapters 3, 5(sections 5.1, 5.3, 5.4) of 'Introduction to the Theory of Numbers', 5th Edition, by Niven, Zuckerman & Montgomery.] References: 1. David, M. Burton, Elementary Number Theory, 2nd Edition (UBS Publishers). 2. Niven, Zuckerman & Montgomery, Introduction to Theory of Numbers, 5th Edition (John Wiley & Sons). 3. Davenport H., Higher Arithmetic (Camb. Univ. Press) 4. Hardy & Wright, Number Theory (Oxford Univ. Press). 5. Dence, J. B. & Dence T. P., Elements of the Theory of Numbers (Academic Press)



Mathematics: Paper IV (Elective – 3)

FLUID MECHANICS

Semester – 6

Unit-I

Conservation of Matter Introduction• Fields and continuum concepts•Lagrangian and Eulerian specifications• Local, Convective and total rates of change• Conservation of mass• Equation of continuity•

Unit-II

Boundary conditions• Nature of Forces and Fluid Flow Surface and body forces• Stress at a point• Viscosity and Newton's viscosity law• Viscous and inviscid flows•

Unit -III

Laminar and turbulent flows• Compressible and incompressible flows•Irrotational Fluid Motion Velocity potential from an irrotational velocity field• Streamlines• Vortex lines and vortex sheets•

Unit-IV

Kelvin's minimum energy theorem• Conservation of linear momentum• Bernoulli's theorem and its applications• Circulation, Rate of change of circulation (Kelvin's theorem)•Axially symmetric motion•

Unit-V

Stokes's stream function• Two-dimensional Motion Stream function• Complex potential and complex velocity, Uniform flows• Sources, Sinks and vortex flows• Flow in a sector• Flow around a sharp edge• Flow due to a doublet•

Recommended Book 1. T. Allen and I. L. Ditsworth: Fluid Mechanics, (McGraw Hill, 1972) 2. I. G. Currie: Fundamentals of Mechanics of Fluids, (CRC, 2002) 3. Chia-Shun Yeh: Fluid Mechanics: An Introduction to the Theory, (McGraw Hill, 1974) 4. F. M. White: Fluid Mechanics, (McGraw Hill, 2003) 5. R. W. Fox, A. T. McDonald and P. J. Pritchard: Introduction to Fluid Mechanics, (John Wiley and Sons Pte. Ltd., 2003)



Mathematics: Paper IV (Elective – 3)
FLUID MECHANICS
Semester – 8

Unit-I

Two and Three-Dimensional Potential Flows Circular cylinder without circulation• Circular cylinder with circulation• 24 Blasius theorem•Kutta condition and the flat-plate airfoil•Joukowski airfoil• Vortex motion•

Unit-II

Karman's vortex street• Method of images• Velocity potential•Stoke's stream function• Solution of the Potential equation• Uniform flow• Source and sink•

Unit-III

Flow due to a doublet• Viscous Flows of Incompressible Fluids Constitutive equations•Navier-Stokes equations and their exact solutions• Steady unidirectional flow•Poiseuille flow•

Unit-IV

Steady unidirectional flow•Poiseuille flow•Couette flow•Flow between rotating cylinders• Stokes' first problem• Stokes' second problem•

Unit-V

Approach to Fluid Flow Problems Similarity from a differential equation• Dimensional analysis• One dimensional, Steady compressible flow•

Recommended Book 1. T. Allen and I. L. Ditsworth: Fluid Mechanics, (McGraw Hill, 1972) 2. I. G. Currie: Fundamentals of Mechanics of Fluids, (CRC, 2002) 3. Chia-Shun Yeh: Fluid Mechanics: An Introduction to the Theory, (McGraw Hill, 1974) 4. F. M. White: Fluid Mechanics, (McGraw Hill, 2003) 5. R. W. Fox, A. T. McDonald and P. J. Pritchard: Introduction to Fluid Mechanics, (John Wiley and Sons Pte. Ltd., 2003)

