BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

B.Sc. Mathematics - Course Structure under CBCS

(For the candidates admitted from the academic year 2010-2011 onwards)

Semester	Part	Course	Title	Instr Hours/ Week	Credit	Exam Hours	Marks		Total
							Int.	Extn.	
I	I	Language Course – I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course – I (CC)	Differential Calculus and Trigonometry	5	5	3	25	75	100
		Core Course – II (CC)	Probability and Statistics	5	5	3	25	75	100
		First Allied Course –I (AC)		5	3	3	25	75	100
		First Allied Course – II (AC)		3	-	***	-	-	-
		Total		30	19				500
II	I	Language Course – II (LC) - – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course – II (ELC)		6	3	3	25	75	100
	III	Core Course – III (CC)	Analytical Geometry 3D and Integral Calculus	6	5	3	25	75	100
		First Allied Course – II (AC)		**3**	3	3	25	75	100
		First Allied Course – III (AC)		5	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	IV	Value Education		2	2	3	25	75	100
		Total		30	22				700
III	I	Language Course – III (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - III (ELC)		6	3	3	25	75	100
	III	Core Course – IV (CC)	Algebra and Theory of Numbers	6	5	3	25	75	100
		Second Allied Course – I	.	**6**	3	3	25	75	100
		Second Allied Course – II		**4**	-	***	-	-	-
	IV	Non Major Elective I - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Quantitative Aptitude - I	2	2	3	25	75	100
		Total		30	16				500
IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course – IV (ELC)		6	3	3	25	75	100
	III	Core Course – V (CC)	Sequences and Series	4	4	3	25	75	100
		Core Course – VI (CC)	Differential Equations and Laplace Transforms	4	4	3	25	75	100
		Second Allied Course - II		2	3	3	25	75	100
		Second Allied Course - III		4	4	3	25	75	100

	IV	Non Major Elective II - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Quantitative Aptitude – II	2	2	3	25	75	100
	IV	Skill Based Elective I		2	**4**	3	25	75	100
		Total		30	**27**				800
V	III	Core Course – VII (CC)	Vector Calculus and Fourier Series	6	5	3	25	75	100
		Core Course – VIII (CC)	Abstract Algebra	5	4	3	25	75	100
		Core Course – IX (CC)	Real Analysis	5	4	3	25	75	100
		Core Course – X (CC)	Statics	5	4	3	25	75	100
		Major based Elective – I	Operations Research / Stochastic Process	5	5	3	25	75	100
	IV	Skill based Elective –II		2	**4**	3	25	75	100
		Skill based Elective – III		2	**4**	3	25	75	100
		Total		30	**30**				700
VI	III	Core Course – XI (CC)	Methods in Numerical Analysis	**6**	5	3	25	75	100
		Core Course – XII (CC)	Complex Analysis	**6**	5	3	25	75	100
		Core Course – XIII (CC)	Dynamics	6	5	3	25	75	100
		Major based Elective II	Graph Theory / Mathematical Modelling	**6**	5	3	25	75	100
		Major based Elective III	Fluid Dynamics / Astronomy	**5**	4	3	25	75	100
	IV	Extension activities பாலின சமத்துவம்		- 1	1 1	- 3	- 25	- 75	- 100
		Total		30	26				600
			Total	180	140		950	2850	3800

List of Allied Courses

Group I (Any one)

1. Physics
2. Quality Control & Reliability
3. Mathematical Statistics
4. Mathematical Economics
5. Cost Accounts
6. Computer Science

Group II (Any one)

1. Chemistry
2. Mathematical Statistics
3. Accountancy and Book-keeping
4. Computer Science

செய்முறை பாடங்கள் உள்ள இயைபுப் பாடங்களுக்கு (4+2+4) தரபுள்ளிகள்

செய்முறை பாடங்கள் இல்லாத இயைபுப் பாடங்களுக்கு(3+3+4) தரபுள்ளிகள்

Note :

1. Either Group of Allied courses may be offered in the I year / II year.
2. Candidates who offer "Mathematical Statistics" as Allied – I from Group – I shall have to offer any courses other than "Mathematical Statistics" in Group – II as Allied – II and vice-versa.
3. Candidates who offer 'Computer Science' as Allied – I from Group – I shall have to offer any subject other than 'Computer Science' in Group – II as Allied – II and vice-versa.

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

* for those who studied Tamil upto +2 (Regular Stream)

** Syllabus for other Languages should be on par with Tamil at Degree level

\# those who studied Tamil upto 10^{th} or +2, but opt for other languages in degree level under Part I should study special Tamil in Part IV

*** Examination at the end of the next semester.

Extension activities shall be out side the instruction hours.

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CORE COURSE – I (CC)
DIFFERENTIAL CALCULUS AND TRIGONOMETRY

UNIT I

Methods of Successive Differentiation – Leibnitz's Theorem and its applications- Increasing & Decreasing functions –Maxima and Minima of function of two variables.

UNIT II

Curvature – Radius of curvature in Cartesian and in Polar Coordinates – Centre of curvature –Evolutes & Involutes

UNIT III

Expansions of sin (nx), cos (nx), tan (nx) – Expansions of $\sin^n x$, $\cos^n x$ –Expansions of Sin(x) ,Cos(x), Tan(x) in powers of x.

UNIT IV

Hyperbolic functions – Relation between hyperbolic & Circular functions- Inverse hyperbolic functions.

UNIT V

Logarithm of a complex number –Summation of Trigonometric series – Difference method- Angles in arithmetic progression method –Gregory's Series

TEXT BOOK(S)

[1]. T.K.Manicavachagam Pillai & others , Differential Calculus, S.V Publications, Chennai -1985 Revised Edition.

[2] S.Arumugam & others, Trigonometry, New Gamma Publications -1985 Revised Edition

UNIT – I - Chapter 3 Sections 1.1 to 2.2 & Chapter 4 Section 2.1, 2.2 and Chapter 8 Section 4 & 4.1 of [1]
UNIT – II Chapter 10 Sections 2.1 to 2.6 of [1]
UNIT – III Chapter 1 Sections 1.2 to 1.4 of [2]
UNIT – IV Chapter 2 Sections 2.1& 2.2 of [2]
UNIT – V Chapter 3 & Chapter 4 Sections 4.1,4.2 & 4.4 of [2]

REFERENCE(S)

[1] S.Arumugam and Isaac, Calculus, Volume1, New Gamma Publishing House, 1991.

[2] S. Narayanan, T.K. Manichavasagam Pillai, Trigonometry, S. Viswanathan Pvt Limited, and Vijay Nicole Imprints Pvt Ltd, 2004.

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CORE COURSE – II (CC)
PROBABILITY AND STATISTICS

UNIT I

Theory of Probability –Definition of probability sample space – Probability of an event - Independence of events – Theorems on Probability – Conditional Probability – Baye's Theorem.

UNIT II

Random variables – Distribution functions – Descrete & continuous random variables – Probability mass & density functions –Joint probability distribution functions .

UNIT III

Expectation –Varience –Covarience-Moment generating functions –Theorems on Moment generating functions –moments –various measures .

UNIT IV

Correlation & Regression –Properties of Correlation & regression coefficients – Numerical Problems for finding the correlation & regression coefficients.

UNIT V

Theoretical Discrete & Continuous distributions – Binomial, Poisson, Normal distributions-Moment generating functions of these distributions –additive properties of these distributions- Recurrence relations for the moments about origin and mean for the Binomial. Poisson and Normal distributions –Properties of normal distributions –relation between Binomial, Poisson, Normal distributions

TEXT BOOK(S)

[1] Gupta.S.C & Kapoor,V.K , Fundamentals of Mathematical Statistics, Sultan Chand & sons, New Delhi -1994 Edition

UNIT – I - Chapter 3 Sections 3.9 & Chapter 4 (except sec 4.8)
UNIT – II - Chapter 5 (except sections 5.6 & 5.7)
UNIT – III - Chapter 6 (Omit all the inequalities & related problems)
UNIT – IV - Chapter 7 (except Sections 7. 2.8 to 7.2.11 & 7.3.9)
UNIT – V - Chapter 8 (Topics relevant to Normal Distributions)

REFERENCE(S)

[1] Thambidurai .P, Practical Statistics, Rainbow publishers – CBE (1991)

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CORE COURSE – III (CC)
ANALYTICAL GEOMETRY (3D) AND INTEGRAL CALCULUS

UNIT I

Standard equation of a plane – intercept form-normal form-plane passing through given points – angle between planes –plane through the line of intersection of two planes- Equation of the straight line – Shortest distance between two skew lines- Equation of the line of shortest distance

UNIT II

Sphere – Standard equation –Length of a tangent from any point-Sphere passing through a given circle – intersection of two spheres – Tangent plane.

UNIT III

Integration by parts – definite integrals & reduction formula

UNIT IV

Double integrals – changing the order of Integration – Triple Integrals.

UNIT V

Beta & Gamma functions and the relation between them –Integration using Beta & Gamma functions

TEXT BOOK(S)

[1] T.K.Manickavasagam Pillai & others, Analytical Geometry, S.V Publications -1985 Revised Edition.

[2] T.K.Manickavasagam Pillai & others, Integral Calculus, SV Publications.

UNIT – I - Chapter 2 Sections 13 to 21 & Chapter 3 Sections 24 to 31 of [1]
UNIT – II - Chapter 4 Sections 35 to 42 of [1]
UNIT – III - Chapter 1 Sections 11 , 12 & 13 of [2]
UNIT – IV - Chapter 5 Sections 2.1 , 2.2 & Section 4 of [2]
UNIT – V - Chapter 7 Sections 2.1 to 5 of [2]

REFERNECE(S)

[1] Duraipandian and Chatterjee, Analytical Geometry

[2] Shanti Narayan, Differential & Integral Calculus.

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CORE COURSE – IV (CC)
ALGEBRA & THEORY OF NUMBERS

UNIT I

Relation between roots & coefficients of Polynomial Equations–Symmetric functions – Sum of the r^{th} powers of the Roots – Two methods

UNIT II

Transformations of Equations – Diminishing ,Increasing & multiplying the roots by a constant- Forming equations with the given roots.-Reciprocal equations –all types- Descarte's rule of Signs(statement only) –simple problems.

UNIT III

Inequalities-elementary principles- Geometric & Arithmetic means -Weirstrass inequalities - Cauchy inequality- Applications to Maxima & minima

UNIT IV

Rank of a Matrix – Consistency - Eigen values ,Eigen vectors – Cayley Hamilton's Theorem (statement only) – Symmetric ,skew Symmetric ,Orthogonal, Hermitian , skew Hermitian, & Unitary Matrices –Simple problems only.

UNIT V

Theory of Numbers – Prime & Composite numbers – divisors of a given number N - Euler's function $\phi(N)$ and its value – The highest power of a prime P contained in N ! – Congruences – Fermat's ,Wilson's & Lagrange's Theorems

TEXT BOOK(S)

[1] T.K.Manickavasagom Pillai & others Algebra Volume I,S.V Publications -1985 Revised Edition

[2] T.K.Manickavasagom Pillai &others Algebra Volume II,S.V Publications -1985 Revised edition

[3] S.Arumugam & A.Thangapandi Issac, Modern Algebra , New Gamma Publishing House, 2000

UNIT – I - Chapter 6 Sections 11 to 14 of [1]
UNIT – II - Chapter 6 Sections 15 to 21 & 24 of [1]
UNIT – III - Chapter 4 of [2]
UNIT – IV - Chapter 6 Sections 6.1 to 6.3 of [3]
UNIT – V - Chapter 5 of [2]

REFERENCES(S)

[1] H.S.Hall and S.R. Knight, Higher Algebra, Prentice Hall of India, New Delhi,

[2] H.S.Hall and S.R. Knight, Higher Algebra, McMillan and Co., London, 1948

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CORE COURSE – V (CC)

SEQUENCES AND SERIES

UNIT I

Sequence (definition) ,Limit, Convergence of a sequence- Cauchy's general principle of convergence- Cauchy's first theorem on Limits-Bounded sequences –monotonic sequence always tends to a limit ,finite or infinite- Limit superior and Limit inferior .

UNIT II

Infinite series- Definition of Convergence, Divergence & Oscillation – Necessary condition for convergence –Convergence of $\sum \frac{1}{n^p}$ and Geometric series. Comparison test , D'Alembert's ratio test , and Raabe's test .Simple problems based on above tests.

UNIT III

Cauchy's condensation Test ,Cauchy's root test and their simple problems-Alternative series with simple problems

UNIT IV

Binomial Theorem for a rational index-Exponential & Logarithmic series-Summation of series & approximations using these theorems.

UNIT V

General summation of series including successive difference and recurring series.

TEXT BOOK(S)

[1] T.K. Manicavachagam Pillai, T. Natarajan, K.S. Ganapathy, Algebra, Vol. I, S. Viswanathan Pvt Limited, Chennai, 2004

UNIT – I - Chapter 2 Sections 1 to 7.
UNIT – II - Chapter 2 Sections 8 to 14 , 16 , 18
UNIT – III - Chapter 2 Sections 15 , 17 , 21 to 24
UNIT – IV - Chapter 3 Sections 5 to 11 , 14 & Chapter 4 Sections 2 , 3, 5 to 9
UNIT – V - Chapter 5 Sections 2 to 7

REFERENCE(S)

[1] M.K.Singal & Asha Rani Singal, A first course in Real Analysis, R. Chand & Co. 1999
[2] Dr.S.Arumugam, Sequences & Series, New Gamma Publishers, 1999.

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CORE COURSE VI (CC)
DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

UNIT I

First order , higher degree Differential equations solvable for x, solvable for y , solvable for $\frac{dy}{dx}$, Clairaut's form.- Conditions of integrability of M dx + N dy =0 - simple problems

UNIT II

Particular integrals of second order Differential Equations with constant coefficients- Linear equations with variable coefficients –Method of Variation of Parameters (Omit third & higher order equations)

UNIT III

Formation of Partial Differential Equation – General , Particular & Complete integrals – Solution of PDE of the standard forms - Lagrange's method of solving – Charpit's method and a few standard forms .

UNIT IV

PDE of second order homogeneous equation with constant coefficients – Particular Integrals of F (D, D') z = f (x ,y) ,where f(x ,y) is of one of the forms $e^{(a x + b y)}$, sin (a x + b y), cos (a x + b y), $x^r y^s$, and $e^{(a x + b y)}$ f(x ,y).

UNIT V

Laplace Transforms –standard formulae –Basic Theorems & simple applications-Inverse Laplace Transform – Use of Laplace Transform in solving ODE with constant coefficients.

TEXT BOOK(S)

[1] M.D. Raisinghania, Ordinary & Partial Differential Equations, S. Chand & Co.,

[2] M.K. Venkataraman, Engineering Mathematics, S.V. Publications, 1985, Revised Edn.

REFERENCE(S)

[1] S.Narayanan, Differential Equations, S. Viswanathan Publishers, 1996.

[2] M.L. Khanna, Differential Calculus, Jaiprakashnath and Co., Meerut-2004.

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CORE COURSE – VII(CC)

VECTOR CALCULUS AND FOURIER SERIES

UNIT I

Vector differentiation –velocity & acceleration-Vector & scalar fields –Gradient of a vector- Directional derivative – divergence & curl of a vector solinoidal & irrotational vectors –Laplacian double operator –simple problems

UNIT II

Vector integration –Tangential line integral –Conservative force field –scalar potential- Work done by a force - Normal surface integral- Volume integral – simple problems.

UNIT III

Gauss Divergence Theorem – Stoke's Theorem- Green's Theorem – Simple problems & Verification of the theorems for simple problems.

UNIT IV

Fourier series- definition - Fourier Series expansion of periodic functions with Period 2π and period 2a – Use of odd & even functions in Fourier Series.

UNIT V

Half-range Fourier Series – definition- Development in Cosine series & in Sine series Change of interval – Combination of series

TEXT BOOK(S)

[1] M.L. Khanna, Vector Calculus, Jai Prakash Nath and Co., 8th Edition, 1986.

[2] S. Narayanan, T.K. Manicavachagam Pillai, Calculus, Vol. III, S. Viswanathan Pvt Limited, and Vijay Nicole Imprints Pvt Ltd, 2004.

UNIT – I - Chapter 1 Section 1 & Chapter 2 Sections 2.3 to 2.6 , 3 , 4 , 5 , 7 of [1]
UNIT – II - Chapter 3 Sections 1 , 2 , 4 of [1]
UNIT – III - Chapter 3 Sections 5 & 6 of [2]
UNIT – IV - [2]
UNIT – V - [2]

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CORE COURSE VIII (CC)
ABSTRACT ALGEBRA

UNIT I

Groups - Subgroups – Cyclic groups – Order of an element – Cosets and Lagrange's Theorem

UNIT II

Normal subgroups and Quotient groups –Finite groups & Cayley Tables-Isomorphism & Homomorphism.

UNIT III

Rings & Fields- definition & examples-Elementary properties of Rings-Types of Rings-Characteristics of Rings –Subrings – Ideals- Quotient rings –Maximal & Prime Ideals – Homomorphism of Rings – Isomorphism of Rings.

UNIT IV

Vector Spaces –definition & examples –Subspaces –Linear Transformation-Span of a set-Linear independence.

UNIT V

Basis & Dimension – Rank & Nullity – Matrix of a Linear Transformation.

TEXT BOOK(S)

[1] N.Arumugam & A.Thangapandi Isaac, Modern Algebra, New Gamma Publishing House -June 1997

UNIT – I - Chapter 3 Sections 3.5 to 3.8
UNIT – II - Chapter 3 Sections 3.9 to 3.12
UNIT – III - Chapter 4 Sec 4.1 to 4.8 & 4.10
UNIT – IV - Chapter 5 Sections 5.1 to 5.5
UNIT – V - Chapter 5 Sections 5.6 to 5.8

REFERENCE(S)

[1] T.K. Manicavachagam Pillai, T. Natarajan, K.S. Ganapathy, Algebra, Vol. I, S. Viswanathan Pvt Limited, Chennai, 2004

[2] M.L.Santiago, Modern Algebra, Arul Publications, Madras, 1988.
[3] M.L.Santiago, Modern Algebra, Tata McGraw Hill, 2003.

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CORE COURSE IX (CC)
REAL ANALYSIS

UNIT I

Real Number system – Field axioms –Order relation in R.Absolute value of a real number & its properties –Supremum & Infimum of a set – Order completeness property – countable & uncountable sets.

UNIT II

Continuous functions –Limit of a Function – Algebra of Limits – Continuity of a function –Types of discontinuities – Elementary properties of continuous functions –Uniform continuity of a function.

UNIT III

Differentiability of a function –Derivability & Continuity –Algebra of derivatives – Inverse Function Theorem – Daurboux's Theorem on derivatives.

UNIT IV

Rolle's Theorem –Mean Value Theorems on derivatives- Taylor's Theorem with remainder- Power series expansion .

UNIT V

Riemann integration –definition – Daurboux's theorem –conditions for integrability – Integrability of continuous & monotonic functions - Integral functions –Properties of Integrable functions - Continuity & derivability of integral functions –The First Mean Value Theorem and the Fundamental Theorem of Calculus.

TEXT BOOK(S)

[1] M.K,Singhal & Asha Rani Singhal , A First Course in Real Analysis, R.Chand & Co., June 1997 Edition

[2] Shanthi Narayan, A Course of Mathematical Analysis, S. Chand & Co., 1995

UNIT – I - Chapter 3 of [1]
UNIT – II - Chapter 7 of [1]
UNIT – III - Chapter 8 of [1]
UNIT – IV - Chapter 9 of [1]
UNIT – V - Chapter 6 of [2]

REFERENCE(S)

[1] Gold Berge, Richar R, Methods of Real Analysis, Oxford & IBHP Publishing Co., New Delhi, 1970.

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CORE COURSE X (CC)
STATICS

UNIT I

Forces & Equilibrium - Forces – Resultant of two forces – Three forces related to a triangle –Equilibrium of a particle under three or more forces.

UNIT II

Forces on a rigid body - Moment – Equivalent systems of forces- Parallel forces – Varignon's Theorm- Forces along a Triangle – Couples –Equilibrium of a rigid body under three coplanar forces – Reduction of coplanar forces into a force & a couple .

UNIT III

Friction – Laws of Friction – Coefficient of Friction, Angle & Cone of Friction –Limiting equilibrium of a particle on a rough inclined plane, Tilting of a body - Simple Problems.

UNIT IV

Virtual Work- Principle of Virtual Work – applied to a body or a system of bodies in equilibrium –Equation of Virtual Work –Simple Problems.

UNIT V

Strings - Equilibrium of Strings under gravity – Common Catenary – Suspension bridge

TEXT BOOK(S)

[1] P.Duraipandiyan, Mechanics (Vector Treatment), S.Chand & Co. -June 1997

UNIT – I -Chapter 2 & Chapter 3 Section 3.1
UNIT – II -Chapter 4 Section 4.1 , 4.3 to 4.9 & Chapter 5 Section 5.1
UNIT – III -Chapter 2 Section 2.1 , Chapter 3 Section 3.2 , Chapter 5 Section 5.2
UNIT – IV -Chapter 8
UNIT – V -Chapter 9

REFERENCE(S)

[1] M.K.Venkataraman, Statics, Agasthiyar Publications, 2002.
[2] A.V.Dharmapadham, Statics, S. Viswanathan Publishers Pvt Ltd., 1979.
[3] S.L. Lony, Elements of Statics and Dynamics, Part-I, A.I.T. Publishers, 1991.

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CORE COURSE – XI (CC)
METHODS IN NUMERICAL ANALYSIS

[In all the units the value of a root may be calculated upto 3 decimal accuracy only]

UNIT I

Algebraic & Transcendental equations– Finding a root of the given equation (Derivation of the formula not needed) using Bisection Method , Method of False Position , Newton Raphson Method ,Iteration method – Types of errors .

UNIT II

Finite differences –Forward , Backward & Central differences – Their symbolic relations –Newton's forward & backward difference interpolation formulae – Interpolation with unevenly spaced intervals –Application of Lagrange's interpolating Polynomial (Proof not needed)– Divided differences and their properties – Application of Newton's General Interpolating formula. (Proof not needed) .

UNIT III

Numerical differentiation - Numerical Integration using Trapezoidal rule & Simpson's first & second rules - Theory & problems.

UNIT IV

Solutions to Linear Systems – Gaussian Elimination Method – Jacobi & Gauss Siedal iterative methods – Theory & problems .

UNIT V

Numerical solution of ODE – Solution by Taylor Series Method , Picard's method, Euler's Method , Modified Euler's Method , Runge Kutta 2^{nd} and 4^{th} order methods (Derivation of the formula not needed) - Theory & problems using Adam's Predictor Corrector Method & Milne's Predictor Corrector Methods

TEXT BOOK(S)

[1] S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt.Limited, 1995.

UNIT – I -Chapter 2 section 2.1 to 2.5 of Text Book
UNIT – II -Chapter 3 Sections 3.1, 3.3, 3.6, 3.9, 3.9.1, 3.10, 3.10.1 of Text Book
UNIT – III -Chapter 4 sections 4.2 , 4.4 , 4.4.1 & 4.4.2 of Text Book
UNIT –IV -Chapter 5 Section 5.4 of Text Book
UNIT – V -Chapter 6 Sections 6.1 to 6.5 , 6.6.1 & 6.6.2 of Text Book

REFERENCE(S)

[1] S. Narayanan & Others, Numerical Analysis, S. Viswanathan Publishers, 1994.
[2] A. Singaravelu, Numerical Methods, Meenachi Agency, June 2000.

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CORE COURSE – XII (CC)
COMPLEX ANALYSIS

UNIT I

Functions of a Complex variable –Limits-Theorems on Limits –Continuous functions – Differentiability – Cauchy-Riemann equations – Analytic functions –Hormonic functions.

UNIT II

Elementary transformations - Bilinear transformations – Cross ratio – fixed points of Bilinear Transformation – Some special bilinear transformations .

UNIT III

Complex integration - definite integral – Cauchy's Theorem –Cauchy's integral formula –Higher derivatives - .

UNIT IV

Series expansions- Taylor's series –Laurant's Series – Zeroes of analytic functions – Singularities .

UNIT V

Residues – Cauchy's Residue Theorem –Evaluation of definite integrals .

TEXT BOOK(S)

[1] S.Arumugam,A.Thangapandi Isaac,& A.Somasundaram, Complex Analysis, New Scitech Publications (India) Pvt Ltd, 2002.

UNIT – I -Chapter 2 section 2.1 to 2.8 of Text Book
UNIT – II -Chapter 3 Sections 3.1 to 3.5 of Text Book
UNIT – III -Chapter 6 sections 6.1 to6.4 of Text Book
UNIT –IV -Chapter 7 Sections 7.1 to 7.4 of Text Book
UNIT – V -Chapter 8 Sections 8.1 to 8.3 of Text Book

REFERENCE(S)

[1] P.P Gupta – Kedarnath & Ramnath, Complex Variables, Meerut -Delhi
[2] J.N. Sharma, Functions of a Complex variable, Krishna Prakasan Media(P) Ltd, 13th Edition, 1996-97.
[3] T.K.Manickavachaagam Pillai, Complex Analysis, S.Viswanathan Publishers Pvt Ltc, 1994.

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CORE COURSE XIII (CC)
DYNAMICS

UNIT I

Kinematics Velocity – Relative Velocity - Acceleration – Coplanar Motion - components of Velocity & Acceleration – Newton's Laws of Motion.

UNIT II

Simple Harmonic motion – Simple Pendulum – Load suspended by an elastic string – Projectile – Maximum height reached , range , time of flight – Projectile up / down an inclined plane .

UNIT III

Impulsive force – conversion of linear momentum – Impact of a sphere & a plane - Direct & Oblique Impact of two smooth spheres –Kinetic energy and Impulse .

UNIT IV

Central Orbit – Central force – Differential equation to a central orbit in polar & pedal coordinates - Given the central orbit , to find the law of force – Kepler's Laws of Planetary motions .

UNIT V

Motion of a rigid body – Moment of Inertia of simple bodies –Theorems of Parallel & Perpendicular axes – Motion in two-dimension – Motion of a rigid body about a fixed axis.

TEXT BOOK(S)

[1] P.Duraipandiyan,Vector Treatment as in Mechanics, S.Chand & Co. -June 1997 Edition .

UNIT – I -Chapter 1 & Chapter 2 Sections 2.1, 2.1.1
UNIT – II -Chapter 12 sections 12.1 to 12.3 & Chapter13
UNIT – III -Chapter 14
UNIT –IV -Chapter 16
UNIT – V -Chapter 4 Section 4.2 Chapter 17 & Chapter 18

REFERENCE(S)

[1] M.K.Venkataraman, Dynamics, Agasthiar Book Depot, 1990.
[2] A.V.Dharmapadam, Dynamics, S. Viswanathan Publishers, 1981.

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MAJOR BASED ELECTIVE - I - OPERATIONS RESEARCH

(In all the Units No Book Work need to be proved – Only applications of the Book works need to be taught)

UNIT I

Introduction to Operations Research- Elementary treatment of Linear Programming – Simplex Method for < , = , > constraints.

UNIT II

Application to Transportation problem –Transportation algorithm –Degeneracy algorithm –Degeneracy in Transportation Problem , Unbalanced transportation problem- Assignment algorithm – Unbalanced Assignment problem .

UNIT III

Sequencing & Replacement.

UNIT IV

PERT CPM network – Critical & sub Critical jobs –Determining the Critical Path – Network Calculation of PERT networks – Probability of PERT.

UNIT V

Inventory Theory –Variables in an inventory problem –Techniques of Inventory Control with known demand.

[1] Purchasing Model with No shortage
[2] Purchasing Model with shortage
[3] Manufacturing Model with No shortage
[4] Manufacturing Model with Shortage

TEXT BOOK(S)

[1] Kanti Swaroop, Gupta.P.K,& Manmohan, Operations Research, Sultan Chand & Co.

UNIT – I -Chapter 0 Sections 0.1 to 0.9 ,Chapter 2 section 2.1 to 2.5 ,Chapter 3 Sections 3.1 to 3.4 , 3.8
UNIT – II -Chapter 9 Sections 9.1 to 9.9 & Chapter 10 Sections 10.1 to 10.3
UNIT – III -Chapter 16 Section 16.1 to 16.5 & Chapter 18 Section18.1 to 18.3
UNIT – IV -Chapter 20 Sections 20.1 to 20.8
UNIT – V -Chapter 17 Sections 17.1 , 17.2 , 17.4 to 17.6 , 17.8 , 17.9

REFERENCE(S)

[1] Hamdy A. Taha, Operations Research (7^{th} Edn.), Prentice Hall of India, 2002.

[2] Richard Bronson, Theory and Problems of Operations Research, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1982.

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OR

MAJOR BASED ELECTIVE - I - STOCHASTIC PROCESS

Unit I:

Generating function - Laplace transforms – Laplace transforms of a probability distribution function Difference equations - Differential difference equations – Matrix analysis.

Unit II

Stochastic process – notion – specification – stationary process – Markov chains – Definition and examples – Higher transition probabilities.

Unit III

Classification of states and chains – Determination of Higher transition probabilities – stability of Markov system – limiting behavior.

Unit IV

Poisson process and related distributions- generalization of Poisson process – Birth and death process.

Unit V

Stochastic process in queuing and reliability – queuing systems, m/m/1 models – Birth and death process in queuing theory – Mutti channel models – Bulk Queues.

Scope and treatment as in "Stochastic Process" by J.Medhi, Chapters 1, 2, 3 (omitting 3,6., 3,7. d 3.8) , 4 (omitting 4.5.and 4.6) and Chapter 10 (omitting 10.6,10.7)

Books for Reference:

1 First course in Stochastic Process by Samuel Kartin.
2 Stochastic Process by Srinivasan and Metha (TATA Mc Graw Hill)
3 Elements of Applied Stochastic Process by V.Narayanan.

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MAJOR BASED ELECTIVE – II - GRAPH THEORY

UNIT I

Definition of a Graph – finite & infinite graphs – incidence, degree isolated & pendent Vertices – isomorphisms –sub graphs – walks , paths & circuits –Connected & disconnected graphs – components –Euler graphs - Operations on Graphs –More on Euler graphs –Hamiltonian paths & circuits .

UNIT II

Trees –properties of trees –pendent vertices in a tree – distances & centres in a tree – Rooted & binary trees – Spanning trees –Fundamental circuits – Finding all spanning trees of a Graph –Spanning trees in a weighted graph .

UNIT III

Cut sets – Properties of a Cut set – all Cut sets in a graph – Fundamental circuits & Cut sets –Connectivity & separability.

UNIT IV

Vector Space of a Graph – Sets with one , two operations –modular arithmetic - Galois Fields –Vectors-Vector Spaces –Basis vectors of a graph – circuit & cutset subspaces – Orthogonal vectors & spaces.

UNIT V

Matrix representation of a graph – Incidence matrix –Circuit Matrix - Fundamental Circuit Matrix and rank of the circuit matrix – Cut set matrix – adjacency matrix – Chromatic Number - Chromatic partitioning – Chromatic polynomial.

TEXT BOOK(S)

[1] Narsingh Deo, Graph Theory with applications to Engineering & Computer Science, Prentice Hall of India ,New Delhi, 1997.

UNIT – I -Chapter 1 section 1.1 to 1.5 & Chapter 2 Sections 2.2, 2.4 to 2.9
UNIT – II -Chapter 3 Sections 3.1 , 3.3 , 3.6, 3.9, 3.9.1, 3.10 , 3.10.1
UNIT – III -Chapter 4 Sections 4.1 to 4.5
UNIT –IV -Chapter 6 Section 6.1 to 6.8
UNIT – V -Chapter 7 Sections 7.1, 7.2, 7.3, 7.4, 7.6,7.9 and Chapter 8 Sections 8.1,8.2,8.3

REFERENCE(S)

[1] Dr.S. Arumugam & Dr. S. Ramachandran, Invitation to Graph Theory, Scitech Publications India Pvt Limited, Chennai, 2001.
[2] K.R. Parthasarathy, Basic Graph Theory, Tata McGraw Hill Publishing Company, New Delhi, 1994.
[3] G.T. John Clark, Derek Allan Holten, A First Look at Graph Theory, World Scientific Publishing company, 1995.

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OR

MAJOR BASED ELECTIVE – II - MATHEMATICAL MODELLING

UNIT I

Mathematical Modelling through Ordinary Differential Equations of First order : Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Dynamic problems – Geometrical problems.

UNIT II

Mathematical Modelling through Systems of Ordinary Differential Equations of First Order : Population Dynamics – Epidemics – Compartment Models – Economics – Medicine, Arms Race, Battles and International Trade – Dynamics.

UNIT III

Mathematical Modelling through Ordinary Differential Equations of Second Order : Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modelling through Linear Differential Equations of Second Order – Miscellaneous Mathematical Models.

UNIT IV

Mathematical Modelling through Difference Equations : Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics – Probability Theory.

UNIT V

Mathematical Modelling through Graphs : Solutions that can be Modelled Through Graphs – Mathematical Modelling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs.

TEXT BOOK(S)

[1] J.N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Delhi, 1988.

REFERENCE(S)

[1] J.N. Kapur, Mathematical Models in biology and Medicine, EWP, New Delhi, 1985.

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MAJOR BASED ELECTIVE – III – FLUID DYNAMICS

Unit I

Real fluids and ideal fluids – Velocity of a fluid at a point – streamlines and path lines; steady and unsteady flows – The velocity potential – The vorticity Vector – Local and Particle Rates of change – The equation of continuity – worked examples – Acceleration of a fluid – Pressure at a point in a fluid at Rest – Pressure at a point in Moving fluid – Conditions at a Boundary of Two Invisid Immiscible fluids.

Unit II

Euler's equations of motions – Bernoulli's equation – Worked examples – Some flows Involving Axial symmetry – Some special two – Dimensional flows – Some three – Dimensional flows: Introduction – sources, sinks and Doublets – Axi – Symmetric flows; Stokes stream function.

Unit III

Some Two – Dimensional flows: Meaning of a Two – Dimensional flow – use of cylindrical Polar coordinates – The stream function – The complex Potential for Two – Dimensional, Irrotational, Incompressible flow – Complex velocity Potentials for standard Two Dimensional flows – Some worked examples – The Milne – Thomson circle theorem and applications – The Theorem of Blasius.

Unit IV

Stress components in Real fluid – relations between Cartesian Components of stress – Translational Motion of fluid Element – The Rate of strain Quadric and Principal Stresses – Some further properties of the Rate of strain Quadric – Stress Analysis ion fluid Motion – Relation Between stress and rate of strain.

Unit V

The Coefficient of viscosity and Laminar flow – The Navier – Stokes equations of Motions of a viscous fluid. Some solvable problems in Viscous flow - steady viscous flow in Tubes of uniform crass section.

TEXT BOOKS (S)

1. Content and Treatment as in Text Book of fluid Dynamics by F.Charlton (CBS Publishers d Distributors, New Delhi-110032) 1985.

Unit I - Chapter 2: Sections 2.1 to 2.9 and
Chapter 3: Sections 3.1 to3.3

Unit II – Chapter 3: Sections 3.4 to 3.6, 3.9, 3.10
Chapter 4: Sections 4.1, 4.2, 4.5

Unit III – Chapter 5: Sections 5.1 to 5.9 except 5.7

Unit IV – Chapter 8: Sections 8.1 to 8.7

Unit V - Chapter 8: Sections 8.8-8.12 except 8.8.4

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OR

MAJOR BASED ELECTIVE – III - ASTRONOMY

UNIT I

Relevant properties of a sphere & relevant formulae for spherical trigonometry (All without Proof) –Celestial sphere – Diurnal motion.

UNIT II

Earth – Dip of the horizon –Twilight – Astronomical refraction –Tangent & Cosine's Formula – Properties & simple problems applying them..

UNIT III

Kepler's Laws of Planetary motion (statement only) –Newton's deductions from them – Three anomalies of the Earth and relation between them – Time- Equation of time - Seasons

UNIT IV

Years and Calendar – Geocentric Parallax –Annual Parallax –Aberration of light – simple problems in the above.

UNIT V

Moon (except Moon's liberations)-Motions of planet (assuming that orbits are circular - Eclipses .

TEXT BOOK(S)

[1] S. Kumaravelu and Prof. Susheela Kumaravelu, Astronomy, SKV Publications, 2004.

UNIT – I -Chapters 1 & 2
UNIT – II -Chapter 3 Section 1 , 2, 5 , 6 & Chapter 4 Sections 117 to 120 ,129 ,130
UNIT – III -Chapter 6
UNIT –IV -Chapter 7 Section 1 , 3 , 4 & Chapter 8 Sections 190 to 193
UNIT – V -Chapter 12

REFERENCE(S)

[1] V. Thiruvenkatacharya, A Text Book of Astronomy, S. Chand and Co., Pvt Ltd., 1972.

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Non- Major Elective I– Quantitative Aptitude –I

Unit I

Numbers – HCF – LCM – Problems on numbers
(Chapters 1, 2 & 7)

Unit II
Decimal Fractions and Simplification
(Chapter 3 & 4)

Unit III
Surds and Indices – Percentage – Profit and Loss
(Chapters 9, 10 & 11)

Unit IV
Ratio and Proportion – Partnership – Allegation or Mixture
(Chapters 12, 13 & 20)

Unit V
Average – Problems on Age
(Chapters 6 &8)

Text Book: Scope and treatment as in "Quantitative Aptitude" by R.S.Aggarwal, S.Chand & Company Ltd., Ram Nagar, New Delhi (2007)

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Non- Major Elective II– Quantitative Aptitude –II

Unit I

Chain Rule – Time –Work and Wages – Pipes and Cisterns
(Chapters 10, 11 & 12)

Unit II

Simple Interest – Compound Interest - Growth and Depreciation- Shares and Debentures
(Chapters 14, 15 & 16)

Unit III

Time and Distance – Trains – Boats and Streams
(Chapters 17, 18 & 19)

Unit IV

Clocks – Area of Plane figure – Volume and Surface Area of Solid Figures
(Chapters 21, 22 & 23)

Unit V

Data Interpretation – Data sufficiency
(Chapters 24 & 25)

Text Book: Scope and treatment as in "Quantitative Aptitude "by Abhijit Guha, Tata McGraw Hill Publishing Company Limited, New Delhi (2005)

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