

**DEPARTMENT OF MATHEMATICS**

# **UG SYLLABUS**

**Effective from the Academic Year 2015-16**



**H.H. The Rajah's College**

(Autonomous)

Accredited at B+ by NAAC

**Pudukkottai.**

S.I. No.	Semester	Course Title	Ins.Hrs /Week	Credit	Exam Hrs	Marks		Total
						Int	Ex	
1	I	Part -I	6	3	3 Hrs	25	75	100
2	I	Part - II	6	3	3 Hrs	25	75	100
3	I	Major - I: Calculus and Trigonometry	5	5	3 Hrs	25	75	100
4	I	Major - II: Theory of equations and Theory of number	5	4	3 Hrs	25	75	100
	I	Allied paper - I*	3					
		Allied Paper - II (practical)*	3					
5	I	Environmental studies	2	2	3 Hrs	25	75	100
6	II	Part - I	6	3	3 Hrs	25	75	100
7	II	Part -II	6	3	3 Hrs	25	75	100
8	II	Major - III:Analytical Geometry 3D and Vector calculus	6	5	3 Hrs	25	75	100
9	II	Allied Paper - I*	3	5	3 Hrs	25	75	100
10	II	Allied Paper - II (practical)*	3	5	3 Hrs	25	75	100
11	II	Soft Skill - I	4	4	3 Hrs	25	75	100
12	II	Value of Education	2	2	3 Hrs	25	75	100
13	III	Part - I	6	3	3 Hrs	25	75	100
14	III	Part - II	6	3	3 Hrs	25	75	100
15	III	Major- IV: Sequence and series	5	4	3 Hrs	25	75	100
	IV	Major - V: Differential equations and Laplace Transforms *	3					
	III	Allied Paper - III*	3					
	III	Allied Paper - IV*(Practical)	3					
16	III	Non- Major Elective - I	4	2	3 Hrs	25	75	100
17	IV	Part - I	6	3	3 Hrs	25	75	100
18	IV	Part - II	6	3	3 Hrs	25	75	100
19	IV	Major - V: Differential equations and Laplace Transforms *	3	4	3 Hrs	25	75	100
20	IV	Major -VI: Algebra	5	4	3 Hrs	25	75	100
21	IV	Allied Paper - III*	3	5	3 Hrs	25	75	100
22	IV	Allied Paper - IV*(Practical)	3	5	3 Hrs	25	75	100
23	IV	Soft Skill - II	4	4	3 Hrs	25	75	100

24	V	Major - VII: Mathematical statistic -I	4	4	3 Hrs	25	75	100
25	V	Major - VIII: Real Analysis	5	4	3 Hrs	25	75	100
26	V	Major- IX: Linear Algebra	5	4	3 Hrs	25	75	100
27	V	Major - X: Mechanics	5	4	3 Hrs	25	75	100
28	V	Elective -I: Programming in C	5	5	3 Hrs	25	75	100
29	V	Non- Major Elective - II	2	2	3 Hrs	25	75	100
30	V	Soft Skill - III	4	4	3 Hrs	25	75	100
31	VI	Major - XI: Mathematical statistic - II	5	4	3 Hrs	25	75	100
32	VI	Major - XII: Numerical Analysis	5	5	3 Hrs	25	75	100
33	VI	Major - XIII: Complex Analysis	5	5	3 Hrs	25	75	100
34	VI	Major - XIV: Operations Research	5	4	3 Hrs	25	75	100
35	VI	Elective - II: Astronomy	5	5	3 Hrs	25	75	100
36	VI	Elective - III : Graph Theory	4	4	3 Hrs	25	75	100
37	VI	Gender Studies	1	1	3 Hrs	25	75	100
		Extension Activities		1				
			180	140				3700
		* Exams will be held at the end of even semester						

**B.Sc. Mathematics**  
**Hard Core: CALCULUS AND TRIGONOMETRY**

**UNIT I:**

**Successive Differentiation:** Methods of Successive Differentiation - Leibnitz's Theorem and its applications.

**Vol: 1 Chapter: III**

**UNIT II:**

**Envelopes, Curvature of plane curves:** Curvature-radius of curvature in Cartesian and polar forms-evolutes and envelopes.

**Chapter: X - Sections 1.1 - 1.3 and 2.1 - 2.6**

**UNIT III:**

**Reduction formulae:**Reduction formulae- problems-**Multiple Integrals:** evaluation of double and triple integrals- Change of order of integration in double integrals.

**Vol: 2 Chapter: I - Sections 13, 14, Chapter: V - Section 2.1, 2.2 and 4.**

**UNIT IV:**

**Trigonometry:** Expression of  $\sin\theta$ ,  $\cos\theta$ ,  $\tan\theta$ ,  $\sin^n\theta$ ,  $\cos^n\theta$  and  $\tan^n\theta$  - Expansions of  $\sin\theta$ ,  $\cos\theta$  and  $\tan\theta$  in powers of  $\theta$ .

**Chapter: III**

**UNIT V:**

Hyperbolic functions and Logarithm of complex Numbers.

**Chapter: IV and Chapter: V - Sections 5.1, 5.2 and 5.3.**

**Text books :**

1. S. Narayanan and T.K.M. Pillay, "**Calculus volume 1 and volume 2**", Viswanathan Publishers.
2. S. Narayanan and T.K.M. Pillay, "**Trigonometry**", Viswanathan Publishers.

**Reference Books:**

1. S. Arumugam and others, Calculus, Scitech Publication, India.
2. S. Arumugam and others, Trigonometry, Scitech Publication, India.
3. Shanthi Narayan (2001) Differential Calculus, Shyamalal Charitable Trust, New Delhi.
4. P.R. Vittal, **Calculus**, Margham Publications, Chennai.

## B.Sc. Mathematics

### Hard Core: THEORY OF EQUATIONS AND THEORY OF NUMBERS

#### Theory of Equations:

##### Unit I:

Relation between the roots and coefficients of equations – symmetric function of the roots of the equation  $f(x)=0$  – sum of the powers of the roots of an equation.

**Volume: I Chapter: 6 Sec. 1 - 14**

##### Unit II:

Transformations of equation – roots with sign change - roots multiplied by a given number – Reciprocal equation -standard form of reciprocal equations - to increase and decrease the roots of a given equation by a given quantity - removal of terms.

**Volume: I Chapter: 6 Sec. 15 - 17, 19, 21**

##### Unit III:

The general transformation -location and nature of the roots of an equation – Descarte’s rule of signs – Rolle’s theorem – Deductions from Rolle’s theorem – Multiple roots – Strum’s theorem (Proof not needed) – Newton’s method of finding integral roots of an equations – Horner’s method.

**Volume: I Chapter: 6 Sec. 24 - 30**

#### Theory of Numbers:

##### Unit IV:

Theory of Numbers – Divisibility in  $Z$  – division algorithm – Euclidean algorithm – Prime and composite numbers – Properties of prime numbers – Unique factorization theorem – division of a given number – Euler’s  $\phi$  – functions – value of  $\phi(n)$  – integral part of a real number – simple problems – product of  $r$  consecutive integer is divisible by  $r!$ .

**Volume: II Chapter: 5 Sec. 1 - 11**

##### Unit V:

*Congruence* – Properties of congruence – criteria of divisibility of a number – simple problems – numbers in Arithmetic progression – residue classes – linear congruence – simultaneous congruence – Chinese remainder theorem – Fermat’s theorem – Wilson’s theorem – Lagrange’s theorem – simple problems.

**Volume: II Chapter: 5 Sec. 12 - 18**

#### Text books:

1. S. Narayanan & Others, Algebra vol. I and vol. II, Viswanathan Publishers.

#### Reference Books:

1. S. Arumugam and others, Theory of Equations and Theory of Numbers, Scitech Publication, India.
2. P.Kandasamy, K.Thilagavathy, Mathematics for B.Sc. Vol. – I,II,III AND IV, S.Chand&Com. Ltd,New Delhi -55.

**B.Sc. Mathematics**  
**ENVIRONMENTAL STUDIES.**

**UNIT -I**

Nature of environment and environmental studies: Definition – scope and importance: need for public awareness – Renewable and non- nonrenewable resources and their management – A preliminary knowledge on the following resources: forest, water, mineral, food and energy.

**UNIT II**

Concept of an ecosystem, structure of an ecosystem, producers, consumers and decomposers – Energy flow in the ecosystem, food chains, food webs and ecological pyramids.

**UNIT III**

Biodiversity and its conservation – introduction – definition genetic – species and ecosystem diversity – Biogeographical classification of India, value of biodiversity : consumptive use, productive use social, ethical, aesthetic and option values – Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India, conservation of biodiversity.

**UNIT IV**

Environmental pollution – Definition, causes, effects control measures of Air pollution, water pollution and Soil pollution, Marine pollution, Noise pollution. Thermal and nuclear pollution: - Solid waste management: causes, effects and control measures of urban and industrial wastes.

**UNIT V**

Social issues and problems from unsustainable to sustainable development, urban problems related to energy conservation – Population growth, variation among nations – population explosion - Family welfare programme – Environment and human health, Human rights, value education, HIV/ AIDS, women and child welfare.

## B.Sc. Mathematics

### Hard Core: ANALYTICAL GEOMETRY 3D AND VECTOR CALCULUS

#### Analytical Geometry 3D

##### UNIT I

**Direction cosine of a line:** Direction cosine of a line- **Plane:** 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.

**Chapter: I and II.**

##### UNIT II

**Equation of the straight line:**The plane and the straight line - Shortest distance between two skew lines- Equation of the line of shortest distance.

**Chapter: III**

##### UNIT III

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

**Chapter: IV**

#### Vector Calculus:

##### UNIT IV

**Differentiation:** Scalar and vector fields - Differentiation of vectors - Gradient, Divergence and Curl.

##### Unit V:

**Integration:** Integration of vectors - line integral - surface integral - Green's theorem in the plane - Gauss divergence theorem - Strokes theorem - (Statements only) - verification of the above said theorems.

#### TEXT BOOK(S)

1. T.K.ManickavasagamPillai& others, Analytical Geometry, S.V Publications - 1985
2. T.K.ManickavasagamPillai& others, Vector Analysis, S.V. Publications.

#### Reference Books:

1. S. Arumugam and others, "Analytical Geometry 3D and Vector Calculus", Scitech Publication, India.
2. P.DuraiPandian and Lakshmi Duraipandian, Analytical Geometry 3D, Emerald Publishers, Chennai 1975.
4. P.R. Vittal, "Analytical Geometry 3D and Vector Calculus", Margham Publications, Chennai.2003

**SOFT SKILL-I**  
**MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I**

**Unit I**

Numbers - HCF - LCM

**(Chapters 1 & 2)**

**Unit II**

Decimal Fractions and Simplification

**(Chapter 3 & 4)**

**Unit III**

Square and Cubic roots and Average

**(Chapter 5 & 6)**

**Unit IV**

Problem on numbers and Problems on ages

**(Chapters 7 & 8)**

**Unit V**

Surds and Indices and Percentage

**(Chapters 9 & 10)**

**Text Book:** Scope and treatment as in "Quantitative Aptitude" by R. S. Aggarwal, S.Chand & Company Ltd., Ram Nagar, New Delhi (2004)



## B.Sc. Mathematics

### VALUE EDUCATION

#### UNIT I

**Meaning and nature of value education:** Meaning and concepts of value education-origin – nature – classification of values- view of eminent thinkers- meaning of value education-need for value education.

#### UNIT II

**Objectives and development of human value:**Role of school and colleges in the development of human values – objectives of value oriented education, Ethical and social values Gandhiji's non violence – Gokak committee.

#### UNIT III

**Strategies and approaches to value education:** Role of education in school, family,. Teacher for the personal value development –conceptual frame work-strategy suggested by J.R.Frankel-NCERT approach to value Education- Role play technique in value education-value based curriculum – teacher's role.

#### UNIT IV

**Sources of values:** Sources of values – Traditional Indian values, sources of values-culture, Education, Religion- Hinduism, Christianity, Islam, Buddhism- Indian constitutions as source for democratic values- equality- secularism, democracy-Research and resources in value education.

#### UNIT V

**Methods of teaching and documents on Human value education:**methods of teaching value education – Guidelines for developing value among students. Problems in promoting value Education – Documents of value education – Recommendation of the committee appointed by the central advisory Board of Education- Recommendation of the university education commission 1964 – 1966. National policy on Education 1986 -1992.

#### REFERENCES

1. J.C.Agarwal, Education for values Environment and Human Rights, Shipra publications, New Delhi 2005.
2. Dube S.C. Modernization and development, the search for an alternative paradigm, zee books ltd. London : 1988.
3. Mansell R and When U, knowledge societies: Information Technology for sustainable Development, Oxford University press, New York.
4. World bank knowledge for Development world development report, Oxford Unit press, New York.

**B.Sc. Mathematics**  
**Hard Core: SEQUENCES AND SERIES**

**Unit I:**

**Sequences:** sequences, bounded sequences, monotonic sequences, convergent sequences, divergent and oscillating sequences.

**Chapter: III Section: 1 - 5**

**Unit II:**

Algebra of limits -Behaviour of monotonic sequences - some theorems on limits.

**Chapter: III Section: 6 - 8**

**Unit III:**

Subsequences - limit points - Cauchy sequences - The upper and lower limits of a sequence.

**Chapter: III Section: 9 - 12**

**Unit IV:**

**Series of positive terms:** infinite series - comparison test - Kummer's test - Root test and condensation test.

**Chapter: IV Section: 1 - 4**

**Unit V:**

Alternative series - absolute converges - test for convergence of series of arbitrary terms.

**Chapter: V Section: 1 - 4**

**Text book:**

1. S. Arumugam and others, Sequences and series, New Gamma publishing house.

**References :**

1. Richard R. Goldberg, Methods of Real analysis, Oxford and IBH Publishing co., New Delhi.
2. T. K. Manicavachagompillay and others, Algebra Volume - 1

**B.Sc. Mathematics**  
**Hard Core: DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS**

**Unit I:**

**Differential Equations of the first order:** Equation of first order and of first degree - Exact differential equations - conditions for the equations to be exact - working rule for solving it - problem - Equations of first order and higher degree - equations solvable for  $x, y, \frac{dy}{dx}$  - Clairaut's equations.

**Chapter: I Section: 1 - 6.**

**Unit II:**

**Linear Differential Equations with constant coefficients:** second and higher order linear differential equations with constant coefficients - Homogenous linear equations with variable coefficients - Equations reducible to the homogenous linear form - Variation of parameters.

**Chapter: II Section: 1 - 4 and 8 - 10.**

**Unit III:**

**Simultaneous equations:** Simultaneous equations - necessary and sufficient condition of integrability of  $Pdx+Qdy+Rdz=0$ . Rule for solving it - Simultaneous linear differential equations with constant coefficients - Total differential equations.

**Chapter: III Section: 1- 7**

**Unit IV:**

**Partial Differential Equations:** Partial differential equations formation of partial differential equation by the elimination of constant formation of partial differential equations by the elimination of arbitrary functions - general, particular and complete integrals of PDE standard forms - Lagrange's method.

**Chapter: IV Section: 1- 6**

**Unit V:**

**Laplace Transforms:** Laplace transforms theorems - Evaluation of integrals - inverse Laplace transform - solving ordinary differential equations with constant coefficients and variable coefficients.

**Chapter: V Section: 1- 8**

**Text Book:**

S. Narayanan and T.K.M. Pillay, Calculus vol. 3, Viswanathan Publishers.

**Reference Books:**

1. S. Arumugam and others, Differential Equations and Applications, New Gamma Publishing House - 20.
2. J.N. Sharma R.K. Gupta, Differential Equations, Krishna Prakashan Mandir Meerd.

**B.Sc. Mathematics**  
**Hard Core: ALGEBRA**

**Unit I:**

**Groups:** Definition and examples – elementary properties of group - Permutations groups – subgroups – cyclic groups – order of an element.

**Chapter: III Section: 3.1, 3.2, 3.4 – 3.7**

**Unit II:**

Cosets and Lagrange's theorem – Normal subgroups and quotient group

**Chapter: III Section: 3.8 – 3.9**

**Unit III:**

Isomorphism -Homomorphisms

**Chapter: III Section: 3.10 – 3.11**

**Unit IV:**

**Rings:** Definition and examples – elementary properties of ring – Types of rings – characteristic of a ring.

**Chapter: IV Section: 4.1 – 4.5**

**Unit V:**

Ideals – quotient rings – Maximal and prime ideals – homomorphism of rings – Field of quotients of an integral domain.

**Chapter: IV Section: 4.7 – 4.11**

**Text book:**

1. S.Arumugam and others, Modern Algebra, Scitech Publication, India. 2013.

**Reference Books:**

1. M.L. KHANNA, **Modern Algebra**, JaiPrakashNarth& co.
2. S.G. Venkatachalapathy, "**Modern Algebra**", Margham Publications – 2003.
3. Dr.AloknathChakabarti, "**A first course in Linear Algebra**", Vijay Nicole imprints p. Ltd.

**SOFT SKILL - II**  
**MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II**

**Unit I:**

Profit and loss and Ratio and proposition  
(Chapter 11 & 12)

**Unit II:**

Partnership and Chain rule  
(Chapters 13 & 14)

**Unit III:**

Time and Work, Time and Distances  
(Chapters 15 & 17)

**Unit IV:**

Problems on trains and Problems on Boats and streams  
(Chapters 18 & 19)

**Unit V:**

Simple Interest and compound interest  
(Chapters 21 & 22)

**Text Book:**

Scope and treatment as in “**Quantitative Aptitude**” by R. S. Aggarwal, S.Chand& Company Ltd., Ram Nagar, New Delhi (2004)

**B.Sc. Mathematics**  
**Hard Core: MATHEMATICAL STATISTICS - I**

**Unit I:**

**Central tendencies:** Mean–median – quartiles –deciles – percentiles – mode –Geometric mean - Harmonic mean.

**Chapter: II Section: 1- 4**

**Unit II:**

**Measure of dispersion:** Range – quartile - mean deviation - standard deviation –Moments - Skewness and Kurtosis.

**Chapter: III & IV**

**Unit III:**

**Correlation and regression:** correlations - rank correlations - regressions.

**Chapter: VI**

**Unit IV:**

**Theory of attributes:** Attributes - consistency of data - independence and association of data.

**Chapter: VIII**

**Unit V:**

**Index Number:** Index number - consumer price index number - conversion of chain base index number into fixed base index and conversely.

**Chapter: IX**

**Text book:**

S.Arumugam and others, **Statistics**, New Gamma publishing house.

**Reference:**

S.C. Gupta and V.K. Kapoor, **Fundamental of Mathematical Statistics**, S.Chand.

**B.Sc. Mathematics**  
**Hard Core: REAL ANALYSIS**

**Unit I:**

**Sets and functions:** countable sets - uncountable sets - inequalities of Holder's and Minkowski.

**Chapter: I Section: 1.1- 1.4**

**Unit II:**

**Metric spaces:** Definition and examples - Bounded sets in a metric space - open ball in a metric space - open sets - subspaces - interior of a set- closed set - closure - limit point - Dense set.

**Chapter: II**

**Unit III:**

**Complete Metric space:** Completeness - Baire's category theorem.

**Chapter: III**

**Unit IV:**

**Continuity:** Continuity -homeomorphism - uniform continuity. Connected: Definition and examples - connected subset of  $\mathbb{R}$  - connectedness and continuity

**Chapter: IV section: 4.1-4.3; Chapter: V section: 5.1-5.3**

**Unit V:**

**Compactness:** Compact space - compact subset of  $\mathbb{R}$  - equivalent characterization for compactness - compactness and continuity.

**Chapter: VI**

**Text book:**

S. Arumugam and others, "**Modern Analysis**", New Gamma publications, 2012.

**Reference Books:**

Richard R. Goldberg, **Methods of Real analysis**, Oxford and IBH Publishing co., New Delhi.

Tom M.Apostol, **Mathematical Analysis**, 2<sup>nd</sup> Edition, Addison-Weseley Publishing Company, New York.

**B.Sc. Mathematics**  
**Hard Core: LINEAR ALGEBRA**

**Unit I:**

**Vector spaces:** Definition and examples – subspaces – Linear transformations – span of sets.

**Chapter: V Section 5.1 – 5.4**

**Unit II:**

Linear Independence – basis and dimension – rank and nullity – Matrix of a Linear transformation - simple problems.

**Chapter: V Section 5.5 – 5.8**

**Unit III:**

**Inner Product spaces:** Definition and examples – orthogonality – orthogonal complement.

**Chapter: VI Section 6.1 – 6.3**

**Unit IV:**

**Theory of Matrices:** - Algebra of matrices – Type of matrices – The inverse of a matrix – elementary transformations – Rank of a Matrix.

**Chapter: VII Section 7.1 – 7.5**

**Unit V:**

Simultaneous Linear equations – Characteristic Equation and Cayley Hamilton theorem – Eigen values and Eigen vector.

**Chapter: VII Section 7.6 – 7.8**

**Text book:**

S.Arumugam and others, “**Modern Algebra**”, Scitech Publication, India. 2013

**Reference Books:**

1. S.G. Venkatachalapathy, “**Modern Algebra**”, Margham Publications – 2003.
2. Dr.AloknathChakabarti, “**A first course in Linear Algebra**”, Vijay Nicole imprints p. Ltd.
3. M.L. KHANNA, **Modern Algebra**, JaiPrakashNarth& co.



**B.Sc. Mathematics**  
**Hard Core: MECHANICS**

**Statics**

**Unit I:**

**Force acting at a point:** Forces acting at a point – resultant and components – Parallelogram law of forces – Triangle law of forces – converse – Lami’s theorem – parallel forces and moments.

**Chapter 2 and 3**

**Unit II:**

**Couples:** Couples -equilibrium of three forces acting on a rigid body.

**Chapter 4 and 5**

**Unit III:**

**Friction:**Friction – Law of friction – Cone of friction – angle of friction – some simple problems.

**Chapter 7**

**Dynamics**

**Unit IV:**

**Projectiles:** Projectiles – Path of projectile is a parabola – range – range of a particle projected on an inclined plane.

**Chapter 6**

**Unit V:**

**Impulsive forces:**Impact - Impulse – Impact in a fixed plane – direct and oblique impact.

**Chapter 7**

**Text books:**

1. M.K. Venkatraman, “**Statics**”, Agasthiar Publications.
2. M.K. Venkatraman, “**Dynamics**”, Agasthiar Publications.

**Reference Books:**

1. S.G.Venkatachalapathy, **Mechanics**, Margham Publications, Chennai 2012.
2. P.duraipandian, **Mechanics**, Emerald Publishers, Chennai.

**B.Sc. Mathematics**  
**SoftCore :PROGRAMMING IN C**

**UNIT I:**

Introduction – Importance of C Basic structure of C programme - Character set - Constants - Keywords and identifiers - Variables Data types - Declaration of variables - Assigning values to variables -Defining symbolic constants.

**UNIT II:**

Arithmetic operators - Relational operators - logical operators - assignment operators - increment and decrement operates -Conditional operators - Special operators - Arithmetic expressions -Evaluation of expressions -Precedence of arithmetic operators.

**UNIT III:**

Decision making with IF statement - Simple IF statement - The if ELSE statement - Nesting of IF.....ELSE statement - The ELSE IF ladder. The Switch statement -The ? Operator -The GOTO statement.

**UNIT IV:**

The WHILE statement - the DO statement the FOR statement -Jumps in loops.

**UNIT V:**

One, Two dimensional arrays - Initiating two dimensional arrays - Multidimensional arrays -Declaring and initializing string variables -reading strings from terminal - Writing strings on the screen - Arithmetic operations on characters.

**TEXT BOOK:**

E.Balagurusamy“Programming in ANSI C” Second Edition - Tata McGraw -Hill PublishingCompany limited, New Delhi.

**REFERENCE BOOKS:**

- 1.Byron Gottfried “Programming with C”(Schaum’s outline series)-Tata McGrawHill publishingcompany -1998.
2. Ashok N.Kamthane “Programming with Ansi and Turbo C”, Pearson Education publishers,2002
- 3.HentryMullish and Herbert L cooper , “The spirit of C” Jaico publisher , 1996.
- 4.THE ANSI C, Second edition , October 1992.BRIAN W.KERNIGHAN,DENNIS M.RITCHIEPublished by Prentice- Hall of India Privated Limited, M-97,New Delhi- 110001.
- 5.ANSI C: With Microsoft C 5.1 and Quick C 2.0 C.Balasubramanian.1992, Tata McGraw-HillPublishing Company limited, New Delhi.
6. “PROGRAMMING IN C “, Kris A.Jamsa 1992, Galgotia Publications Pvt.ltd.

**SOFT SKILL - III**

## MATHEMATICS FOR COMPETITIVE EXAMINATIONS - III

### **Unit I:**

Logarithms and areas  
(Chapters 23 & 24)

### **Unit II:**

Volume and Surface areas; Races and games of skill  
(Chapter 25 & 26)

### **Unit III:**

Calendar and clocks  
(Chapter 27 & 28)

### **Unit IV:**

Stock and Shares; True Discount  
(Chapter 29 & 30)

### **Unit V:**

Banker's discount and odd man out and series  
(Chapter 31 & 32)

### **Text book**

Scope and treatment as in "**Quantitative Aptitude**" by R.S. Aggarwal, S. Chand & Company Ltd., Ram Nagar, New Delhi (2004)

**B.Sc. Mathematics**  
**Hard Core: MATHEMATICAL STATISTIC - II**

**Unit I:**

Probability: Probability - conditional probability - Baye's theorem.

**Chapter 11**

**Unit II:**

Random variables: Discrete random variables - continuous random variables -  
Mathematical Expectations - moment generating functions.

**Chapter 12**

**Unit III:**

Probability distributions: Binomial-Paisson and normal distributions.

**Chapter 13**

**Unit IV:**

Test of significance (Large sample): Sample, Sampling distributions, testing hypothesis, Test of significance for proposition or percentage, Test of significance for mean, Test of significance standard deviations, Test of significance for correlations.

**Chapter 14**

**Unit V:**

Test of significance (small sample): t-test, F-test.

**Chapter 15**

**Text book:**

S.Arumugam and others, "Statistics", New Gamma publishing house - 2009.

**Reference:**

S.C. Gupta and V.K. Kapoor, **Fundamental of Mathematical Statistics**, S.Chand.

**B.Sc. Mathematics**  
**Hard Core: NUMERICAL ANALYSIS**

[In all the units the value of a root may be calculated up to 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.

**Chapter 2 section 2.1 to 2.5**

**UNIT II**

**Interpolation:** 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).

**Chapter 3 Sections 3.1, 3.3, 3.6, 3.9, 3.9.1, 3.11, 3.11.1**

**UNIT III**

**Numerical differentiation and Integration:** Numerical differentiation - Numerical Integration using Trapezoidal rule & Simpson’s 1/3 & 3/8 rules - Theory & problems.

**Chapter 5 Sections 5.1- 5.2, 5.4.1 – 5.4.3**

**UNIT IV**

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

**Chapter 6 Sections 6.3.2 & 6.4**

**UNIT V**

**Numerical solution of ODE:** Solution by Taylor Series Method , Picard’s method, Euler’s Method , Modified Euler’s Method , RungeKutta 2nd and 4th order methods (Derivation of the formula not needed).

**Chapter 7 Sections 7.1 – 7.5**

**TEXT BOOK(S)**

1. S.S.Sastry, **Introductory Methods of Numerical Analysis**, Prentice Hall of India Pvt.Limited, 2000.

**REFERENCE(S)**

- [1] S. Narayanan & Others, **Numerical Analysis**, S. Viswanathan Publishers, 1994.
- [2] S.Arumugam ,**Numerical Methods**, New Gamma Publishing, Palamkottai, 2003.
- [3] A.Singaravelu, **Numerical Methods**, Meenakshi Agency, Chennai, 2004.

**B.Sc. Mathematics**  
**Hard Core: COMPLEX ANALYSIS**

**UNIT I**

**Functions of a Complex variable:** Limits-Theorems on Limits -Continuous functions - Differentiability - Cauchy-Riemann equations - Analytic functions -Harmonic functions.  
**Chapter 2 section 2.1 to 2.8**

**UNIT II**

**Elementary transformations:** Bilinear transformations - Cross ratio.  
**Chapter 3 Sections 3.1 to 3.3**

**UNIT III**

**Complex integration:** definite integral - Cauchy's Theorem -Cauchy's integral formula - Higher derivatives.  
**Chapter 6 sections 6.1 to 6.4**

**UNIT IV**

**Series expansions:** Taylor's series -Laurant's Series - Zeroes of analyticfunctions.  
**Chapter 7 Sections 7.1 to 7.3**

**UNIT V**

**Residues:** Cauchy's Residue Theorem -Evaluation of definite integrals.  
**Chapter 8 Sections 8.1 to 8.3**

**Text Book:**

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

**Reference Books:**

[1] P.P Gupta - Kedarnath&Ramnath, **Complex Variables**, Meerut -Delhi

[2] J.N. Sharma, Functions of a **Complex variable**, Krishna PrakasanMedia (P) Ltd, 13<sup>th</sup> Edition, 1996-97.

[3] T.K.ManickavachaagamPillai, **Complex Analysis**, S.Viswanathan Publishers Pvt. Ltd,1994.

**B.Sc. Mathematics**  
**Soft Core: OPERATIONS RESEARCH**

**UNIT I**

**Introduction to Operations Research:** Elementary treatment of Linear Programming – Simplex Method – Artificial variable – Big-M method – Two Phase Method.  
**Chapter 1 (Preliminaries only), Chapter 2 and Chapter 3**

**UNIT II**

**Duality in Linear Programming:** Dual Simplex Method – Integer Programming Problem- Gomory's all integer cutting plane method.  
**Chapter 4 Section:4.1 to 4.6 and Chapter 11 Section: 11.1 to 11.3**

**UNIT III**

**Transportation problems:** Application to Transportation problem –Transportation algorithm –Degeneracy algorithm –Degeneracy in Transportation Problem, Unbalanced transportation problem-  
**Chapter 9 Section: 9.1 to 9.9**

**UNIT IV**

**Assignment problems:** Assignment algorithm – Unbalanced Assignment problem.  
**Chapter 10 Section: 10.1 to 10.3**

**UNIT V**

**PERT CPM network:** PERT CPM network – Critical & sub Critical jobs –Determining the Critical Path – Network Calculation of PERT networks – Probability of PERT.  
**Chapter 20 Section: 20.1 to 20.8**

**TEXT BOOK(S)**

[1] KantiSwarop, Gupta.P.K&Manmohan, **Operations Research**, Sultan Chand & Co.

**REFERENCE(S)**

[1] Hamdy A. Taha, **Operations Research** (7th Edn.), Prentice Hall of India,2002.  
[2] Richard Bronson, **Theory and Problems of Operations Research**, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1982.

**B.Sc. Mathematics**  
**SoftCore:ASTRONOMY**

**UNIT I**

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

**Chapters 1 & 2**

**UNIT II**

Earth - Dip of the horizon.

**Chapter 3 Section 1 , 2, 5 , 6**

**UNIT III**

Twilight - Astronomical refraction -Tangent &Cosine's formula - Properties & simple problems applying them.

**Chapter 4 Sections 117 to 120, 129, 130**

**UNIT IV**

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

**Chapter 6**

**UNIT V**

Moon (except Moon's librations)-Motions of planet (assuming that orbits arecircular - Eclipses.

**Chapter 12**

**Text Book:**

1. S. Kumaravelu and SusheelaKumaravelu, Astronomy, SKV Publications,2004.

**Reference Books:**

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



**B.Sc. Mathematics**  
**SoftCore:GRAPH THEORY**

**Unit I:**

Definition of graph – Application of graph – Finite and infinite graphs – incidence and degree– isolated vertex – pendant vertex and null graph – sub graphs – walks – paths – circuits – connected graphs –disconnected graph and components.

**Chapter 1: 1.1 – 1.5**

**Unit II:**

Euler graph – Operation on graphs - more on Euler graphs – Hamiltonian paths and circuits.

**Chapter 2: 2.2, 2.4 – 2.9**

**Unit III:**

Trees – Properties of trees – spanning trees – fundamental circuits – spanning trees in a weighted graph.

**Chapter 3: 3.1 – 3.4, 3.7, 3.8, 3.10**

**Unit IV:**

Cut sets – properties – fundamental circuits and cut sets – connecting and separability.

**Chapter 4: 4.1 – 4.5**

**Unit V:**

Planar graphs– Kuratowski's two graphs – different representation of a planar graph – detection of planarity – geometric dual.

**Chapter 5: 5.2 – 5.6, 5.8**

**Text book:**

NarsinghDeo, **Graph theory with Application to Engineering and computer Science**, Prentice, Hall of India P.Ltd., New Delhi 2001.

**NMEC1 - Non Major Elective - I:**

**ASTRONOMY (For Physics)**

**Unit I:**

Sphere - great circles and small circles - formulae on spherical trigonometry (without proof) - Naiper's rule.

**Chapter I: section 1-7, 12, 13, 20-23, 25-32**

**Unit II:**

Celestial sphere - first point of aries - equinoxes and solstices - four systems of celestial coordinates - relation between R.A. and longitude of the sun - sidereal time -  $t = \alpha \pm h$  - latitude of a place - to find the azimuth of a star at rising - circumpolar stars.

**Chapter II: Section: 39 - 58, 60 - 63, 66, 68 - 70, 75 - 78, 80 - 82**

**Unit III:**

The earth - variations in the duration of day - dip of horizon - refraction - tangent formula.

**Chapter III: Section: 87 - 90, 106, 107, 109, 110.**

**Chapter IV: Section: 117 - 123**

**Unit IV:**

Kepler's law - to fix the position of a planet in its orbit - anomalies - equation of time - seasons.

**Chapter VI: Section: 146 - 149, 156 - 163, 173, 174**

**Unit V:**

The moon - harvest moon - metonic cycle - eclipses ecliptic limits - planetary phenomena - sidereal period - stationary points - direct and retrograde motion.

**Chapter XII: Section: 229 -242, 250**

**Chapter XIII: section 256 - 262, 269, 271, 272, 273**

**Chapter XIV: section: 285 - 287, 300**

**Text book**

1. S. Kumaravelu and SusheelaKumaravelu, Astronomy, SKV Publications, 2004.

## **NMEC2 - Non Major Elective - II: Arithmetic Aptitude (for English)**

### **Unit I:**

Profit and loss.

**Chapter: 11**

### **Unit II:**

Ratio and Proportion

**Chapter: 12**

### **Unit III:**

Time and work - time and distance.

**Chapter: 15 &17**

### **Unit IV:**

Simple and compound interest.

**Chapter: 21&22**

### **Unit V:**

Area - volume - weight and measure (elementary).

**Chapter: 25**

### **Text book**

Scope and treatment as in "**Quantitative Aptitude**" by R. S. Aggarwal, S.Chand& Company Ltd., Ram Nagar, New Delhi (2004).

For B.Sc., Computer science  
CCA1: Allied Paper I:

### NUMERICAL ANALYSIS

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

#### UNIT I

**Solution of 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.

**Chapter 2 section 2.1 to 2.5**

#### UNIT II

**Interpolation:** Forward and Backward differences -Newton's forward & backward difference interpolation formulae -Lagrange's interpolating Polynomial ( Proof not needed).

**Chapter 3 Sections 3.3.1, 3.3.2, 3.6 and 3.9.1**

#### UNIT III

**Numerical Differentiation and Integration:** Numerical differentiation - Numerical Integration using Trapezoidal rule & Simpson's 1/3 & 3/8 rules.

**Chapter 5 Sections 5.1- 5.2, 5.4.1 - 5.4.3**

#### UNIT IV

**Solutions to Linear Systems:** Gaussian Elimination Method - Jacobi & Gauss Siedal iterative methods.

**Chapter 6 Sections 6.3.2 & 6.4**

#### UNIT V

**Numerical solution of ODE:** Solution by Taylor Series Method, Euler's Method , Modified Euler's Method , RungeKutta 2nd and 4th order methods (Derivation of the formula not needed).

**Chapter 7 Sections 7.1, 7.2, 7.4 and 7.5**

#### Text Book:

1. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt.Limited, 2000.

#### Reference Books:

- [1] S. Narayanan & Others, Numerical Analysis, S. Viswanathan Publishers, 1994.
- [2] S.Arumugam , Numerical Methods, New Gamma Publishing, Palamkottai, 2003.
- [3] A.Singaravelu, Numerical Methods, Meenakshi Agency, Chennai, 2004.

**For B.Sc., Computer science  
CCA2: Allied Paper II:**

## **OPERATIONS RESEARCH**

### **UNIT I**

**Introduction to Operations Research:** Application of OR - Elementary treatment of Linear Programming - Graphical Method.

### **UNIT II**

Slack variable - surplus variable - Simplex Method - Artificial variable - Big-M method - Two Phase Method.

### **UNIT III**

**Transportation problems:** Transportation algorithm -Degeneracy algorithm -Degeneracy in Transportation Problem -Unbalanced transportation problem.

### **UNIT IV**

**Assignment Problems:** Assignment algorithm - Unbalanced Assignment problem.

### **UNIT V**

**PERT CPM network:**PERT CPM network -Determining the Critical Path - Network Calculation of PERT networks - Probability of PERT.

### **Text Book:**

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

### **Reference Books:**

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

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

For B.Sc., Physics & Chemistry  
CCA1: Allied Paper I

## ALGEBRA AND CALCULUS

### Unit I:

**Matrices:** Various types of matrices – Characteristic roots of a square matrix – evaluation of eigen values and eigen vectors – verification of Cayley’s Hamilton theorem.

### Chapter 5

### Unit II:

**Derivatives:** Higher Derivatives -  $n^{\text{th}}$  derivative of standard functions – Leibnitz’s theorem (statement only) for the  $n^{\text{th}}$  derivative of product of functions – applicable to suitable problems.

### Chapter 8

### Unit III:

**Reduction formula:** Reduction formula for  $\int e^{ax} x^n dx$ ;  $\int \sin^n x dx$ ;  $\int \cos^n x dx$ ; where  $n$  is a positive integer. Evaluation of  $\int_0^{\infty} e^{-ax} x^n dx$ ;  $\int_0^{\frac{\pi}{2}} \sin^n x dx$ ;  $\int_0^{\frac{\pi}{2}} \cos^n x dx$ , where  $n$  is a positive integer.

### Chapter 16

### Unit IV:

**Vector Calculus:** Vector differentiation – velocity and acceleration – circular motion – angular velocity vector – scalar and vector fields – Divergence and curl applications.

### Chapter 28

### Unit V:

Vector integration – application of Gauss, Green’s and Stroke’s theorem (no proof).

### Chapter 29

### Text books:

1. Dr.P.R. Vittal, **Allied Mathematics**, Margham Publications – 2014.

### REFERENCE(S)

1. T.K.Manickavachaagam Pillai and others, **Calculus vol I and vol II**, S.Viswanathan Publishers Pvt Ltd.
2. M.L. Khanna, **Vector Calculus**, JaiPrakashNarth&co.

For B.Sc., Physics and Chemistry

CCA2: Allied Paper II

DIFFERENTIAL EQUATIONS, LAPLACE TRANSFORMS AND FOURIER SERIES

**Unit I:**

**Differential equations of first order and higher degree:** Equations solvable for  $p$ ,  $y$  and  $x$  - Clairaut's equation - Exact equation - Equations reducible to exact form.

**Chapter 22**

**Unit II:**

**Linear equations with constant coefficients:** evaluation of particular integral of the equation for  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $x^k$ ,  $e^{ax} f(x)$  where  $a, k$  are constants and  $f(x)$  is any function of  $x$ .

**Chapter 23**

**Unit III:**

Formation of equations by elimination of constants and arbitrary functions - definition of general, particular and complete solutions - singular integral (geometrical meaning not expected). Solutions of first order equations in their standard forms.  $F(p, q) = 0$ ;  $F(x, p, q) = 0$ ;  $F(y, p, q) = 0$ ;  $F(z, p, q) = 0$ ;  $f(x, p) = g(y, q)$ ;  $z = px + qy + f(p, q)$ ; Lagrange's method of solving the linear equations  $Pp + Qq = R$  (Geometrical interpretation not expected).

**Chapter 26**

**Unit IV:**

Definition - Laplace transform of functions  $e^{at}$ ,  $\cos at$ ,  $\sin at$ ,  $t^n$ . First shifting theorem - Laplace transform of  $e^{-at} f(t)$  is  $\varphi(s + a)$  - Laplace transform of  $e^{-at} \cos bt$ ,  $e^{-at} \sin bt$ , and  $e^{-at} f(t)$  - Laplace transform of  $f'(t)$ ,  $f''(t)$  - Inverse Laplace transform relating to the above standard forms - applications to the solution of ordinary differential equations with constant coefficients involving above transformations.

**Chapter 27**

**Unit V:**

Definition of Fourier series - finding Fourier coefficient for a given periodic function with period  $2\pi$  (odd or even function) - sine and cosine series.

**Chapter 21**

**Text books:**

1. Dr.P.R. Vittal, Allied Mathematics, Margham Publications - 2014.

**REFERENCE(S)**

1. S. Arumugam and others, Trigonometry and Fourier series, New gamma publication
2. S. Narayanan and T.K.M. Pillay, Differential equations, S. Viswanathan Publishers.  
T.K.ManickavachaagamPillai and others, Calculus vol II, S.Viswanathan Publishers.