CHRIST
UNIVERSITY

(Under Section 3 of the UGC Act, 1956)

DEPARTMENT OF MATHEMATICS

B.Sc., Mathematics

Syllabus

Bangalore, Karnataka, India, 2012

Table of Contents

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COURSE OBJECTIVE AND METHODOLOGY

1.1 COURSE OBJECTIVE

An educational institution that does not lead to research and specialization will remain on the way side of the higher education missing the golden opportunities for pushing farther the frontiers of knowledge and opening up new vistas of scientific endeavor to the young. Keeping the above in mind it has been proposed to continue with triple main system with mathematics as one of the core subjects. The B.Sc. course aims at to fulfill the following broad objectives:

1. Developing a respectable intellectual level seeking to expose the various concepts in mathematics.
2. To enhance the students reasoning, analytical and problem solving skills.
3. To cultivate a mathematicians habit of thought and reasoning.
4. To enlighten the student that the mathematical ideas are relevant for oneself no matter what his/her interests are.
5. To cultivate a research culture in young minds.
6. Development of students' competence by evolving a learner centered curriculum.
7. To encourage the students to uphold scientific integrity and objectivity in professional endeavors.
8. To pursue higher studies in top notch institutions.

The course curriculum is intensive and extensive and includes 8 major papers covering all major topics in mathematics. There will be one paper in each of the first four semesters and two papers in each of the fifth and sixth semesters. Each of the eight papers will carry 100 marks. In each paper the minimum marks for pass will be 40 percent. Courses line "Foundations of Mathematics", "Introduction to Mathematica", "Quantitative methods for

managers" and "Quantitative aptitude for competitive examinations" are offered as certificate courses.

After completing these three years degree course, students can opt for higher studies; get into the institutions like ISRO, NAL etc or IT oriented service sections.

1.2 METHODOLOGY

In order to realize the objectives, a methodology based on the combination of the following will be adopted**:** Case studies, Debates, Project work, Team teaching, Reflective diary writing, Seminars, Field visits, Information and communications technology.

2

PAPER OBJECTIVES

2.1 B.Sc., MATHEMATICS:

2.1.1 MAT 131: INTRODUCTORY ALGEBRA:

This paper emphasizes general techniques of problem solving and explores the creation of mathematical patters. It aims at introducing a course that initiates the students into the world of Discrete Mathematics. It includes the topic like Mathematical Logic, Set Theory, Relations, Functions, Mathematical Induction, Recursive relations and Matrices.

2.1.2 MAT 231: CALCULUS:

This paper aims at enabling the students to know various concepts and principles of differential and integral calculus. Sound Knowledge of calculus is essential for the students of mathematics for the better perceptions of the subject and its development.

2.1.3 MAT 331: DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS:

This paper enables the students to know the beauty of an important branch of mathematics, viz. Differential Equations and its applications in Physics.

2.1.4 MAT 431: ANALYTICAL GEOMETRY AND VECTOR CALCULUS:

Three Dimensional Geometry is one of the fundamental areas of Mathematics. The course is designed to lay a strong foundation of Geometry and Vector Calculus.

2.1.5 MAT 531: ALGEBRA:

This paper aims at developing the ability to write the mathematical proofs. It helps the students to understand and appreciate the beauty of the abstract nature

of mathematics and also to develop a solid foundation of theoretical mathematics.

2.1.6 MAT 532: INTEGRAL TRANSFORMS AND LINEAR PROGRAMMING:

This paper aims at providing a solid foundation upon the fundamental theories and transformations of Fourier Transforms and Laplace Transforms. It also covers the introduction to linear programming techniques.

2.1.7 MAT 631: REAL AND COMPLEX ANALYSIS:

This paper enables the students to understand the basic techniques and theories of real and complex analysis, two traditionally separated subjects.

2.1.8 MAT 632(A): NUMERICAL METHODS : (Elective)

This paper will help the students to have an in depth knowledge of various advanced numerical methods and some interpolation techniques.

2.1.9 MAT 632(B): NUMERICAL METHODS WITH MATHEMATICAL PACKAGES: (Elective)

This paper will help the students to have an in depth knowledge of various advanced numerical methods and the use of MATLAB for solving problems in numerical methods.

2.2 CERTIFICATE COURSES:

2.2.1 MAT 101: FOUNDATION OF MATHEMATICS:

This course is designed as a foundation course in Mathematics for those who have not been exposed to any Mathematics course earlier. This enables the students to improve their analytical, reasoning and problem solving skills. Topics included are Set Theory, Theory of Equations, Matrices, Determinants, Differential Calculus and Integral Calculus.

2.2.2 MAT 201: INTRODUCTION TO MATHEMATICA:

This paper can be used by students in Mathematics as an introduction to the fundamental ideas of MATHEMATICA PACKAGE and as a foundation for the development of more advanced concepts in MATHEMATICA. Study of this paper promotes the development of Basic Programming skills in MATHEMATICA.

2.2.3 MAT 301: QUANTITATIVE TECHNIQUES FOR MANAGERS:

This skill based paper aims at imparting theoretical knowledge of optimization techniques. These techniques are widely used in the industry to optimize available resources. This will help the student to apply the mathematical techniques to real life situations.

2.2.4 MAT 401: QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS:

The quantitative aptitude occupies a very important place in any business school entrance examination. This skill based paper aims at imparting the aptitude knowledge required for competitive examination and provides a well-knitted path to success. This knowledge acquisition will help the students to over come the hurdles of competitive examinations like CAT, MAT, XAT, JMET, GMAT, SWAT, etc.,

COURSE STRUCTURE

B.Sc., MATHEMATICS

Semester	Paper Code	Title of the Paper	Hrs / Week	Marks	Credit
I	MAT 131	INTRODUCTORY ALGEBRA	6	100	4
II	MAT 231	CALCULUS	6	100	4
III	MAT 331	DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS	6	100	4
IV	MAT 431	ANALYTICAL GEOMETRY AND VECTOR CALCULUS	6	100	4
V	MAT 531	ALGEBRA	5	100	4
	MAT 532	INTEGRAL TRANSFORMS AND LINEAR PROGRAMMING	5	100	4
VI	MAT 631	REAL AND COMPLEX ANALYSIS	5	100	4
	ELECTIVES				
	MAT 632(A)	NUMERICAL METHODS	5	100	4
	MAT 632(B)	NUMERICAL METHODS WITH MATHEMATICAL PACKAGES	5	100	4

CERTIFICATE COURSES

Semester	Subject Code	Paper Name	Hrs / Week	Credit
I	MAT 101	FOUNDATIONS OF MATHEMATICS	4	2
II	MAT 201	INTRODUCTION TO MATHEMATICA	4	2
III	MAT 301	QUANTITATIVE TECHNIQUES FOR MANAGERS.	4	2
IV	MAT 401	QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS.	4	2

SYLLABI FOR REGULAR PAPERS

CHRIST UNIVERSITY
DEPARTMENT OF MATHEMATICS

B.Sc., Mathematics – I Semester

MAT131: INTRODUCTORY ALGEBRA

UNIT I: MATHEMATICAL LOGIC: (15 Hrs)

Propositions and Truth values – Connectives, their truth values – Tautology and contradiction – Logical equivalence – Standard Theorems – Problems on Negation – Converse, Inverse and Contrapostive of Propositions – open sentences – Quantifiers – Logical implications involving quantifiers – Rules of inferences.

UNIT II: SETS, RELATIONS AND FUNCTIONS: (25 Hrs)

Sets :– Axiom of extension – sub sets and empty set – Venn diagrams – Unordered pairs and Singletons – Intersections – Unions – complements – power sets – Union and intersection of subsets – Ordered pairs – Cartesian product of sets. **Relations : -** Properties of special binary relations - equivalence relations - ordering relations - Hasse Diagram. **Functions : -** Types of functions – composition of functions – invertible functions – inverse of compositions (Standard theorems and related problems).

UNIT III : MATHEMATICAL INDUCTION AND RECURCIVE RELATION (15 Hrs)

Mathematical induction – induction principle - related examples – Recursive Definitions – Fibonacci Sequence – Lucas sequence – Eulerian numbers – Ackermann's numbers – Other recursive definitions – Union and intersection of n sets – conjunction and disjunction of *n*-proposition – well formed formulae.

UNIT IV : MATRIX THEORY (20 Hrs)

Recapitulation of fundamentals of matrix algebra – Symmetric and skew-symmetric – Hermitian and skew Hermitian matrices – Idempotent, Nilpotent, Orthogonal, Unitary matrices and their properties – Rank of a matrix – Normal form – Finding the inverse of a matrix by elementary transformation – System of linear equations and consistency - Characteristic equations – Eigen values, Eigen vectors and properties – Cayley Hamilton theorem and its use in finding inverse and powers of a matrix.

Total Hours: (75+15)

TEXT BOOKS:

1. Doris L C Chen K T Lueng, *Elementary Set Theory – Part I*, Reprint.: Hong Kong University Press, 2009. (Chapter 2: A, B, C, D, E, F, G, H, I, J; Chapter 3: A, B)
2. D.S.Chandrasekharaiah, *Discrete Mathematical Structures*, 2nd ed.: PRISM Book Pvt. Ltd., 2005 (Sections : 2.1, 2.1.1, 2.1.2, 2.2 , 2.2.1, 2.2.3, 2.2.4, 2.3, 2.4 , 2.4.1, 3.1, 3.2, 4.1, 4.2, 4.2.1, 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4)
3. B S Vatssa, *Theory of Matrices*. New Delhi: New Age International Publishers., 2005. (Sections : 1.5, 3.5, 2.6, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 6.1, 6.2, 6.3, 6.4, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6)
4. Kenneth H Rosen, *Discrete Mathematics and its Applications*, 5th ed.: WCB / McGraw – Hill., 1999 . (10.1, 10.2, 10.3, 10.4)

Books for Reference:

1. Tremblay & Manohar, *Discrete Mathematical Structures with Application to Computer Science*, 5th ed.: Tata McGraw Hill Book Company, 2000.
2. Shanti Narayan, *Text book of Matrices*, 5th ed. New Delhi: S Chand and Co., 1968.

Suggested Web links:

1. **http://www.cs.columbia.edu/~zeph/3203s04/lectures.html**
2. **http://home.scarlet.be/math/matr.htm**
3. **http://www.cut-the-knot.org/induction.shtml**
4. **http://www.themathpage.com/**
5. **http://www.abstractmath.org/**
6. **http://mathworld.wolfram.com/DiscreteMathematics.html**

FORMAT OF QUESTION PAPER
MAT 131: INTRODUCTORY ALGEBRA

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	2	10	1	10
	Unit II	3			
	Unit III	2			
	Unit IV	3			
B	Unit I	2	9	2	18
	Unit II	3			
	Unit III	2			
	Unit IV	3			
C	Unit I and II	5	8	6	48
	Unit III and IV	5			
D	Unit I, II, III and IV	4	3	8	24
				Total	100

CHRIST UNIVERSITY
DEPARTMENT OF MATHEMATICS

B.Sc Mathematics - II Semester

MAT 231: CALCULUS

UNIT I: SUCCESSIVE AND PARTIAL DIFFERENTIATIONS (15 Hrs)

Successive differentiation – n^{th} derivatives of functions – Leibnitz theorem and its applications – Partial differentiation – First and higher order derivatives – Differentiation of homogeneous functions – Euler's theorem – Total derivative and differential – Differentiation of implicit functions and composite functions – Jacobians.

UNIT II : DERIVATIVES OF ARCS (25 Hrs)

Polar coordinates – Angle between the radius vector and the tangent – Angle of intersection of curves (polar form) – Polar subtangent and polar subnormal – Perpendicular from pole on the tangent – Pedal equations – Derivative of an arc in Cartesian, parameter and polar forms – Equation of a conic in polar form – Convexity, concavity and curvature of plane curves – Formula for radius of curvature in Cartesian, parametric, polar and pedal forms – Centre of curvature – Evolutes and involutes – Envelopes – Asymptotes – Singular points – Cusp, node and conjugate points. Tracing of standard Cartesian and polar curves.

UNIT III : LIMITS, CONTINUITY AND MEAN VALUE THEOREMS (15 Hrs)

Definition of the limit of a function (ε - δ) form – Continuity – Types of discontinuities – Properties of continuous functions on a closed interval – Differentiability – Differentiability implies continuity – Converse not true – Rolle's theorem – Lagrange's and Cauchy's First Mean Value Theorems – Taylor's theorem (Lagrange's form) – Maclaurin's theorem and expansions – Evaluation of limits by L'Hospital's rule.

UNIT IV: INTEGRAL CALCULUS (20 Hrs)

Integral Calculus: Recapitulation of methods of integration and Definite Integral – Reduction Formulae – Application of Integral Calculus – Length of arcs – Surface areas and Volumes of solids of revolutions for standard curves in Cartesian and Polar forms, Improper Integrals – beta and gamma functions – properties – relation between beta and gamma functions.

Total Hours:(75+15)

TEXT BOOKS:

1. Shanthi Narayan and P.K.Mittal, *Differential Calculus*, Reprint. New Delhi: S.Chand & Company Ltd., 2011 (Sections : 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 4.1, 5.1, 5.2, 5.3, 5.4, 5.5, 6.1, 6.2, 7.3, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12, 7.13,, 8.1, 8.2, 8.5, 10.1, 10.2, 10.3, 10.4, 10.5, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 12.1, 12.2, 12.3, 12.4, 13.2, 14.1, 14.2, 14.3, 14.4, 14.5, 14.7, 15.1, 15.2, 15.3, 16.1, 16.2, 16.3, 16.4, 18.1, 18.4, 18.8, 18.11)
2. Shanthi Narayan, *Integral Calculus*, Reprint. New Delhi: S. Chand and Company Ltd., 2004. (Sections : 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.10, 7.1, 7.2, 7.3, 8.1, 8.2, 8.3, 9.1, 9.2, 9.3, 9.4, 9.5)

Books for Reference:

1. G B Thomas and R L Finney, *Calculus and Analytical geometry*, 10th ed.: Addison – Wesley, 2000.
2. S. Narayanan & T. K. Manicavachogam Pillay, *Calculus*.: S. Viswanathan Pvt. Ltd., 1996, vol. I & II.
3. S.Narayanan and T.K.Manicavachogam Pillay, *Calculus (I & II)*. Chennai, India: S. Viswanathan Pvt. Ltd., 1996.
4. Joseph Edwards, *An elementary treatise on the differential calculus: with applications and numerous example*, Reprint. Charleston, USA: BiblioBazaar, 2010.
5. G K Ranganath, *Text book of B.Sc., Mathematics*, Revised ed. New Delhi, India: S Chand and Co., 2011.
6. Frank Ayres and Elliott Mendelson, *Schaum's Outline of Calculus*, 5th ed. USA: Mc. Graw Hill., 2008.
7. N. P. Bali, *Differential Calculus*, New ed. New Delhi, India: Laxmi Publications (P) Ltd.., 2010.

Suggested Web links:

1. **http://ocw.mit.edu/courses/mathematics/**
2. **http://planetmath.org/encyclopedia/TopicsOnCalculus.html**
3. **http://ocw.mit.edu/OcwWeb/Mathematics/18-01Fall-2005/CourseHome/index.htm**
4. **http://mathworld.wolfram.com/Calculus.html**

FORMAT OF QUESTION PAPER

MAT 231: CALCULUS

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	2	10	1	10
	Unit II	3			
	Unit III	2			
	Unit IV	3			
B	Unit I	2	9	2	18
	Unit II	3			
	Unit III	2			
	Unit IV	3			
C	Unit I and II	5	8	6	48
	Unit III and IV	5			
D	Unit I, II, III and IV	4	3	8	24
				Total	100

CHRIST UNIVERSITY
DEPARTMENT OF MATHEMATICS

B.Sc Mathematics - III Semester

MAT 331: DIFFERENTIAL EQUATIONS AND APPLICATIONS

UNIT I : FIRST ORDER DIFFERENTIAL EQUATIONS (15 Hrs)

Solution of ordinary differential equations of first order and first degree – Variable separable and reducible to variable separable forms – Homogeneous and reducible to homogeneous forms – Linear equations and Bernoulli equations – Exact equations, equations reducible to exact form with standard integrating factors – Clairaut's equation – singular solution for Clairaut's equation. Orthogonal trajectories.

UNIT II : HIGHER ORDER DIFFERENTIAL EQUATIONS (25 Hrs)

Second and higher order ordinary linear differential equations with constant coefficients –Cauchy-Euler differential equations – Simultaneous differential equations (two variables) with constant coefficients. Second order linear differential equations with variable coefficients by the following methods: (i) when a part of complementary functions is given, (ii) reducing to normal form, (iii) variation of parameters and (iv) method of undetermined co-efficient (v) by finding the first integral (exact equation) - Total and Simultaneous differential equation.

UNIT III : PARTIAL DIFFERENTIAL EQUATIONS (20 Hrs)

Partial differential equations of first order – Lagrange's solution – Charpit's general method of solution – Partial differential equations of 2^{nd} order – Classification of linear partial differential equation of 2^{nd} order – Homogeneous and non- homogeneous equations with constant coefficients – Partial differential equations reducible to equations with constant coefficients.

UNIT IV : APPLICATIONS OF DIFFERENTIAL EQUATIONS (15 Hrs)

Particle dynamics: Simple Harmonic motion – Projectiles**: –** horizontal plane - trajectory – velocity of projection – angle of projection – Range - time of flight – greatest height - projectiles on inclined plane. Central orbit and Central forces**: –** differential equation of a path – pedal equation of a differential equation – velocity at any point of a central orbit – areal velocity – Kepler's laws of planetary motion.

Total Hours:(75+15)

TEXT BOOKS:

1. Frank Ayres, *Schaum's outline of theory and problems of Differential Equations*, 1st ed. USA: McGraw-Hill, 1972. (Chapters: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 28, 29, 30, 31, 32, 33)
2. S Narayanan, *Dynamics*, 16th ed. New Delhi: S Chand and Company Ltd., 1986. (Chapter: 8)
3. N.P. Bali, *Dynamics (Golden Series)*, Latest ed. New Delhi, India: Lakshmi Publications (p) Limited, 2004. (Chapters:5,6,7)

Books for Reference:

1. I N Sneddon, *Elements of Partial Differential Equations*, 3rd ed.: Mc. Graw Hill., 1980.
2. S Narayanan & T K Manicavachogam Pillay, *Differential Equations*.: S V Publishers Private Ltd., 1981.
3. P Duraipandian, *Mechanics*, 4th ed. New Delhi: S Chand and Company Ltd., 1995.
4. G K Ranganath, *Text book of B.Sc, Mathematics*, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.
5. George F Simmons, *Differential equation with Applications and historical notes*, 2nd ed.: McGraw-Hill Publishing Company, Oct 1991.

Suggested Web links:

1. **http://ocw.mit.edu/courses/mathematics/**
2. **http://www.analyzemath.com/**
3. **http://tutorial.math.lamar.edu/classes/de/de.aspx**
4. **http://www.sosmath.com/diffeq/diffeq.html**
5. **http://www.analyzemath.com/calculus/Differential_Equations/applications.html**

FORMAT OF QUESTION PAPER

MAT 331: DIFFERENTIAL EQUATIONS AND APPLICATIONS

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	2	10	1	10
	Unit II	3			
	Unit III	3			
	Unit IV	2			
B	Unit I	2	9	2	18
	Unit II	3			
	Unit III	3			
	Unit IV	2			
C	Unit I and II	5	8	6	48
	Unit III and IV	5			
D	Unit I, II, III and IV	4	3	8	24
				Total	100

CHRIST UNIVERSITY
DEPARTMENT OF MATHEMATICS

B.Sc Mathematics - IV Semester

MAT 431: Analytical Geometry and Vector Calculus

UNIT I: ANALYTICAL GEOMETRY(3D) - (Lines and Planes) (25 Hrs)

Direction cosines of a line – Direction ratios of the join of two points - Projection on a line – Angle between the lines – Area of a triangle and volume of a tetrahedron with given vertices - Equation of line in different forms – Perpendicular from a point onto a line - Equation of a plane in different forms – Perpendicular from a point onto a plane - Angle between two planes – Line of intersection of two planes - Plane co-axial with given planes – Planes bisecting the angle between two planes – Angle between a line and a Plane – Co-Planarity of two lines – Shortest distance between two lines.

UNIT II : ANALYTICAL GEOMETRY(3D) - (Spheres, Cylinders & Cone) (15 Hrs)

Equation of the sphere in its general form – Determination of the centre and radius of a sphere with the given ends of a diameter – section of sphere by a plane – tangent plane - orthogonal spheres - Equations of Right circular cones and right circular cylinders – Problems.

UNIT III : VECTOR DIFFERENTIAL CALCULUS, LINE AND MULTIPLE INTEGRALS (25 Hrs)

Vector Differentiation – Gradient – Divergence – Curl and Laplacian Operators – Vector identities - Line integral and basic properties – examples on evaluation of the integrals – Definition of a double integral – its conversion to iterated integrals – evaluation of double integral by change of order of integration and by change of variables – surface areas as double integrals – Definition of a triple integral and evaluation – change of variables – volume as a triple integral – Line, surface and volume integrals of vector functions

UNIT IV: INTEGRAL THEOREMS (10 Hrs)

Green's theorem in the plane (statement and proof) – Direct consequences of the theorem – The Divergence theorem (statement only) – Direct consequences of the theorem – The Stoke's theorem (statement only) – Direct consequences of the theorem.

Total Hours:(75+15)

TEXT BOOKS:

1. S.P.Mahajan & Ajay Aggarwal, *Comprehensive Solid Geometry* , 1st ed.: Anmol Publications , 2000. (Sections : 1.8, 1.15, 3.2, 3.3,3.7, 3.8, 3.9, 3.10, 3.12, 3.13, 4.2, 4.3, 5.3, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10)
2. B Spain, *Vector Analysis*, 2nd ed. Calcutta: Radha Publishing Co., 1988. (Chapter 3 : Sections 17, 18, 19, 20, 21, Chapter 5 : Sections 32, 33, 34, 35, 36, Chapter 6 : Sections 37, 38, 39, Chapter 7 : 41, 42, 43, Chapter 8 : Sections 44, 45, 46, 47, 48, 49, Chapter 9 : Sections 50, 51, 53, 54, 55, Chapter 10 : Sections 56, 57, 58, 59, 60, Chapter 11: section 66)

Books for Reference:

1. Shanthi Narayan, *Analytical Solid Geometry*. New Delhi: S. Chand and Co. Pvt. Ltd., 2004.
2. S Narayanan & Manicavachogam Pillay, *Vector Algebra and Analysis*, 4th ed.: S V Publishers, 1986.
3. Raisinghania Md, Saxena Hc, and Dass Hk, *Simplified course in Vector Calculus*, 1st ed. New Delhi, India: S.Chand and Company Ltd., 2002.
4. G K Ranganath, *Text book of B.Sc. Mathematics*, Revised ed. NewDelhi, India: S Chand and Co., 2011.

Suggested Web links :

1. **http://ocw.mit.edu/courses/mathematics/**
2. **http://www.univie.ac.at/future.media/moe/galerie.html**
3. **http://mathworld.wolfram.com/AnalyticGeometry.html**
4. **http://www.math.gatech.edu/~harrell/calc/**

FORMAT OF QUESTION PAPER
MAT 431: ANALYTICAL GEOMETRY AND VECTOR CALCULUS

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	2	10	1	10
	Unit II	3			
	Unit III	3			
	Unit IV	2			
B	Unit I	2	9	2	18
	Unit II	3			
	Unit III	3			
	Unit IV	2			
C	Unit I and II	5	8	6	48
	Unit III and IV	5			
D	Unit I, II, III and IV	4	3	8	24
				Total	100

2.3 MAT 531: ALGEBRA

CHRIST UNIVERSITY

DEPARTMENT OF MATHEMATICS

B.Sc Mathematics - V Semester

MAT 531: ALGEBRA

UNIT I : GROUPS **(25 Hrs)**

Groups – Subgroups – Cyclic groups – Cosets – Lagrange's theorem – Normal Subgroup – Quotient Group – Homomorphism of groups – Fundamental Theorem of Homomorphism – Isomorphism - Cayley's theorem – Permutation groups.

UNIT II : RINGS, INTEGRAL DOMAINS AND FIELDS **(15 Hrs)**

Rings – Properties – Integral domains – Fields – Subrings – Quotient Rings – Ideals, Principal, Prime and Maximal ideal in a commutative ring – Homomorphism and Isomorphism of Rings – Fields – Properties following the definition.

UNIT III : LINEAR ALGEBRA **(20 Hrs)**

Vector space: Definition – Examples – Properties – Subspaces – Span of a set – Linear dependence and independence – Dimension and Basis

Linear transformation: Definition and examples – Range and Kernel of a linear map – Matrix of the Linear Transformation – Rank and Nullity – inverse of a linear transformation – consequence of Rank-nullity theorem.

Inner product space: Definition – examples – orthonormal sets – Schwarz inequality – Gram Schmidt orthogonolization process – problems.

Total Hours:(60+15)

TEXT BOOKS:

1. Herstein I N, *Topics in Algebra*, 4th ed. New Delhi, India: Vikas Publishing House Pvt. Ltd, 1991. **(for Unit I and II).** (Sections : 2.1 , 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.10, 3.1, 3.2, 3.3, 3.4, 3.5)
2. Krishnamoorty V K and Mainra V P and Arora J L, *An Introduction to Linear Algebra*, Reprint. New Delhi, India: Affiliated East West Press Pvt. Ltd., 2003. **(for Unit III)**. (Sections: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 4.1, 4.2, 4.3, 4.4, 4.5, 7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.2.5, 7.2.6, 7.2.7, 7.2.8, 7.2.9, 7.2.10, 7.2.11, 7.2.12)

Books for Reference:

1. John B Fraleigh, *A First course in Abstract Algebra*, 3rd ed.: Narosa Publishing House., 1990.
2. Vashista, *A First Course in Modern Algebra*, 11th ed.: Krishna Prakasan Mandir, 1980.
3. R. Balakrishan and N.Ramabadran, *A Textbook of Modern Algebra*, 1st ed. New Delhi, India: Vikas publishing house pvt. Ltd., 1991.
4. G K Ranganath, *Text book of B.Sc. Mathematics*, Revised ed. NewDelhi, India: S Chand and Co., 2011.
5. Michael Artin, *Algebra*, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2011.

Suggested Web links :

1. **http://ocw.mit.edu/courses/mathematics/**
2. **http://www.extension.harvard.edu/openlearning/math222/**
3. **http://mathworld.wolfram.com/Algebra.html**
4. **http://www.math.niu.edu/~beachy/aaol/**
5. **http://planetmath.org/encyclopedia/Inverse.html**

FORMAT OF QUESTION PAPER
MAT 531: ALGEBRA

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	4	10	1	10
	Unit II	3			
	Unit III	3			
B	Unit I	4	9	2	18
	Unit II	3			
	Unit III	3			
C	Unit I	4	8	6	48
	Unit II and III	6			
D	Unit I, II and III	4	3	8	24
				Total	100

2.4 MAT 532: INTEGRAL TRANSFORMS AND LINEAR PROGRAMMING

CHRIST UNIVERSITY

DEPARTMENT OF MATHEMATICS

B.Sc Mathematics – V Semester

MAT 532 : INTEGRAL TRANSFORMS AND LINEAR PROGRAMMING

UNIT I : FOURIER SERIES AND FOURIER TRANSFORMS (25 Hrs)

Introduction to Sequence and Series -Introduction to integral transforms - Fourier Series of functions with period 2π and period 2L – half range cosine and sine series – Finite Fourier cosine and sine transforms – transform of some common functions.

The Fourier Integral – Complex Fourier Transforms – Basic Properties - - Transform of the derivative and t he derivative of the transform – Convolution theorem – Parseval's Identity – Fourier sine and cosine transforms – transforms for first and second order derivatives.

UNIT II : LAPLACE TRANSFORM (15 Hrs)

Laplace Transform of standard functions – Laplace transform of periodic functions – Inverse Laplace transform– Solution of ordinary differential equation with constant coefficient using Laplace transform.

UNIT III : LINEAR PROGRAMMING (20 Hrs)

Introduction - General form of Linear Programming Problem – Graphical Method of solution – Simplex Method for Maximization of L.P.P. standard form – Minimization problem in standard form – Big M method – Two phase method.

Introduction to Transportation Problem – Initial Basic Feasible solution – Moving towards Optimality – Degeneracy in Transportation Problems – Unbalanced Transportation Problem – Mathematical formulation of Assignment Problems – Hungarian method for solving Assignment problem – Unbalanced Assignment problem – Travelling salesman problem – Formulation of Travelling salesman problem as an assignment problem and solution procedure.

Total Hours:(60+15)

TEXT BOOKS:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2010. (Sections : 5.1, 5.2, 5.3, 5.4,5.5,5.6,5.7, 5.8, 5.9, 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9,10.10,10.11).
2. S Dharani Venkata Krishnan, *Operations Research - Principles and Problems*, 3rd ed.: Keerthi Publishing House house(p) ltd., 1992.(Sections : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7.1, 2.7.2 2.7.3, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7).

Books for Reference:

1. Sneddon I N, *Fourier Transform*, 1st ed. New York, USA: Dover Publications., 1995.
2. Raisinghania M.D., *Laplace and Fourier Transforms*. New Delhi, India: S. Chand and Co. Ltd. , 1995.
3. G K Ranganath, *Text book of B.Sc. Mathematics*, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.
4. G Hadley, *Linear Programming*, Reprint. New Delhi, India: Narosa Publishing House, 2002.
5. Hamdy A Taha, *Operations Research – an introduction*, 6th ed. New Delhi, India: Prentice Hall of India., 1996.
6. V K Kapoor, *Operations Research*, Reprint. New Delhi, India: Sultan Chand & Sons., 1994.

Suggested Web links:

1. **http://ocw.mit.edu/courses/mathematics/**
2. **http://www.fourier-series.com/**
3. **http://mathworld.wolfram.com/**
4. **http://www.princeton.edu/~rvdb**
5. **http://www.zweigmedia.com/RealWorld/Summary4.html**
6. **http://people.brunel.ac.uk/~mastjjb/jeb/or/contents.html**
7. **http://people.brunel.ac.uk/~mastjjb/jeb/or/lpmore.html**

FORMAT OF QUESTION PAPER
MAT 532: INTEGRAL TRANSFORMS AND LINEAR PROGRAMMING

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	4	10	1	10
	Unit II	3			
	Unit III	3			
B	Unit I	4	9	2	18
	Unit II	3			
	Unit III	3			
C	Unit I	4	8	6	48
	Unit II and III	6			
D	Unit I, II and III	4	3	8	24
				Total	100

2.5 MAT 631: REAL AND COMPLEX ANALYSIS

CHRIST UNIVERSITY

DEPARTMENT OF MATHEMATICS

B.Sc Mathematics – VI Semester

MAT 631: REAL AND COMPLEX ANALYSIS

UNIT I : OPEN SETS, CLOSED SETS, COUNTABLE SETS AND SEQUENCES (10 Hrs)

Limit of a set, Open sets, Closed sets, closure of a set, countable and uncountable sets - **Sequences**: Definition of Sequences – limit of a sequence – algebra of limits of a sequence – convergent, divergent and oscillatory sequences - problems thereon. Bounded sequences – every convergent sequence is bounded – converse is not true – Monotonic sequences and their properties – problems using the properties – Cauchy sequence – Results related to Cauchy's sequences.

UNIT II: INFINITE SERIES (25 Hrs)

Infinite Series: Definition of convergence, divergence and oscillation of series – properties of convergent series – a series of positive terms either convergences or diverges – Cauchy's criterion – Statement only – Geometric series. – Tests of convergence of series - *p* series – comparison tests – D'Alembert's test, Raabe's test, Cauchy's root test – Absolute and conditional convergence, Leibnitz test for alternating series. – Summation of Binomial, Exponential and Logarithmic series.

UNIT III : COMPLEX ANALYSIS (25 Hrs)

Continuity and Differentiability of complex functions – Analytic Functions – Cauchy-Riemann equations – Harmonic functions – Contours – Line integrals – The Cauchy's Integral theorem and its direct consequences – Cauchy's Integral formula for the functions and derivatives – Morera's theorem – Applications to the Evaluation of Simple line integrals – Cauchy's inequality – Liouville's Theorem – Fundamental theorem of Algebra – power series – Taylors series – Laurent's series – circle and radius of convergence – sum functions - Transformations – Definition of Conformal Mapping – Bilinear Transformation – Cross ratio – Properties – Inverse points – Bilinear Transformation transforms Circles into circles or lines – Problems there on – Discussion of various Transformations.

Total Hours:(60+15)

TEXT BOOKS:

1. S.C.Malik and Savita Arora, *Mathematical Analysis*, 2nd ed. New Delhi, India: New Age international (P) Ltd., 1992 (Chapter2, Chapter 3 : Sections 1, 2, 3, 4, 5, 6, 7, 9 ; Chapter 4 : Sections 1.1, 1.2, 1.3, 1.4, 2, 2.1, 2.2, 2.3, 3, 3.1, 3.2, 4, 5, 6, 10, 10.1, 10.2)
2. R V Churchil & J W Brown, *Complex Variables and Applications*, 5th ed.: Mc. Graw Hill Companies., 1989. (Sections:14,15,16,17,18,19,20,21,22,23,24,25,36,37,38,39,40,41,47,48,49,51, 52, 53,,54, 55, 56, 57,58, 83, 84, 85, 86, 87, 88, 89, 90, 94)

Books for Reference:

1. Richard R Goldberg, *Methods of Real Analysis*, Indian ed. New Delhi, India: Oxford and IBH Publishing Co., 1970.
2. L V Ahlfors, *Complex Analysis*, 3rd ed.: Mc Graw Hill. , 1979.
3. G K Ranganath, *Text book of B.Sc. Mathematics*, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.

Suggested Web links:

1. **http://www.math.unl.edu/~webnotes/contents/chapters.htm**
2. **http://www-groups.mcs.st-andrews.ac.uk/~john/analysis/index.html**
3. **http://web01.shu.edu/projects/reals/index.html**
4. **http://www.mathcs.org/analysis/reals/index.html**

FORMAT OF QUESTION PAPER
MAT 631: REAL AND COMPLEX ANALYSIS

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	2	10	1	10
	Unit II	4			
	Unit III	4			
B	Unit I	2	9	2	18
	Unit II	4			
	Unit III	4			
C	Unit I and II	6	8	6	48
	Unit III	4			
D	Unit I, II and III	4	3	8	24
				Total	100

2.6 MAT 632 (A): NUMERICAL METHODS (Elective)

CHRIST UNIVERSITY

DEPARTMENT OF MATHEMATICS

B.Sc Mathematics - VI Semester

MAT 632(A): NUMERICAL METHODS (Elective)

UNIT I. NUMERICAL SOLUTION OF ALGEBRAIC AND SYSTEM OF EQUATIONS (20 Hrs)

Errors and their analysis – Floating point representation of numbers – Solution of Algebraic and Transcendental Equations : Bisection method, Iteration method, the method of False Position, Newton Raphson method.

Solution of linear systems – Matrix inversion method – Gaussian Elimination method – Modification of the Gauss method to compute the inverse – Method of factorization – Iterative methods.

UNIT II. FINITE DIFFERENCES AND INTERPOLATION (20 Hrs)

Finite differences: Forward difference, Backward difference and Shift Operators – Separation of symbols – Newton's Formulae for interpolation – Lagranges interpolation formulae - Hermite, Cubic-Spline interpolation formulas, Bivariate interpolation and least square approximation.

UNIT III. NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS (20 Hrs)

Numerical differentiation – Numerical integration : Trapezoidal rule, Simpson's one-third rule and Simpson's three-eighth rule.

Numerical solution of ordinary differential equations – Taylor's series – Picard's method – Euler's method – Modified Euler's method – Runge Kutta methods - second order (with proof) and fourth order (without proof).

Total Hours:(60+15)

TEXT BOOKS:

1. S S Sastry, *Introductory methods of Numerical Analysis*, 3rd ed. New Delhi, India: Prentice Hall of India, 1999. (Sections : 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 5.3.1, 5.3.2, 5.3.3, 5.4, 3.3.1, 3.3.2, 3.3.3, 3.9.1, 3.9.3, 3.10, 4.2, 4.4.1).
2. Francis Scheid, *Schaum's Outline of Numerical Analysis*, Revised ed.: Mc.Graw Hill., 2006.

Books for Reference:

1. M K Jain, S R K Iyengar, and R K Jain, *Numerical Methods for Scientific and Engineering Computation*, 4th ed. New Delhi, India: New Age International, 2003.
2. G K Ranganath, *Text book of B.Sc. Mathematics*, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.

Suggested Web links:

1. **http://www.amtp.cam.ac.uk/lab/people/sd/lectures/nummeth98/index.htm**
2. **http://math.fullerton.edu/mathews/numerical.html**
3. **http://www.onesmartclick.com/engineering/numerical-methods.html**

FORMAT OF QUESTION PAPER
MAT 632(A): NUMERICAL METHODS (Elective)

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	4	10	1	10
	Unit II	3			
	Unit III	3			
B	Unit I	3	9	2	18
	Unit II	4			
	Unit III	3			
C	Unit I and II	6	8	6	48
	Unit III	4			
D	Unit I, II and III	4	3	8	24
				Total	100

2.7 MAT 632(B): NUMERICAL METHODS WITH MATHEMATICAL PACKAGES (Elective)

CHRIST UNIVERSITY
DEPARTMENT OF MATHEMATICS

B.Sc Mathematics - VI Semester

MAT 632(B): NUMERICAL METHODS WITH MATHEMATICAL PACKAGES (Elective)

UNIT I: NUMERICAL SOLUTION OF ALGEBRAIC AND SYSTEM OF EQUATIONS (20 Hrs)

Errors and their analysis – Floating point representation of numbers – Solution of Algebraic and Transcendental Equations : Bisection method, Iteration method, the method of False Position, Newton Raphson method.

Solution of linear systems – Matrix inversion method – Gaussian Elimination method – Modification of the Gauss method to compute the inverse – Method of factorization – Iterative methods.

UNIT II: FINITE DIFFERENCES AND NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS (20 Hrs)

Finite differences (Forward and Backward) – Newton's Formulae for interpolation – Lagranges interpolation formulae – Numerical differentiation – Numerical integration – Trapezoidal, Simpson's and Weddle's rule.

Numerical solution of ordinary differential equations – Taylor's series – Picard's method – Euler's method – Modified Euler's method – Runge Kutta methods - second order (with proof) and fourth order (without proof).

UNIT III: NUMERICAL METHODS WITH MATLAB (20 Hrs)

Introduction to MATLAB – Basics of MATLAB – input and output – File types – Arrays – Plot function – Creating, Saving and Executing a Script File – Working with files and directories – Matrices and vectors – Arithmetic operations – Relational operations – Logical operations – Elementary math functions – Matrix functions – Character strings – creating and using inline functions – Script files – Function files – Language specific functions.

Writing programs in Bisection method – False position method – Newton Raphson method – Secant method – PA = LU factorization method with pivoting – Jacobi iteration method – Gauss elimination method – Numerical differentiation – Trapezoidal rule – Simpsons rule.

Total Hours:(60+15)

TEXT BOOKS:

1. S S Sastry, *Introductory methods of Numerical Analysis*, 3rd ed. New Delhi, India: Prentice Hall of India, 1999. (Sections : 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 5.3.1, 5.3.2, 5.3.3, 5.4, 3.3.1, 3.3.2, 3.3.3).
2. Rudra Pratap, *Getting started with MATLAB – a quick introduction to scientists and engineers*, Reprint. USE: Oxford university press, 2005. (Sections: 1.1, 1.2, 1.3, 1.6, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3).
3. Francis Scheid, *Schaum's Outline of Numerical Analysis*, Revised ed.: Mc.Graw Hill., 2006.
4. John H. Mathews and Kurtis.D.Fink, *Numerical Methods using MATLAB*, International ed.: Pearson Education, 2006.

Books for Reference:

1. M K Jain, S R K Iyengar, and R K Jain, *Numerical Methods for Scientific and Engineering Computation*, 4th ed. New Delhi, India: New Age International, 2003.
2. G K Ranganath, *Text book of B.Sc. Mathematics*, Revised ed. New Delhi, India: S Chand and Company Ltd., 2011.

Suggested Web links:

1. **http://www.amtp.cam.ac.uk/lab/people/sd/lectures/nummeth98/index.htm**
2. **http://math.fullerton.edu/mathews/numerical.html**
3. **http://www.onesmartclick.com/engineering/numerical-methods.html**
4. **http://www.mathworks.com/help/techdoc/rn/rn_intro.html**

FORMAT OF QUESTION PAPER
MAT 632(B): NUMERICAL METHODS WITH MATLAB (Elective)

Part	Unit and No. of subdivisions to be set in the unit		No. of subdivisions to be answered	Marks for each subdivision	Max. marks for the part
A	Unit I	4	10	1	10
	Unit II	3			
	Unit III	3			
B	Unit I	3	9	2	18
	Unit II	4			
	Unit III	3			
C	Unit I and II	6	8	6	48
	Unit III	4			
D	Unit I, II and III	4	3	8	24
				Total	100

3 SYLLABI FOR CERTIFICATE COURSES

3.1 MAT 101: FOUNDATIONS OF MATHEMATICS

UNIT I : SET THEORY **(10 Hrs)**

Set Theory – Definition – Types of Sets – Operation on sets (Union, Intersection Complement, Difference) – Venn Diagram – Application problems.

UNIT II : EQUATIONS **(10 Hrs)**

Linear Equations – solution of linear equation – Quadratic equations – solutions of Quadratic equations – The equation $x^2 + 1 = 0$ and introduction to complex numbers - Square roots, cube roots and fourth roots of unity.

UNIT III: MATRICES AND DETERMINANTS **(10 Hrs)**

Matrices – Types of Matrices – Operations on Matrices – Expansion of 2^{nd} and 3^{rd} order Determinants – Minors – Co-factors – Adjoint – Singular and Non-singular matrices – Inverse of a matrix – Solution of system of linear equation by matrix and determinant methods.

UNIT IV: DIFFERENTIAL AND INTEGRAL CALCULUS **(15 Hrs)**

Limits – Differentiation – Methods of differentiation – Second order derivative – Maxima and Minima – Applications to Revenue Function, Cost function, profit function, Elasticity of demand, Break even point. Indefinite integral – Standard results – substitution method – application to cost and revenue functions.

(2 credits) **Total Hours : 45**

TEXT BOOKS :

1. D.C.Sancheti and V. K.Kapoor, *Business Mathematics*, 11th ed. New Delhi, India: Sultan Chand and Sons., 2009.
2. B.G.Sathtyaprasad, K.Nirmala, R.G.Saha, and C.S.Anantharaman, *Business Mathematics*. Mumbai, India: Himalaya publishing House., 2004.

Books for Reference:

1. Shanti Narayanan and P.K. Mittal, *Text book of Matrices*, 10th ed.: S. Chand and Company Ltd., 2004.
2. Navaneetham, *Business Mathematics*, Reprint. Tanjore: Gemini Publishing House, 1997.

Suggested Web Links:

1. **http://planetmath.org/encyclopedia/SetTheory.html**
2. **http://plato.stanford.edu/entries/set-theory/**
3. **http://mathworld.wolfram.com/Logarithm.html**
4. **http://www.sosmath.com/algebra/logs/log1/log1.html**
5. **http://www.mathagonyaunt.co.uk/STATISTICS/ESP/Perms_combs.html**
6. **http://www.mathsisfun.com/combinatorics/combinations-permutations.html**
7. **http://home.scarlet.be/math/matr.htm**
8. **http://www.maths.surrey.ac.uk/explore/emmaspages/option1.html**

3.2 MAT 201: INTRODUCTION TO MATHEMATICA

UNIT I : ALGEGRAIC COMPUTATION: (10 Hrs)

Simplification of algebraic expression, simplification of expressions involving special functions, built-in functions for transformations on trigonometric expressions, definite and indefinite symbolic integration, symbolic sums and products, symbolic solution of ordinary and partial differential equations, symbolic linear algebra, equations solving, calculus, polynomial functions, matrix operations.

UNIT II : MATHEMATICAL FUNCTIONS: (07 Hrs)

Special functions, inverse error function, gamma and beta function, hyper-geometric function, elliptic function, Mathieu function.

UNIT III: NUMERICAL COMPUTATION: (10 Hrs)

Numerical solution of differential equations, numerical solution of initial and boundary value problems, numerical integration, numerical differentiation, matrix manipulations and optimization techniques.

UNIT IV : GRAPHICS: (08 Hrs)

Two and Three dimensional plots, parametric plots, contours, typesetting capabilities for labels and text in plots, direct control of final graphics size, resolution etc.

UNIT V : PACKAGES: (10 Hrs)

Algebra, linear algebra, calculus, discrete math, geometry, graphics, number theory, vector analysis, Laplace and Fourier transforms, statistics.

Total Hours : 45

(2 credits)

TEXT BOOKS:

1. Stephen Wolfram, *The Mathematica book*.: Wolfram Research Inc. , 2003..
2. Michael Trott, *The Mathematica guide book for programminG*, Springer, 2004.
3. P.Wellin, R.Gaylord, and S.Kamin, *An introduction to programming with Mathematica*, 3rd ed.: Cambridge, 2005.

Suggested Web Links:

1. **http://www.math.montana.edu/frankw/ccp/modeling/topic.htm**
2. **http://library.wolfram.com/**

3.3 MAT 301: QUANTITATIVE TECHNIQUES FOR MANAGERS

1 : LINEAR PROGRAMMING **(20 Hrs)**

Definitions of O.R.- Definition of Linear Programming Problem (L.P.P) - Formulation of L.P.P. – Linear Programming in Matrix Notation – Graphical Solution of L.P.P – Simplex Method – Big M Technique – Two Phase Method - Concept of Duality – Formulation of Primal Dual Pairs – Dual Simplex Method.

2 : TRANSPORTATION AND ASSIGNMENT PROBLEMS **(10 Hrs)**

Introduction to Transportation Problem – Initial Basic Feasible solution – Moving towards Optimality – Degeneracy in Transportation Problems – Unbalanced Transportation Problem – Assignment Problems.

3 : GAME THEORY **(15 Hrs)**

Games and Strategies – Introduction – Two person zero sum games – Maximin and Minimax Principles – Games without saddle point – mixed strategies – Solution of 2 x 2 rectangular games – Graphical method – Dominance Property – Algebraic Method for m x n games

Total Hours : 45

(2 credits)

TEXTBOOK:

Kanti Swarup, P.K.Gupta, and ManMohan, *Operations Research*, Reprint. New Delhi, India: Sultan Chand & Sons, 1994.

Books for Reference:

1. G Hadley, *Linear Programming*, Reprint .: Narosa Publishing House, 2002.
2. K.V.Mittal and C.Mohan, *Optimization Methods in Operation Research and System Analysis*, Reprint .: New Age International Pvt. Ltd., 1996.
3. Hamdy A Taha, *Operations Research- an introduction*, 6th ed.: Prentice Hall of India, 1996.

Suggested Web Links:

1. **http://www.zweigmedia.com/RealWorld/Summary4.html**
2. **http://people.brunel.ac.uk/~mastjjb/jeb/or/lpmore.html**
3. **http://www2.isye.gatech.edu/~jswann/casestudy/assign.html**
4. **http://mathworld.wolfram.com/GameTheory.html**

3.4 MAT 401: QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS

1. PERCENTAGES, AVERAGES AND PROGRESSIONS: (10 Hrs)

Number System,

HCF and LCM: – Factors – Multiples – HCF – LCM – Product of two numbers – Difference between HCF and LCM,

Fraction: Fractional part of a number – To find the fraction related to Balance amount,

Square roots - Cube roots,

Percentage: Fraction to Rate Percent – Rate Percent to Fraction – Rate Percent of a Number – Expressing a given quantity as a Percentage of Another given quantity – Converting a percentage into decimal – converting a decimal into a percentage – Effect of percentage change on any quantity – Rate change and change in quantity available for fixed expenditure ,

Average: Average of different groups – Addition or removal of items and change in average – replacement of some of the items,

Arithmetic progression and Geometric Progression.

2 : RATIOS AND PROPORTIONS (25 Hrs)

Ratio and Proportions: Properties of Ratio – Dividing a given number in the given ratio – comparison of ratios – useful results on proportion – continued proportion – relation among the quantities more than two – direct proportion and indirect proportion,

Profit and Loss: Gain percentage and Loss Percentage – Relation among cost price, sale price, Gain/Loss and Gain% or Loss% - Discount and Marked Price,

Time and work: Basic concepts – examples,

Pipes and Cistern: Basic concepts – examples,

Time and Distance: Definition – Average speed – distance covered is same, different – stoppage time per hour for a train – time taken with two difference modes of transport,

Boats and Streams: Introduction, Speed of Man (Boat) and stream – Important formulae,

Mixture: Allegation rule – Mean Value of the Mixture – Six golden rules to solve problems on mixture – Removal and replacement by equal amount.

3 : COMMERCIAL ARITHMETICS (10 Hrs)

Simple interest: Definition – Effect of change of *P*, *R* and *T* on simple interest – amount – amount becomes N times the principal – Repayment of debt in equal installments – Rate and Time are numerically equal,

Compound Interest: Basic Formula - conversion period – to find the principal/time/rate – difference between compound interest and simple interest – equal annual installments to pay the debt amount – growth – depreciation

Shares and Debentures : Basic facts – Approach to problems on stock – Approach to problems on Shares – regular problems - Debentures.

Total Hours : 45

(2 credits)

Text Book :

Abhijit Guha, *Quantitative Aptitude for competitive examinations*, 3rd ed.: Tata Mc-Graw Hill, 2005.

Books for Reference:

1. Dinesh Khattar, *Quantitative Aptitude*, 3rd ed.: Pearson Education, 2005.
2. Muhamed Muneer, *How to prepare for CAT*.: Tata Mc Graw Hill. , 2003.

Suggested Web links :

1. **http://www.ascenteducation.com**
2. **http://www.winentrance.com/MCA-Entrance-Exam-Question-Bank-CD.html**

External Experts:

1) Dr. Y B Maralabhavi,
Professor and Chairman,
Department of Mathematics,
Bangalore University, Bangalore

2) Prof. Jayanthi Purandar,
Professor and Head,
Department of Mathematics,
Jyothi Nivas College, Bangalore.

3) Dr. Reena K Abraham,
Infosys Technologies Ltd,
Electronics City,
Hosur Road,
Bangalore – 561229.