

**MOTHER TERESA WOMEN'S UNIVERSITY**

**KODAIKANAL**

**DEPARTMENT OF MATHEMATICS**

**B.Sc. MATHEMATICS PROGRAMME**



**SYLLABI**

**WITH EFFECT FROM THE ACADEMIC YEAR**

**2014 – 2015 Onwards**

**MOTHER TERESA WOMEN'S UNIVERSITY**

**KODAIKANAL**

**B.Sc MATHEMATICS**

**Regulations**

**Objectives:**

The Subjects of study are suitably designed to provide core knowledge and also to develop skills.

**Mode:**

Full - time Regular Programme.

**Eligibility for Admission:**

A candidate for admission into B.Sc. programme shall have studied. Mathematics under 10+2 pattern of study.

Candidates who passed +2 (Vocational and Academic Board) in Mathematics are eligible to apply.

**Duration of study:**

The course duration shall normally be three years spread over six semesters. The duration of each semester is minimum 90 working days and maximum 110 working days. The maximum duration to complete the course shall 5 years.

**Medium:**

The medium of instruction shall be English.

**Number of Courses:**

The total number of courses for the programme is 42 and that includes Tamil 4, English 4 , hard core courses 17 , Allied 4 , soft core courses 4 ,Non Major Elective 2, Skill based subject 4, Value Education 1,Environmental studies1 , and Extension Activity 1 .

**Passing minimum:**

Passing Eligibility and Classification for the award of the Degree are as per the norms of the Choice Based Credit System(CBCS) and Introduction of Transfer of Credits. A candidate who obtains not less than 40% marks (24/60) in each paper in the summative examination and 40% marks (16/40) in each internal evaluation.

Minimum credits required to pass – 140

**Assessment:**

Evaluation of the candidates shall be through both Internal & External assessment. The ratio internal and external assessment should be 40:60

The Breakup of marks for internal assessment shall be as follows

Best score of two tests out of three tests	- 25
Speaking	- 05
Listening and Comprehension	- 05
Reading and Comprehension	- 05

**Question Paper in External Examination carrying 60 marks will be in the format:**

	Type	No.of Questions to be answered	Marks
PART A	Objective	24 questions, each carrying 1 mark- no choice	24 X 1 = 24
PART B	Paragraph About 1 to 1 $\frac{1}{2}$ Pages	4 questions out of 6, each carrying 3 marks	4 X 3 = 12
PART C	Essay Type About 3 pages	3 questions out of 5, each carrying 8 marks	3 X 8 = 24
		Total	60

**Publication of Result:**

	Examinations	Publications of Results
Odd Semester	I week of November	2 <sup>nd</sup> week of January
Even Semester	III week of April	2 <sup>nd</sup> week of June

**MOTHER TERESA WOMEN'S UNIVERSITY - KODAIKANAL**

**B.Sc MATHEMATICS 2014-2015 – Onwards**

**Curriculum**

Sem	Part	Subject code	Paper Title	Internal		External		No. of hours	Credit
				Max	Min	Max	Min		
I	I	B1TA1	Tamil – I	40	16	60	24	6	3
	II	B2EN1	English – I	40	16	60	24	6	3
	III	BMAC 1	Calculus	40	16	60	24	5	4
		BMAC 2	Theory of Equations and Trigonometry	40	16	60	24	5	4
		BAPH1	Allied: Physics-I	40	16	60	24	5	4
	IV	SBEVE	Value Education	40	16	60	24	3	3
II	I	B1TA2	Tamil – II	40	16	60	24	6	3
	II	B2EN2	English – II	40	16	60	24	6	3
	III	BMAC 3	Analytical Geometry 2D and 3D	40	16	60	24	5	4
		BMAC 4	Differential Equations	40	16	60	24	5	4
		BAPH2	Allied: Physics-II	40	16	60	24	5	4
	IV	BMAE1	Environmental Studies	40	16	60	24	2	2
III	I	B1TA3	Tamil – III	40	16	60	24	6	3
	II	B2EN3	English – III	40	16	60	24	6	3
	III	BMAC 5	Statics	40	16	60	24	5	4
		BMAA 1	Allied: Mathematical Statistics-I	40	16	60	24	5	4
		BMAE1	Elective: Fourier Series	40	16	60	24	4	3

			and Fourier Transform						
	IV	NME1	Operation Research	40	16	60	24	2	2
		SBS1	General Awareness	40	16	60	24	2	2
IV	I	B1TA4	Tamil – IV	40	16	60	24	6	3
	II	B2EN4	English – IV	40	16	60	24	6	3
	III	BMAC 6	Dynamics	40	16	60	24	4	4
		BMAC 7	Vector Calculus and Laplace Transform	40	16	60	24	4	4
		BMAA 2	Allied: Mathematical Statistics –II	40	16	60	24	4	4
		BMAE2	Elective: Discrete Mathematics	40	16	60	24	3	3
	IV	NME2	Set Theory and Logic	40	16	60	24	2	2
		SBS2	Theory of Numbers	40	16	60	24	2	2
V	III	BMAC 8	Modern Algebra – I	40	16	60	24	5	4
		BMAC 9	Real Analysis –I	40	16	60	24	5	4
		BMAC10	Complex Analysis – I	40	16	60	24	5	4
		BMAC11	Operation Research- I	40	16	60	24	5	4
		BMAC12	Numerical Methods	40	16	60	24	5	4
		BMAE3	Elective : Program in C	40	16	60	24	3	3
IV	SBS3	Accountancy – I	40	16	60	24	2	2	
VI	III	BMAC13	Modern Algebra –II	40	16	60	24	5	4
		BMAC14	Real Analysis –II	40	16	60	24	5	4
		BMAC15	Complex Analysis – II	40	16	60	24	5	4
		BMAC16	Operation Research- II	40	16	60	24	5	4

		BMAC17	Graph Theory	40	16	60	24	5	4
		BMAE4	Elective: Program in C++	40	16	60	24	3	3
	IV	SBS4	Fuzzy Logic	40	16	60	24	2	2
	V	NSS1	EA – NSS	40	16	60	24	1	3

**Mother Teresa Women's University**

**B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: I

No. of Hours / Week: 5

Subject Code: BMAC1

**Core Paper – 1**

No. of Credit: 4

**CALCULUS**

**Unit I:**

Successive differentiation- Expansion of function - Leibnitz Theorem and its application  
Maxima and Minima of Function of two variables.

**Unit II:**

Curvature – Radius of Curvature and Center of Curvature in Cartesian Form and Polar Form p - r  
equation; Pedal Equation of a Curve – Chord of a Curvature.

**Unit III:**

Define Integral – Integrals of the Form  $\int \frac{f'(x)}{f(x)} dx$  -  $\int \frac{1}{ax^2+bx+c} dx$  ,  $\int \frac{1}{\sqrt{ax^2+bx+c}} dx$ ,  
 $\int \sqrt{ax^2 + bx + c} dx$ ,  $\int \frac{px+q}{ax^2+bx+c} dx$  -Bernoulli's Theorem on integration - properties of definite  
integrals.

**Unit IV:**

Double integral: Definition the of double integral – Evaluation the of double integral - double  
integral in polar coordinates of area between curves .

**Unit V:**

Triple Integral: Definition – Applications of multiple integrals - Change of variables in the case  
two variables - Change of variables in the case three variables.

**Text Book:**

1. **S.Narayanan and T.K.M.Pillai Calculus Volume I and Volume II**  
Viswanathan(Printers and Publishers) 1992.

**Reference Book:**

1. **P.Kandasamy and K.Thilagavathi** “Mathematics for Branch I: Vol I and Vol II”  
S.Chand and Company Ltd., 2004, New Delhi.



## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: I

**Core Paper – 2**

No. of Hours / Week: 5

Subject Code: BMAC2

No. of Credit: 4

### **THEORY OF EQUATIONS AND TRIGONOMETRY**

#### **Unit I :**

Theory of Equations: Remainder Theorem – Relation between roots and coefficients of equations  
Symmetric Function of Roots – Newton’s Theorem on the sum of the powers of the roots.

#### **Unit II:**

Transformations of Equations: Roots with signs changes - Reciprocal roots - Reciprocal Equation.

#### **Unit III:**

Solutions of Numerical Equations: Solutions of Numerical Equations – Newton’s methods of divisors – Horner’s method.

#### **Unit IV:**

Trigonometry: Expansion of  $\sin n\theta$ ,  $\cos n\theta$ ,  $\tan n\theta$  – Expansion of  $\sin^n \theta$  and  $\cos^n \theta$ , when  $n$  is a positive integer – Expansion of  $\sin \theta$  and  $\cos \theta$  in a series of ascending power of  $\cos \theta$ .

#### **Unit V:**

Series: Hyperbolic Functions Relation Between Hyperbolic Function – Invers Hyperbolic Function - Logarithmic of Complex Numbers- Gregory Series-Summation of Trigonometric Series-Difference Method Fax Finite Series and for Finding The Sum of Finite and Infinite Series.

#### **Text Books:**

1. **T.K.M. Pillai and others**, “Algebra Vol.I ”, S.Viswanathan (Printers & Publisher) Pvt.Ltd.2006
2. **T.K.M.Pillai and S.Narayanan**, “Trigonometry”, S.Viswanathan (Printers & Publisher) Pvt.Ltd.2006.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: II

No. of Hours / Week: 5

Subject Code: BMAC3

**Core Paper – 3**

No. of Credit : 4

### **ANALYTICAL GEOMETRY 2D and 3D**

#### **Unit I:**

Analytical geometry of two dimensions: Polar equation of a conic –directrix –Chord –Tangent –Normal.

#### **Unit II:**

Analytical geometry of three dimensions: - Straight lines - Co-planarity of Straight lines – Shortest distance (S.D) and Equations of S.D between two lines.

#### **Unit III:**

Sphere: - Standard equation of a sphere – Results based on the properties of a sphere –Tangent plane to a Sphere –Equations of a circle.

#### **Unit IV:**

Cone and Cylinder: Cone whose vertex is at the origin- Enveloping cone of a sphere – Right circular Cone – Equation of a cylinder – Right circular cylinder.

#### **Unit V:**

Conicoids: - Nature of conicoid –Standard equation of a central conicoids –Enveloping cone – Tangent Plane –conditions for tangency –Director sphere and director plane.

#### **Text Books:**

1. **T.K.M.Pillai & T.Natarajan**, “Analytical Geometry 2D”, **S.Viswanathan** (Printers & Publishers) Pvt. Ltd, Chennai, 2000. (Unit I).
2. **P.Duraipandian & Others**, “Analytical Geometry 3D”, Emerald Publishers, Chennai – 2, 1998. (Unit II, III, IV and V).

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: II

No. of Hours / Week: 5

Subject Code: BMAC4

**Core Paper – 4**

No. of Credit: 4

### **DIFFERENTIAL EQUATIONS**

#### **Unit I:**

Equations of the first order and of degree Higher than one. Equations solvable for p, x, y-Clairaut's equation- Linear equations of second order.

#### **Unit II:**

Simultaneous differential equations-Euler homogeneous linear differential equations- Method of variation of parameters.

#### **Unit III:**

Method of Variation of Parameter – Second Order Linear Differential Equation - Method of undetermined coefficients to solve second order differential equations.

#### **PDE**

#### **Unit IV:**

Formation of Differential Equations - By eliminating arbitrary constants and functions -Solution of pde by direct integration- Methods to solve first order pde:  $F(p,q)=0$ ,  $F(z,p,q)=0$ ,  $F(x,p,q)=0$ ,  $F(y,p,q)=0$ ,  $z=px+qy+f(p,q)$ ,  $f(x,p)=\phi(y,q)$

#### **Unit V:**

Lagranges Linear Equations-Charpits Method

#### **Text Book:**

1. **P.Kandasamy and K. Thilagavathi** “Mathematics for Branch I – Vol III”, S. Chand & Company Ltd., 2004. New Delhi.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: III

No. of Hours / Week: 5

Subject Code: BMAC5

**Core Paper – 5**

No. of Credit: 4

### **STATICS**

#### **UNIT I:**

Forces acting at a point : Resultant and Components- Parallelogram of Forces- Analytical expression for the Resultant of two forces acting at a point – Triangle of Forces – Perpendicular Triangle of Forces – Converse of the Triangle of Forces- The Polygon of Forces – Lami's Theorem – An extended form of the parallelogram law of Forces- Resolution of a Force – Components of a Force along two given directions – Theorem on Resolved parts – Resultant of any number of Coplanar Forces Acting at a Point: Analytical Method - Conditions of Equilibrium of any Number of forces Acting upon a Particle – Geometrical or Graphical Conditions - Analytical Conditions.

#### **UNIT II:**

Parallel Forces and Moments: To find the Resultant of Two like parallel forces acting on a rigid body- To find the Resultant of Two unlike and unequal parallel forces acting on a rigid body – Resultant of a Number of Parallel Forces Acting on a rigid Body – conditions of Equilibrium of Three Coplanar Parallel Forces – Centre of two Parallel Forces – Moment of a Force – Physical Significance of the Moment of a Force – Geometrical Representation of a Moment – Sign of a Moment – Unit of Moment – Varignon's theorem of moments – Generalised Theorem of Moments ( Principle of Moments)- Moment of a Force about an axis. Couples: Definition – Equilibrium of two couples – Equivalence of two Couples- Couples in Parallel Planes – Resultant of Coplanar Couples - Resultant of a Couple and a Force .

#### **UNIT III:**

Equilibrium of Three forces Acting on a Rigid Body: Rigid Body subjected to any Three Forces – Three Coplanar Forces – Conditions of Equilibrium- Procedure to be followed in solving any Statical Problem – Two Trigonometrical Theorems – Coplanar Forces: Introduction - Reduction of any number of Coplanar forces – analytical Proof of theorem – Conditions for a system of forces to Reduce to a single force or to a Couple.

#### **UNIT IV:**

Friction: Introduction – Experimental Results – Statical, Dynamical and Limiting Friction – Law of Friction – Friction-a Passive force – coefficients of Friction – Angle of Friction – Cone of Friction – Numerical Analysis – Equilibrium of a particular on a rough inclined plane - Equilibrium of a body on a rough inclined plane under a force parallel to the plane - Equilibrium of a body on a rough inclined plane under any force.

#### **Unit V:**

Equilibrium of strings: Equation of common catenary – definitions – tension at any part- important formula – geometrical properties of the common catenary – Approximation to the shape of the catenary – the parabolic catenary.

#### **Text Book:**

1. M.K.Venkatraman, ‘Statics’, 12<sup>th</sup> edn, Agasthiar Publications, Trichy,2007

#### **Reference Books:**

1. A.V.Dharmapadam, ‘‘Statics’, S Viswanathan Printers and Publishing Pvt.,Ltd. 1993
2. P.Duraipandian and Lakshmi Duraipandian, ‘Mechanics’, S.Chand and Company Ltd, Ram Nagar, New Delhi-55,1985.
- 3.Dr.P.P.Gupta, ‘Statics’, Kedal Nath Ram Nath, Meerut,1983-1984.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: III

No. of Hours / Week: 5

Subject Code: BMAA1

**Allied Paper – 3**

No. of Credit: 4

### **MATHEMATICAL STATISTICS - I**

#### **Unit I:**

Probability : Introduction – Classical Definition – Additional Theorem – Multiplication Theorem – Odds in favour and odds against an Event – Axiomatic Approach – Axioms of Probability – Conditional Probability – Multiplicative Law of Probability – Probability of an event in terms of conditional Probability - Baye's Theorem.

#### **Unit II:**

Random Variables: Definition – Discrete Random Variable – Continuous Random Variable – Cumulative Distribution – Properties of Distribution Function – Function of a Random Variable- Two Dimensional Random Variable – Definitions – Marginal Probability Distribution- Conditional Probability Distribution – Independent Random Variable.

#### **Unit III:**

Mathematical Expectations: Expectation or Mean Value – Definition - Functions of a Random Variable – Definition – Theorem - Properties of Expected Values – Theorems . Variance : Variability or Dispersion – Range – Mean Deviation – Definition – Formula for Variance of X – Theorems - Tchebechev's Inequality .

#### **Unit IV:**

Moments and Moment Generating Function : Definition – Central moments in terms of moments about Origin- Moment Generating Function – Definition – Properties of Moment Generating Function – Theorems . Conditional Expectation : Definition – Theorem.

## **Unit V:**

Correlation: Definition – Theorems - Sample Correlation – Positive Correlation – Negative Correlation – No Correlation – Simple Correlation – Scatter Diagram – Numerical Value of the Correlation Coefficient – Rank Correlation – Properties of Correlation Coefficient - Limitations – Concurrent Deviation – Method of Calculating Correlation Coefficient- Merits and Demerits - Probable Error.

### **Text Books:**

1. **Dr.P.R.Vittal**, “Mathematical Statistics”, Margham Publications, Chennai, 2002.

### **Reference Books:**

1. **S.C.Gupta and V.K.Kapoor** , “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, New Delhi- 2, 1999.
2. **B.L.Agarwal**, “Basic Statistics”, New Age International Publishers, Chennai, 2000.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: III

No. of Hours / Week: 4

Subject Code: BMAE1

**Elective Paper – 1**

No. of Credit: 3

### **FOURIER SERIES AND FOURIER TRANSFORM**

#### **Unit I:**

Fourier Series: Definition- Dirchlet's conditions- Fourier Series of periodicity  $2\pi$  - Odd and even functions – half range series.

#### **Unit II:**

Change of interval- Harmonic analysis- Complex form of Fourier Series.

#### **Unit III:**

Fourier transform: Definition- Fourier integral Theorems- Inversion theorems-properties of Fourier Transforms-Problems.

#### **Unit IV:**

Convolution theorem- Parseval's identity-Infinite Fourier cosine and Sine transform.

#### **Unit V:**

Fourier transform of derivatives- Relation between Fourier and Laplace transform- applications of boundary value problems.

#### **Text Book:**

1. **P.Kandasamy and K.Thilagavathi**, "Mathematics for branch" I-volume IV, S.Chand and company Ltd , New Delhi 2005.



## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: III

No. of Hours / Week: 2

Subject Code: SBS1

**Skill Based Subject Paper – 1**

No. of Credit: 2

### **GENERAL AWARENESS**

#### **Unit I:**

##### **1. Tamil and other Literatures**

Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics -Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry) .

##### **2. Economics and Commerce**

Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking .

#### **Unit II:**

##### **3. Numerical Aptitude**

Objective Arithmetic : Number systems – probability – HCF and LCM of numbers - decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work - simple interest – area , volume and surface area.

##### **4. Verbal Aptitude**

Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

### **Unit III:**

#### **5. General Science and Technology**

SCIENCE Basic principles and concepts in Physics , Chemistry , Botany and Zoology.

TECHNOLOGY - Metallurgy, instrumentation, discoveries and inventions of techniques.

#### **6. Education**

Development process of the learner – Principles of development ( physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis – Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counselling .

### **Unit IV:**

#### **7. Library and Information Science**

Library and Information Science – Basics, Computer , Library Network and others like Research, Reprography etc.

#### **8. Sports and Games**

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games –General knowledge – Sports and Olympics – First Aid.

#### **9. Current Affairs**

State, Central and International affairs: Budgets – Politics – Sports – Education - Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research - Defence etc.

## **Unit V :**

### **10. National Cadet Corps (NCC)**

Introduction to the Armed Forces (Army, Navy, Air Force) – Drill – Weapon Training – Map Reading – Civil Defence.

### **11. National Service Scheme (NSS)**

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrative setup – History of voluntary organisation – Regular activities – Special camp activities – Special programmes – awards – Important days.

### **12. Youth Red Cross (YRC)**

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers - Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

## **Text Book**

1. VBC 1 - General Awareness , Question Bank, Kongunadu Arts and Science College, Coimbatore - 29, 2006.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: III

**Non Major Elective Paper - 1**

No. of Hours / Week: 2

Subject Code: NME1

**OPERATIONS RESEARCH**

No. of Credit: 2

### **Unit I:**

Definition - Mathematical formation of the Linear Programming Problem– Graphical solution method- Some exceptional cases- General Linear Programming Problem – Canonical and Standard form of Linear Programming Problem – Basic Solution- Degenerate Solution- Basic Feasible Solution of the Linear Programming Problem.

### **Unit II:**

Transportation Problem: Definition - Mathematical form of L.P.P - Table - Find Intial Basic Feasible Solution – North West Corner Rule - Row Minima - Colum Minima - Least Cost Method- Vogel’s Approximations Method (VAM) - Un balanced Transportation problem- Only upto Intial Basic Feasible Solution.

### **Unit III:**

Assignment Problem: Definition - Mathematical formulation of the problem – Hungarian Algorithm – Simple Problem – Special Case in Assignment Problem- The Trawelling Salesman Problem.

### **Unit IV:**

Sequencing Problem: Definition - Problem of Sequencing - Basic Terms Used in Sequencing - Processing n jobs & Two machine - Processing n jobs Through two Machines.

### **Unit V:**

Game Theory: Definition - Two-Person Zero-Sum Games - Some basic terms - The Maximin-Minimax Principle - Game without Saddle point - Mixed Strategies - Graphic Solution of  $2 \times n$  and  $m \times 2$  games.

### **Text Book:**

1. **Kanti Swarup, P.K.Gupta & Man Mohan**, "Operations Research", S.Chand & Company, NewDelhi.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: IV

No. of Hours / Week: 4

Subject Code: BMAC6

**Core Paper – 6**

No. of Credit: 4

### **DYNAMICS**

#### **UNIT I:**

Newton Laws of Motion and Applications (Chapter 4, 4.1 to 4.37)

#### **UNIT II:**

Projectiles – Equation of path range etc. –Range of a particle projected on an inclined plan etc.  
(Chapter 6, 6.1 to 6.17)

#### **UNIT III:**

Impulses – Impact in a fixed plane – Direct and Oblique impact.(Chapter 7, 7.1 to 7.6 and  
Chapter 8, 8.1 to 8.10)

#### **UNIT IV:**

Simple harmonic motion – Equation of motion – composition of two simple harmonic motions –  
simple pendulum (Chapter 10, 10.1 to 10.16)

#### **UNIT V:**

Central Orbits – components velocity and accelerations along and perpendicular to the radius  
vector – differential equations of a central orbit pedal equation (Chapter 11, 11.1 to 11.15)

#### **Text Book:**

1. M.K.Venkatraman, 'Dynamics', 11<sup>th</sup> edn, Agasthiar Publications, Trichy,1994.

**Reference Books:**

- 1.A.V.Dharmapadam, 'Dynamics', S Viswanathan Printers and Publishing Pvt.,Ltd.,Chennai 1993.
- 2.K.Viswantham Naik and M.S.Kasi, 'Dynamics', Emerald Publishers, 1992 .
- 3.Narayanamurthy, 'Dynamics', National Publishers, New Delhi,1992.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: IV

No. of Hours / Week: 4

Subject Code: BMAC 7

**Core Paper - 7**

No. of Credit:4

### **VECTOR CALCULUS AND LAPLACE TRANSFORM**

#### **Unit I:**

Differentiation of vectors – Gradient, divergence and Curl of a vector.

#### **Unit II:**

Integration of vectors - Greens Theorem- Gauss's divergence theorem - Stokes theorem.

#### **Unit III:**

Laplace Transform: Definition - Laplace transform of standard functions - Linear property - First shifting theorem - Transform of derivatives - Transform of  $tf(t)$ ,  $f(t)/t$ .

#### **Unit IV:**

Laplace inverse transform for first shifting theorem. Partial fractions Laplace Transform for Derivatives and Integrals.

#### **Unit V:**

Application to solution of differential equations: First and second order ODE - Simultaneous Equations.

#### **Text Book:**

1. **P.Kandasamy & K.Thilagavathi**, "Mathematics for B.Sc Branch I – Vol I,II,III&IV", S.Chand & Company 2004, NewDelhi.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: IV

No. of Hours / Week: 4

Subject Code: BMAA2

**Allied Paper - 4**

No. of Credit: 4

### **MATHEMATICAL STATISTICS- II**

#### **Unit I:**

**Binomial Distribution:** Binomial frequency distribution – Examples – Moments of the Binomial Distribution – Recurrence formula for Moments – Moment Generating Function – Additive Property of Binomial Random Variable – Generalization – Mode of the Binomial Distribution.

#### **Unit II:**

**Poisson Distribution:** Examples – Poisson Distribution – Definition – Moments of the Poisson Distribution ; Expected value (Mean) – Variance – Recurrence Formula for Moments – Moment Generating Function – Generalization – Mode of the Poisson Distribution.

**Geometric Distribution:** Definition – Memory less Property of Geometric Distribution – Moment Generating Function – Recurrence Formula Examples

#### **Unit III:**

**Normal Distribution:** Definition – Standard Normal Probability Distribution – Moments – Moments Generating Function – Moments about Mean – Linearity Property – Absolute Mean Deviation – Mode – Points of Inflexion – Normal Probability Integral – Properties of Normal Distribution – Example. **Uniform Distribution:** Definition -Mean -Variance -Moment Generating Function Examples

#### **Unit IV:**



Small Samples - F- Test: Procedure for Test of Equality of two population variances – Examples . SampleTest - t- Test: Introduction – Uses of t test – Properties of Sampling Distribution of t – Test for specified Mean – Examples – Test of significance for Difference between two population Means when population Standard Deviation are not known – Examples - t test for paired Observation – Examples

### **Unit V:**

Small Samples F Test: Analysis of Variance – One –way classification – ANOVA Table – Two way classification – Examples .

Small Samples –Chi Square Test: Additive Property –Pearson’s statistic – Uses of  $\chi^2$  Test – Procedure for testing the significance of the Difference between the observed and Expected Frequencies – Test of Independence of Attributes – Test for a specified Population Variance – Examples – Test of independence of Attributes – Examples – Examples.

### **Text Book:**

1. **P. R. Vittal** , “Mathematical Statistics”, Printed and Published by Margham Publication, Edition 2012.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: IV

No. of Hours / Week: 3

Subject Code: BMAE2

**Elective Paper – 2**

No. of Credit: 3

### **DISCRETE MATHEMATICS**

#### **Unit I:**

Mathematical Logic Statement and Notation – Connection – Negation Conjunction – Disjunction – Statement Formulas and Truth Tables – Logical Capabilities of Programming Languages – Conditional and Bi Conditional – Well Formed Formula – Tautologies –Equivalence of Formula – Duality Law Tautological Implication.

#### **Unit II:**

**Normal Forms:** Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Norms – Rules of Inference – Predicates – Statement Function, Variables and Quantities.

#### **Unit III:**

Basic Concept of Set Theory – Induction and Equality of Sets – The Power Set – Some Operation on Sets – Venn Diagram – Some Basic set Identities – Relations – Properties of Binary Relations in a Set – Relation matrix and the Graph of a Relation – Equivalence Relation – Composition of Binary Relation – Function – Definition – Composition of Function – Inverse Function.

#### **Unit IV:**

Grammar – Definition – Types of Grammar – Phrase Structure Grammar – Context Sensitive Grammar – Context Free Grammar – Regular Grammar – Languages Generated by these Grammars.

**Unit V:**

Automata – Definition – Deterministic Automata – Non-Deterministic Automates –  
Conversion of NDFSA to DFSA.

**Text Book:**

1. **J.P.Tremblay, R. Manohar** – “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw – Hill Edition 1997.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: IV

No. of Hours / Week: 2

Subject Code: NME2

**Non Major Elective Paper - 2**

No. of Credit: 2

### **SET THEORY AND LOGIC**

#### **UNIT I**

Basic set operations – Union – Intersection – Difference – Complement.

#### **UNIT II**

Reflexive – Symmetric – Transitive – Antisymmetric – Poset – Definition.

#### **UNIT III**

Logic – Statements – Conjunction – Disjunction – Negation - Conditional – Biconditional.

#### **UNIT IV**

Propositions and truth table – Tautology and contradiction.

#### **UNIT V**

Logical Equivalence, Algebra of propositions, Logically true and Logically equivalent statement.

#### **Text Book**

1. **J.P.Tremblay, R. Manohar** – “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw – Hill Edition 1997.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: IV

No. of Hours / Week: 2

Subject Code: SBS2

**Skill Based Subject Paper - 2**

No. of Credit: 2

### **THEORY OF NUMBERS**

#### **Unit I:**

Divisibility : Associates – Division algorithm – gcd (HCF) - Euclidean algorithm – l.c.m.

#### **Unit II:**

Prime and Composite Numbers : Coprimes – Sieve of Eratosthenes – Euclid's theorem – Unique Factorization – Fundamental Theorem of Arithmetic – Positional Representation of Integers - Euler Function  $\Phi (n)$  – Greatest integer function.

#### **Unit III:**

Congruences : Definition – Residue classes – Complete and least residue systems - Residue systems – Divisibility tests – Linear congruences - Solution of congruences – Chinese Remainder Theorem.

#### **Unit IV:**

Theorems of Fermat and Wilson : Little Fermat's theorem – Euler's extension – Inverse modulo – Wilson's Theorem and its Converse – Lagrange's theorem - Wolstenholme Theorem.

#### **Unit V:**

Exponent of an integer – Primitive roots – Number of primitive roots –  $1, 2, 4, p^\alpha, 2p^\alpha$  alone have primitive roots – Test for primitive Roots – Legendre Theorem.

**Text Book:**

1. **S.Kumaravelu and Susheela Kumaravelu,**” Elements of Number Theory”,  
Raja Sankar Offset Printers, Sivakasi, 1<sup>st</sup> Edition, January 2002.

**Reference Book:**

1. **Ivan Niven and Herbert S Zuckerman,** “An Introduction to the theory of  
Numbers”, 3<sup>rd</sup> Edition, Wiley Eastern Ltd., New Delhi, 2000.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: V

No. of Hours / Week: 5

Subject Code: BMAC8

**Core Paper – 8**

No. of Credit: 4

### **MODERN ALGEBRA I**

#### **Unit I:**

Sets – Mappings – Relations and Binary operations – Groups: Abelian group, Symmetric group  
Definitions and Examples.

#### **Unit II:**

Subgroups – Cyclic subgroup - Index of a group – Order of an Element – Fermat Theorem - A  
Counting Principle - Normal Subgroups and Quotient Groups.

#### **Unit III:**

Homomorphisms – Cauchy’s theorem for Abelian groups – Sylow’s Theorem for Abelian groups  
Automorphisms – Inner automorphism - Cayley’s Theorem.

#### **Unit IV:**

**Rings:** Definition and Examples –Some Special Classes of Rings – Commutative Ring – Field –  
Integral domain - Homomorphisms of Rings.

#### **Unit V:**

Ideals and Quotient Rings – More Ideals and Quotient Rings – Maximal ideal - The field of  
Quotients of an Integral Domain.

#### **Text Book:**

1. **N. Herstein**, “Topics in Algebra”, John Wiley & Sons, New York, 2003.

#### **Reference Books:**

1. **Surjeet Singh and Qazi Zameeruddin**, “Modern Algebra”, Vikas Publishing house,  
1992.
2. **A.R.Vasishtha**, “Modern Algebra”, Krishna Prakashan Mandir, Meerut, 1994 – 95.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: V

No. of Hours / Week: 5

Subject Code: BMAC9

**Core Paper – 9**

No. of Credit: 4

### **REAL ANALYSIS I**

#### **Unit I:**

The Real and Complex number systems the field axioms, the order axioms – Integers – the Unique Factorization Theorem for integers – Rational numbers – Irrational numbers – Upper bounds, Maximum Elements, Least upper bound – The completeness axiom – some properties of the supremum – Properties of the Integers deduced from the completeness axiom - The Archimedian property of the real number system – Rational numbers with finite decimal representation of real numbers – Absolute values and the Triangle inequality – The Cauchy - Schewarz, Inequality – Plus and Minus infinity and the extended real number system.

#### **Unit II:**

Basic Notions of a set Theory, Notations – Ordered Pairs – Cartesian Product of two sets – Relations and functions – Further Terminology concerning functions – one – one functions and Inverse – Composite functions – Sequences – Similar sets- Finite and Infinite sets – Countable and Uncountable sets – Uncountability of the real number system – Set algebra – Countable collection of countable sets.

#### **Unit III:**

Elements of point set topology: Euclidean space  $\mathbb{R}^n$  – Open balls and open sets in  $\mathbb{R}^n$ . The Structure of open Sets in  $\mathbb{R}^n$  – Closed sets and Adherent points – The Bolzano – Weierstrass Theorem – The Cantor Intersection Theorem.

#### **Unit IV:**

Covering – Lindelof Covering Theorem – The Heine Borel Covering Theorem – Compactness in  $\mathbb{R}^n$  – Metric Spaces – Point set topology in metric spaces – compact subsets of a metric space – Boundary of a set.



## **Unit V:**

Convergent Sequences in a Metric space – Cauchy sequences – Completeness sequences – Complete metric Spaces. Limit of a function – Continuous functions – Continuity of composite functions.

### **Text Book:**

1. **T.M.Apostol**, “Mathematical Analysis, 2<sup>nd</sup> ed.”, Narosa Publishing Company, Chennai, 1990.

### **Reference Books:**

1. **R.R.Goldberg**, “Methods of Real Analysis”, NY, John Wiley, New York 1976.
2. **G.F.Simmons**, “Introduction to Topology and Modern Analysis”, McGraw – Hill, New York, 1963.
2. **G.Birkhoff and MacLane**, “A survey of Modern Algebra, 3<sup>rd</sup> Edition”, Macmillan, New York, 1965.
4. **J.N.Sharma and A.R.Vasistha**, “Real Analysis”, Krishna Prakashan Media (P) Ltd, 1997.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: V

No. of Hours / Week: 5

Subject Code: BMAC10

**Core Paper – 10**

No. of Credit: 4

### **COMPLEX ANALYSIS I**

#### **Unit I:**

Complex number system : Absolute value of a complex number –Argument – Inequalities in terms of moduli – Relevant examples. Complex plane: Elementary transformation. i)  $w = z + \alpha$   
ii)  $w = az$  iii)  $w = 1/z$  – Definition of Extended Complex plane –Stereographic projection. Elementary and conformal mappings: Bilinear transformation.

#### **Unit II:**

Analytic functions : Complex functions: Limit of a function – Continuity of a function – Differentiability and Analyticity of a Function. Necessary conditions for Differentiability – Sufficient Conditions for Differentiability –Cauchy-Riemann Equations in Polar Coordinates– Definition of Entire function.

#### **Unit III:**

Power Series and Elementary functions: Power Series - Absolute convergence of a Power Series –Circle of convergence – Analyticity of the sum of power series in the Circle of convergence (term by term differentiation of a series) Elementary functions : Exponential, Trigonometric and Hyperbolic functions.

#### **Unit IV:**

Conjugate Harmonic functions: Definition and Determination, Conformal Mapping: Isogonal mapping – Conformal Mapping - Mapping  $z \rightarrow f(z)$ , where  $f$  is analytic, particularly the mappings.  $w = e^z$  ;  $w = \sin z$  ;  $w = 1/2(z + 1/z)$ .

## **Unit V:**

Complex Integration: Simple Rectifiable oriented curves- Integration of complex functions- Definite integral – Simply connected region - Proof of Cauchy's Theorem (using Goursat's lemma for a simply connected region). Cauchy's integral formula, Cauchy's integral formula for first derivatives - Cauchy's integral formula for Higher Derivatives -Morera's theorem.

## **Text Book:**

1. **P.Duraipandian, Laxmi Duraipandian and D.Muhilan** "Complex Analysis", Emerald Publishers, Chennai –2, 1986.

## **Reference Books:**

1. **Churchill and Others**, "Complex Variable and Applications", Tata Mecgrow Hill Publishing Company Ltd, 1974.
2. **Santhinarayan**, "Theory of functions of Complex Variable", S.Chand and Company, Meerut, 1995.
3. **Tyagi B.S.** "Functions of Complex Variable", 17<sup>th</sup> Edition, Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: V

No. of Hours / Week: 5

Subject Code: BMAC11

**Core Paper – 11**

No. of Credit: 4

### **OPERATIONS RESEARCH - I**

#### **Unit I:**

Linear Programming : Mathematical formulation of linear programming problem - Graphical solution - Simplex method .

#### **Unit II:**

Use of Artificial Variables: Big M Method – Two Phase Method – Degeneracy in Linear Programming – Duality - Duality Theorem – Duality and Simplex Method – Dual Simplex Method .

#### **Unit III:**

Transportation Problem : Mathematical formulation of the problem - Finding Initial Basic Feasible Solution using North - West Corner Rule - Matrix Minima Method - Vogel's Approximation Method - Optimum solution – MODI method .

#### **Unit IV:**

Assignment Problem: Mathematical formulation of Assignment Problem - Assignment Algorithm - Maximization case Routing problem.

#### **Unit V:**

Theory of Games: Two person zero sum game - The maximin and minimax principle - Games without saddle points - Mixed strategies - Dominance property-solution of  $2 \times 2$  rectangle game - Graphical Method.

#### **Text Book:**

1. **Kantiswarup, Gupta, P.K.Manmohan** "Operations Research", Sultanchand and sons , Edition 2000.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: V

No. of Hours / Week: 5

Subject Code: BMAC12

**Core Paper –12**

No. of Credit: 4

### **NUMERICAL METHODS**

#### **Unit I:**

Solution of Algebraic and Transcendental Equations: Bisection Method – Iteration Method – Condition for Convergence - Regula Falsi Method - Newton's Method – Criterion for Convergence – Graffe's root Squaring Method.

#### **Unit II:**

Solutions of simultaneous Linear Algebraic Equations: Gauss Elimination Method – Gauss Jordan Method – Method of Factorization - Gauss Jacobi – Gauss Siedel Method .

#### **Unit III:**

Finite Differences: First and Higher Order Differences – Forward and Backward Differences – Properties of Operator - Differences of a Polynomial - Factorial Polynomials - Relation between the Operators  $\Delta$ ,  $E$  and  $D$ - Summation of the series.

#### **Unit IV:**

Interpolation - Gregory Newton Forward and Backward Formula – Stirlings Formula- Interpolation with Unequal Intervals: Divided differences - Newton's Interpolation Formula- Lagrange's Interpolation Inverse Interpolation.

#### **Unit V:**

Numerical Differentiation and Integration: Newtons Forward and Backward Difference Formula - Stirlings Formule to Compute Derivatives -Trapezoidal rule - Simpsons  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  Rules- Difference Equations:order and Degree - Linear Difference Equation -Finding complementary function and Particular Integral.

#### **Text Book:**

1. **P.Kandasamy , K.Thilagavathi and K. Gunavathi**, "Numerical Methods", S.Chand and Company Ltd , New Delhi 2013.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: V

No. of Hours / Week: 3

Subject Code: BMAE3

**Elective Paper – 3**

No. of Credit: 3

### **PROGRAMMING IN ‘C’**

#### **Unit I:**

Overview of C : Importance of C - Sample C Programs - Basic structure of C program- Programming style - Executing a C Program. Constants, Variables and Data types : – Character set – C tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of Variables – Assigning Values to Variables – Defining Symbolic Constants.

#### **Unit II:**

Operators and Expression : Arithmetic of Operators – Relational Operators – Logical Operators – Assignment Operators- Increment and decrement Operators – Conditional Operator – Bitwise Operators - Special Operators – Arithmetic Expressions – Evaluation of Expressions – Precedence of Arithmetic Operators – Some Computational Problems – Type Conversions in Expressions – Operator Precedence and Associativity – Mathematical Functions.

#### **Unit III:**

Managing Input and Output Operations : Reading a Character – Writing a Character – Formatted Input – Formatted Output.

#### **Unit IV:**

Decision Making and Branching : Decision making with IF statement – Simple IF statement – The IF ELSE statement – Nesting of IF ... ELSE statements – The ELSE IF ladder – The switch statement – The ?: operator- The GOTO statement.

#### **Unit V:**

Decision Making and Looping : The WHILE statement – The DO statement – The FOR statement – Jumps in loops.

**Text Book:**

1. **E.Balagurusamy**, “Programming in ANSI C” , 4E, 7<sup>th</sup> reprint 2008 , Tata McGraw-Hill Publishing Company Ltd., New Delhi.

**Reference Book:**

1. **Kris A.Jamsa**, “ Programming in C”, Gazlgotia Publication, New Delhi 1990.
2. **V.Rajaraman**, “Computer Programming in C”, Prentice Hall of India, New Delhi, 1994.
3. **Stephen .G Kochan**, “ Programming in C”, CBS Publishers, New Delhi, 1991.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: V

No. of Hours / Week: 2

Subject Code: SBS3

**Skill Based Subject Paper – 3**

No. of Credit: 2

### **ACCOUNTANCY I**

#### **Unit I:**

Accounting Concept, Conventions – Rules of accounts.

#### **Unit II:**

Books of Accounts double entry system - Journal, ledger and trial balance.

#### **Unit III:**

Subsidiary Books-Purchase Book, Sales Book, Cash Book, Petty Cash Book.

#### **Unit IV:**

Final accounts of sole trading concerns.(Simple problems only)

#### **Unit V:**

Depreciation- Causes-Methods of Depreciation -Merits & demerits. (Theory only).

40% Theory – 60% Problems

#### **Text Books:**

- 1.**N.Vinayakam, P.L.Mani and K.L.Nagarajan**, “ Principles of Accountancy” ,  
Eurasia Publishing House Pvt Ltd., New Delhi – 55 , 2000.
2. **Reddy .T.S., & A.Murthy** , “Financial Accounts” , Margham Publishers.



## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: VI

No. of Hours / Week: 5

Subject Code: BMAC13

**Core Paper – 13**

No. of Credit: 4

### **MODERN ALGEBRA - II**

#### **Unit I:**

Matrices: Introduction – Addition and Scalar Multiplication of Matrices – Product of Matrices – Transpose of a Matrix – Matrix Inverse – Symmetric and Skew – Symmetric Matrices.

#### **Unit II:**

Hermitian and Skew-Hermitian Matrices – Orthogonal and Unitary Matrices – Rank of a Matrix – Characteristic Roots and Characteristic Vectors of a Square Matrix.

#### **Unit III:**

Vector space: Elementary Basic Concepts – Subspace of a Vector space – Homomorphism – Isomorphism – Internal and External direct sums – Linear span – Linear Independence and Bases.

#### **Unit IV:**

Dual Spaces – Annihilator of a subspace – Inner Product Spaces – Norm of a Vector – Orthogonal Vectors - Orthogonal Complement of a subspace – Orthonormal set.

#### **Unit V:**

Linear Transformations: Algebra of Linear Transformations – Regular, Singular Transformations – Range of  $T$  – Rank of  $T$  – Characteristic Roots – Characteristic Vectors - Matrices.

**Text Books:**

1. **R.Balakrishnan** and **M.Ramabadran**, “Modern Algebra”, Vikas Publishing House Pvt. Ltd, New Delhi, (Second Revised Edition 1994) (For Units I & II)
2. **I.N. Herstein**, “Topics in Algebra”, John Wiley & Sons, New York, 2003.  
(For Units III, IV & V)

**Reference Book:**

1. **A.R.Vasishtha**, “Modern Algebra”, Krishna Prakashan Mandir, Meerut, 1994 – 95.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: VI

No. of Hours / Week: 5

Subject Code: BMAC14

**Core Paper – 14**

No. of Credit: 4

### **REAL ANALYSIS II**

#### **Unit I:**

Examples of continuous functions – Continuity and inverse images of open or closed sets  
Functions continuous on compact sets – Topological mappings – Bolzano's theorem.

#### **Unit II:**

Connectedness – Components of a metric space – Uniform continuity : Uniform continuity and compact sets – Fixed point theorem for contractions – Monotonic functions.

#### **Unit III:**

Definition of derivative – Derivative and continuity – Algebra of derivatives – the chain rule – one sided derivatives and infinite derivatives – functions with non-zero derivatives – zero derivatives and local extrema – Roll's theorem – The mean value theorem for derivatives – Taylor's formula with remainder.

#### **Unit IV:**

Properties of monotonic functions – functions of bounded variation – Total Variation – additive properties of total variation on  $(a, x)$  as a function of  $x$  – Functions of bounded variation expressed as the difference of increasing functions – Continuous functions of bounded variation.

#### **Unit V:**

The Riemann – Stieltjes integral : Introduction – Notation – The definition of Riemann – Stieltjes integral – Linear properties – Integration by parts – Change of variable in a Riemann – Stieltjes integral – Reduction to a Riemann integral.

**Text Book:**

1. **Tom. M. APOSTOL**, “Mathematical Analysis”, 2<sup>nd</sup> ed., Addison-Wisely.  
Narosa Publishing Company, Chennai, 1990.

**Reference Book:**

1. **R.R.Goldberg**, “Methods of Real Analysis”, NY, John Wiley, New York 1976.
2. **G.F.Simmons**, “Introduction to Topology and Modern Analysis’, McGraw – Hill,  
New York, 1963.
3. **G.Birkhoff** and **MacLane**, “ A survey of Modern Algebra”, 3<sup>rd</sup> Edition, Macmillian,  
NewYork, 1965.
4. **J.N.Sharma** and **A.R.Vasistha**, “Real Analysis”, Krishna Prakashan Media (P) Ltd,  
1997.

## B.Sc. Mathematics

2014 – 2015 onwards

Semester: VI

No. of Hours / Week: 5

Subject Code: BMAC15

Core Paper – 15

No. of Credit: 4

### COMPLEX ANALYSIS - II

#### Unit I:

Zeros of a function – Cauchy's Inequality – Liouville's Theorem – Fundamental Theorem of algebra – Maximum Modulus Theorem – Gauss Mean Value Theorem. Mean Value Theorem of a Harmonic Function on a circle.

#### Unit II:

Taylor's and Laurent's series – Taylor series – Laurent series .

#### Unit III:

Singularities and Residues : Singularities - Isolated singularities – Removable Singularity - Pole Essential singularity. Behaviour of a function at an isolated singularity. Residues: Residue – Calculus of residues - Residue Theorem .

#### Unit IV:

Real definite integrals: Evaluation using the calculus of residues :

- (i) Integrals of the form  $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$  where  $f$  is a rational function in  $\cos \theta$  and  $\sin \theta$  – Integral with  $-\infty$  and  $+\infty$  as lower and upper limits with the following integrals:
- ii)  $P(x)/Q(x)$  where the degree of  $Q(x)$  exceeds that of  $P(x)$  at least 2.
- iii)  $(\sin ax).f(x)$ ,  $(\cos ax).f(x)$ , where  $a > 0$  and  $f(z) \rightarrow 0$  as  $z \rightarrow \infty$  and  $f(z)$  does not have a pole on the real axis.

### **Unit V:**

Meromorphic functions: Meromorphic functions – Theorem on number of zeros minus number of Poles – Principle of Argument – Rouché's Theorem – Fundamental Theorem of algebra – Problems (Examples) related to these Theorems.

### **Text Book:**

1. **P.Duraipandian, Laxmi Duraipandian and D. Muhilan**, “ Complex Analysis”, Emerald Publishers, Chennai –2, 1997.

### **Reference Book:**

1. **Churchill and Others**, “Complex Variable and Applications”, Tata Mcgraw Hill Publishing Company Ltd, 1974.
2. **Santhinarayan**, “Theory of functions of Complex Variable”, S.Chand and Company, Meerut, 1995.
3. **Tyagi B.S**, “Functions of Complex Variable”, 17<sup>th</sup> Edition, Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: VI

No. of Hours / Week: 5

Subject Code: BMAC16

**Core Paper – 16**

No. of Credit: 4

### **OPERATION RESEARCH - II**

#### **Unit I:**

Integer Programming: Gomory's All – IPP Method – Construction of Gomory's Constraints – Fractional Cut Method – All integer and Mixed integer Branch and Bound Method .

#### **Unit II:**

Queueing Theory: Introduction – Queueing System – Characteristic of Queueing System – Poisson Process and Exponential Distribution – Classification of Queues – Poisson Queues (M/M/I): ( $\infty$  /FIFO), (M/M/C): ( $\infty$  /FIFOL), (M/M/1): (N/FIFO) Methods.

#### **Unit III:**

Inventory Control: Types of Inventories – The inventory decisions economic order quantity – Deterministic Inventory Problems: EOQ Problem with no shortages – EOQ Problem with price break – EOQ Problem with two price break – EOQ Problem with n price break

#### **Unit IV:**

Replacement Problem: Replace problem and System Reliability – Replacement of Equipment that Deteriorates Gradually- Replacement of Equipmant the Fails Suddently.

#### **Unit V:**

Network Seduling by PERT / CPM: Inmtrouction network and Basic Components- Rules of Construction – Critical Path Analysis – Probability Considerations in PERT – Distinction between PERT and CPM

**Text Book:**

1. **Kantiswarup, Gupta, P.K.Manmohan** , “Operations Research” , Sultanchand and sons Edition 2000.

**Reference Book:**

1. **P.K.Gupta and D.Shira, O.R** (S.Chand and Company Ltd New Delhi-.1994)
2. **Taha H.A.O.R**, “An introduction Prennce Hall of India Private Ltd 1<sup>st</sup> Edition New Delhi (1995).



## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: VI

No. of Hours / Week: 5

Subject Code: BMAC17

**Core Paper – 17**

No. of Credit: 4

### **GRAPH THEORY**

#### **Unit I:**

Introduction : Application of graphs – Finite and Infinite graphs – Incidence and degree – Isolated vertex, pendant vertex and null graph. Paths and Circuits – Isomorphism – Subgraphs – walks, paths and circuits – Connected graphs, Disconnected graphs and Components – Euler graphs – Operations on graphs – More on Euler graphs – Hamiltonian paths and circuits – The Travelling salesman problem.

#### **Unit II:**

Trees and Fundamental Circuits : Trees – Some Properties of Trees – Pendant vertices in a Tree – Distance and Centres in a Tree – Rooted and Binary Trees – On counting trees – Spanning Trees – Fundamental circuits.

#### **Unit III:**

Cut sets and Cut vertices : Cut sets – Some properties of a cut set – All cut sets in a graph – Fundamental Circuits and Cut sets – Connectivity and Separability – Network flows – 1 – Isomorphism – 2- Isomorphism.

#### **Unit IV:**

Matrix representation of graphs : Incidence Matrix – Submatrices of  $A(G)$  – Circuit matrix – Fundamental circuit matrix and Rank of  $B$  – An application to a switching network – cut -set

Matrix - Relationships among  $A_f$ ,  $B_f$  and  $C_f$  – Path matrix – Adjacency matrix.

### **Unit V:**

Directed graphs : Some types of Digraphs – Digraphs and Binary Relations – Directed Paths and Connectedness – Fundamental circuits in digraphs – Matrices A, B and C of digraphs – adjacency matrix of a digraph.

### **Text Book:**

1. **Narsingh Deo**, “Graph Theory with Applications to Engineering and Computer Science”, Prentice Hall of India (P) Ltd, New Delhi, 1997.

### **Reference Book:**

1. **S.Arumugam** and **S.Ramachandran**, “Invitation to graph Theory, Scitech Publications of India Pvt., Ltd, Chennai, 2001.
2. **Frank Harary**, “Graph Theory”, Narosa Publishing House, New Delhi, 2001.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: VI

No. of Hours / Week: 3

Subject Code: BMAE4

**Elective Paper – 4**

No. of Credit: 3

### **PROGRAMMING IN ‘C++’**

#### **Unit I:**

Principles of Object- Oriented Programming: Software crisis – Software evolution – A look at procedure-oriented programming – Object oriented programming paradigm – Basic concept of Object -oriented programming – Benefits of OOP – Object Oriented Languages – Applications of OOP .

#### **Unit II:**

Tokens, Expressions and Control Structures: Introduction – Tokens – Keywords – Identifiers and constants – Basic data types – User Defined data types – Derived data types – Symbolic constants – Type compatibility – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators in C++ - Scope resolution operator – Member Dereferencing operators - Memory management operators – Manipulators – Type cast operator – Expressions and their Types – Special assignment expressions – Implicit conversions – Operator overloading – Operator precedence – Control structures.

#### **Unit III:**

Functions in C++: Introduction – The main function – Function prototyping – Call by reference – Return by reference- Inline functions – Default arguments – Constant arguments – Function overloading – Friend and Virtual Functions – Math Library functions. Managing Console I/O operations Introduction – C++ streams - C++ stream classes – Unformatted I/O operations – Formatted Console I/O operations – Managing Output with Manipulators.

**Unit IV:**

Classes and Objects: Introduction – C Structures Revisited – Specifying a Class – Defining Member Functions – A C++ program with class – Making an Outside Function Inline – Nesting of Member Functions – Private Member Functions – Arrays within a class – Memory Allocation for Objects.

**Unit V:**

Constructors and Destructors: Introduction – Constructors – Parameterized Constructors – Multiple constructors in a Class – Constructors with Default Arguments – Dynamic Initializations of objects – Copy Constructor

**Text Book:**

1. **E.Balaguruswamy**, “Object - Oriented Programming with C++”, Tata McGraw Hill Publishing Company Ltd, 1999.

**Reference Books:**

1. **Ashok N.Kamthane**, “Object Oriented Programming with ANSI and TURBO C++”, Pearson Education (P) Ltd, 2003.
2. **Bjarne Stroustrup**, “ The C++ Programming Language”, AT & T Labs, Murray Hill, New Jersey, 1998.

## **B.Sc. Mathematics**

**2014 – 2015 onwards**

Semester: VI

No. of Hours / Week: 2

Subject Code: SBS4

**Skill Based Subject Paper – 4**

No. of Credit: 2

### **FUZZY LOGIC**

#### **Unit I**

Classical sets: Relations and functions – Definition of Fuzzy sets – Basic Operations on Fuzzy sets.

#### **Unit II**

Fuzzy numbers – The Triangular Fuzzy Numbers – Trapezoidal Fuzzy Numbers.

#### **Unit III**

Fuzzy Relations – Basic Operations on Fuzzy Relations – Basic concepts of classical logic – many valued logic.

#### **Unit IV**

Linguistic variables – Linguistic Modifiers – Compositions Rules for Fuzzy Propositions.

#### **Unit V**

Statistical Average – Arithmetic Operations with Triangular and Trapezoidal Numbers.

#### **Text Book:**

1. George Bojadziev and Maria Bojadziev, 'Fuzzy Logic for Business, Finance and Management' 2<sup>nd</sup> Edition, World Scientific Publishing Co Pvt Ltd, Singapore, 1996.

## **B.Sc. Physics / Chemistry**

**2014 – 2015 onwards**

Semester: I

No. of Hours / Week: 5

Subject Code: BMPH1

**Allied Paper – 1**

No. of Credit: 4

### **ALLIED MATHEMATICS I**

#### **Unit I:**

Partial Fractions : Binomial Theorem : The General Term – Expansion of Rational Fractions – Summation of Series. Exponential Theorem: Summation of Series, The Logarithmic Series

#### **Unit II:**

Theory of Equations: Fundamental Theorem of Algebra – Symmetric Function of Roots – Relation between Roots and Coefficient of Equation – Formation of Equation – Diminish the Roots of the Equation – Reciprocal Equation. Newton- Raphson Method.

#### **Unit III:**

Matrices: Fundamental Concepts : Special Types of Matrices – Addition and Subtraction of Matrices – Matrix Multiplication – Associated Matrices. Rank of a Matrix: Elementary Operations or Transformation. Linear Equations: Homogeneous linear Equation – Non-Homogeneous Equation Characteristic Roots and Vectors: Eigen Value and Eigen Vectors – Properties of the Eigen Vectors – Cayley-Hamilton theorem. Unitary and Orthogonal Matrices: Some Properties of Orthogonal Matrices .

#### **Unit IV:**

Finite Differences: Differences of a polynomial – Factorial Polynomial. Interpolations: Newton's Forward Method - Newton's Backward Method.

Lagrange's Interpolation Formula: Different form of Lagrange's Interpolation Formula

**Unit V:**

Trigonometry: Expansions:  $\cos^n \theta$ ,  $\sin^n \theta - \cos n\theta$  and  $\sin n\theta$  –Expansion of  $\sin \theta$ ,  $\cos \theta$  and  $\tan \theta$  in powers of  $\theta$ . Hyperbolic Function: Relation between Hyperbolic Functions and Circular Functions – Periods of Hyperbolic Functions – Inverse Hyperbolic Functions. Logarithm of Complex Quantities.

**Text Book:**

1. **P.Kandasamy, K.Thilagavathy**, “Allied Mathematics Paper I”, 1<sup>st</sup> Semester, S. Chand Publishing . A Division of S. Chand & Company Pvt. Ltd, Edition 2013.

## **B.Sc. Physics / Chemistry**

**2014 – 2015 onwards**

Semester: II

No. of Hours / Week: 5

Subject Code: BMPH2

**Allied Paper – 2**

No. of Credit: 4

### **ALLIED MATHEMATICS II**

#### **Unit I:**

Methods of Integration: Standard Results – Integration by Substitution – Definite Integral – Types of Integrals (I &II).

#### **Unit II:**

Properties of Definite Integrals: Theorems, Reduction Formula: Theorems & Problems

#### **Unit III:**

Ordinary Differential Equations: Equation of First Order and of a Degree Higher than one - Equations Solvable for P - Equations Solvable for X - Equations Solvable for Y .

#### **Unit IV:**

Laplace Transformation: Definition – Laplace Transform for Standard Functions – Linear Properties – First Shifting Theorem.

#### **Unit V:**

Vector Analysis: Differentiation of Vectors – Gradient – Divergence and Curl – Integration of Vectors.

#### **Text Book:**

1. **P.Kandasamy and K.Thilagavathy.** “Allied Mathematics Paper II”, 2<sup>nd</sup> Semester .  
S. Chand Publishing, A Division of S. Chand & Company Pvt. Ltd, Edition 2013.