



**MOTHER TERESA WOMEN'S UNIVERSITY**

**KODAIKANAL - 624 101**



**DEPARTMENT OF MATHEMATICS**

**B.Sc. MATHEMATICS PROGRAMME**

**SYLLABI**

**2018 – 2019 Onwards**

**ALLOCATION OF PAPERS AND CREDITS(SEMESTER-WISE) FOR UG  
PROGRAMMES AS PER THE TANSCHER RULES  
MATHEMATICS**

**UG Course Structure under Choice Based Credit System (CBCS)  
with effect from 2018 - 2019 onwards**

P. No.	Paper Code	Course Title	Hours	Credits	Continuous Internal Assessment (CIS)	End Semester Exam (ESE)	Total
<b>Semester I</b>							
1.	ULTA11	Part-I- Tamil	6	3	25	75	100
2.	ULEN11	Part-II-English	6	3	25	75	100
3.	UMTT11	Core I - Calculus	5	4	25	75	100
4.	UMTT12	Core II- Classical Algebra	5	4	25	75	100
5.	UMTA11	Allied Theory I - Ancillary Physics-I	5	4	25	75	100
6.	UVAE11	Value Education	3	3	25	75	100
<b>Total</b>			<b>30</b>	<b>21</b>			<b>600</b>
<b>Semester II</b>							
7.	ULTA22	Part I-Tamil	6	3	25	75	100
8.	ULEN22	Part II-English	6	3	25	75	100
9.	UMTT21	Core III -Analytical Geometry 3D	6	4	25	75	100
10.	UMTT22	Core IV - Differential Equations and Laplace Transforms	5	4	25	75	100
11.	UMTA21	Allied Theory/Practical I - Ancillary Physics-II	5	4	25	75	100
12.	UEVS21	Environmental Studies	2	2	25	75	100
<b>Total</b>			<b>30</b>	<b>20</b>			<b>600</b>
<b>Semester III</b>							
13.	ULTA33	Part I-Tamil	6	3	25	75	100
14.	ULEN33	Part II- English	6	3	25	75	100
15.	UMTT31	Core V- Statics	5	4	25	75	100
16.	UMTA32	Allied II - Ancillary Mathematical Statistics-I	5	4	25	75	100
17.	UMTE31	Elective I - Vector Calculus , Fourier Series and Fourier Transform	4	3	25	75	100
18.	UMTN31	Non Major Elective Course I- Resource Management Techniques	2	2	25	75	100
19.	UMTS31	Skill Based Studies I: Astronomy –I	2	2	25	75	100
<b>Total</b>			<b>30</b>	<b>21</b>			<b>700</b>

		Semester IV					
20.	ULTA44	Part I-Tamil	6	3	25	75	100
21.	ULEN44	Part II-English	6	3	25	75	100
22.	UMTT41	Core VI - Dynamics	4	4	25	75	100
23.	UMTT42	Core VII- Sequence and Series	4	4	25	75	100
24.	UMTA42	Allied Practical II- Ancillary Mathematical Statistics –II	3	4	25	75	100
25.	UMTE42	Elective II - Discrete Mathematics	3	3	25	75	100
26.	UMTN42	Non Major Elective course II - Mathematical Aptitude	2	2	25	75	100
27.	UMTS42	Skill Based Studies II – Astronomy –II	2	2	25	75	100
<b>Total</b>			<b>30</b>	<b>25</b>			<b>800</b>
		Semester V					
28.	UMTT51	Core VIII- Abstract Algebra	5	4	25	75	100
29.	UMTT52	Core IX - Real Analysis	5	4	25	75	100
30.	UMTT53	Core X - Operations Research – I	5	4	25	75	100
31.	UMTT54	Core XI - Number Theory	5	4	25	75	100
32.	UMTT55	Core XII - Numerical Methods	5	4	25	75	100
33.	UMTE53	Elective III - Programming in C	3	3	25	75	100
34.	UMTS53	Skill Based Studies III - Mathematical Methods	2	2	25	75	100
<b>Total</b>			<b>30</b>	<b>25</b>			<b>700</b>
		Semester VI					
35.	UMTT61	Core XIII - Linear Algebra	5	4	25	75	100
36.	UMTT62	Core XIV - Complex Analysis	5	4	25	75	100
37.	UMTT63	Core XV - Operations Research-II	5	4	25	75	100
38.	UMTT64	Core XVI- Graph Theory	5	4	25	75	100
39.	UMTT65	Core XVII- Fuzzy Sets and Fuzzy Numbers	5	4	25	75	100
40.	UMTE64	Elective IV - Programming in C <sup>++</sup>	3	3	25	75	100
41.	UMTS64	Skill Based Studies IV: Numerical Methods Lab using C <sup>++</sup>	2	2	25	75	100
42.	UEAS61	Extension Activity	-	3	25	75	100
<b>Total</b>			<b>30</b>	<b>28</b>			<b>800</b>
<b>Total credits</b>				<b>140</b>		<b>Total</b>	<b>4200</b>

### **SCHEME OF EXAMINATION**

<b>Internal (Theory)</b>	<b>- 25</b>
Test	- 15
Attendance	- 5
Assignment/Technical Quiz	- 5
 Total	 - 25

**External (Theory) - 75**

### **QUESTION PATTERN**

1.	10*1 Marks (Objective type / Multiple choice 2 Question from each unit)	10
2.	5*4 Marks (from each unit either or choice)	20
3.	3*15 Marks (Open choice Any Three Questions out of 5, one question from each unit )	45
Total		75

The Internal Assessment for Practical : 25  
The External Assessment for Practical : 75

## Semester I

UMTT11

CALCULUS

5 Hours / 4 Credits

### Objectives

- To learn the different concepts of differential and integral calculus.
- To learn will acquire basic knowledge of integration
- To learn will become proficient in multiple integrals and its applications
- The learner will gain concepts of change of variables

**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:** Double Integral : Definition – Evaluation of double integral – Double integral in polar Co- ordinates.

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

**Unit V:** Beta and Gamma functions : Definitions – Covergence of  $\Gamma(n)$  – Recurrence formula of Gamma functions – Properties of Beta functions – Relation between Beta and Gamma functions – Applications of Gamma functions to multiple Integrals.

### Text Book:

**S.Narayanan and T.K.Manickachagam Pillai** – “Calculus-Volume I & II”- Viswanathan Printers and Publishers - 2011.

Unit I – Calculus – Volume I : Chapter 3 and Chapter 8-Sec 4,

Unit II - Calculus – Volume I : Chapter 10.2.1 to 3.1

Unit III - Calculus – Volume I : Chapter 5- Sec. 1 to 3.2

Unit IV – Calculus - Volume II : Chapter 5- Sec. 4 to 5.4 and Chapter 6

Unit V - Calculus - Volume II : Chapter 7 – Sec. 2.1 to 6

### Reference Books:

1. **P.Kandasamy and K.Thilagavathi** - “Mathematics for Branch I: Vol I and Vol II” - S.Chand and Company Ltd., - New Delhi - 2004.
2. **Arumugam Issac** – “ Calculus ” – New Gamma Publishing House – Jan 2011.

## Semester I

UMTT12

CLASSICAL ALGEBRA

5 Hours / 4 Credits

### Objectives

- To impart skills in the various applications of algebraic methods.
- The learner will become proficient in expansion and summation of function.
- Understanding relation between roots and coefficients of equations, sign changes, reciprocals.
- To understand terms of series, summation and its changes

**Unit I :** Binomial theorem – Greatest term in the expansion of  $(1 + x)^n$  .- sum of the coefficients - Multinomial theorem - Binomial theorem for rational index – Particular cases – Summation of binomial series - Approximate values.

**Unit II:** Exponential limit – Exponential theorem – Summation – Logarithmic series – Modification – Euler’s constant – Logarithms of Complex Numbers.

**Unit III:** Summation of series – Application of partial fraction- Summation by difference series –Recurring series – Generating function.

**Unit IV:** 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. Transformations of Equations: Roots with signs changes - Reciprocal roots.

**Unit V:**Reciprocal Equation - Solutionsof Numerical Equations: Solutionsof Numerical Equations – Newton’s methods of divisors – Horner’s method.

### Text Book:

**T.K.Manickachagam Pillai and others,** - “Algebra Volume I”, - S. Viswanathan Printers & Publisher Pvt, Ltd., - 2010.

Unit – I - Algebra Volume I – Chapter 3

Unit – II - Algebra Volume I – Chapter 4

Unit – III - Algebra Volume I – Chapter 5

Unit – IV - Algebra Volume I – Chapter 6 – Section 1 to 15.2

Unit – V - Algebra Volume I – Chapter 6 – Section 15.3 to 30

### Reference Book :

**P. Kandasamy and K.Thilagavathy,** - “ Mathematics, Volume I - S.Chand and Company Ltd., New Delhi - 2004.

## Semester II

**UMTT21**

**ANALYTICAL GEOMETRY 3D**

**5 Hours / 4 Credits**

### **Objectives**

- *This is used to model geometric objects - points, (straight) lines, and circles being the most basic of these.*
- *To acquire knowledge of planes and its properties as a 3 dimensional objects.*
- *To understand the concepts skew lines and spheres.*
- *solving problems related to geometry of three dimension.*

**Unit I:** Rectangular cartesian coordinates :Dirction cosines of the line –Angle between the lines – Projections – Direction cosines.

**Unit II:** The Plane – General equation – Angle between planes – Eqation of plane through the intersection of two given planes –Length of the perpendicular.

**Unit III:** Stright line – Symmetric form – Equation of Plane and straight line – Shortest distance between two given lines. (CIS)

**Unit IV:** Sphere – General equation – Length of the tangent – Plane section of a sphere – Equation of circle on sphere – Intersection of two spheres – Equation of the tangent plane to the sphere.

**Unit V:** Equation of a Cone with its vertex at the origin - equation of a quadratic cone with given vertex and given guiding curve - necessary condition for general equation of second degree to represent a cone - circular cone - equation of circular cone with given vertex - axis and semi vertical angle – Cylender – Equation – Enveloping cylinder.

### **Text Book:**

**T.K.Manickavachagom Pillay and T.Natarajan**, “A Text Book of Analytical Geometry – part II - Three dimensions”, Viswanathan Printers and Publishers — 2011.

Unit I - Chapter 1

Unit II - Chapter 2

Unit III - Chapter 3

Unit IV - Chapter 4

Unit V - Chapter 5 – Sec. 1 to 8

### **Reference Books:**

1. **H.K.Dasse, H.C.Saxena and M.D.Raisinghanian**, “Simplified Course in Solid Geometry(3D)” – S.Chand and Company.
2. **P.Duraipandian**, “Analytical Geomentry – 3 Dimensional “- Emerald publishers – 1998

## Semester II

### UMTT22 DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS 5 Hours / 4 Credits

#### Objectives

- To introduce the basic concepts of differential equations and Laplace Transforms.
- Understand the basic concepts of first order differential equation and its applications.
- Determine solutions to second order linear homogeneous, non-homogeneous differential equations with constant coefficients.
- Find solutions by applying Laplace transform methods.
- Understand the elementary theory of partial differential equations, and solve it using various techniques.

**Unit I :** Differential Equations of the first order and first degree : Variable separable Homogeneous, non – homogeneous, Linear equation, Bernoulli's equations, Exact differential equations. Equation of the first order and higher degree : Equations Solvable for  $dy/dx$  – equations solvable for  $y$  – equations solvable for  $x$  – Clairaut's form.

**Unit II :** Linear equations with constant Co – efficient : Definition – complementary function of a Linear equation with constant Co – efficient – particular Integral – General method of finding P.I – special methods for finding P.I of the functions of the type  $e^{ax}$ ,  $\cos ax$  or  $\sin ax$ ,  $e^{ax} V$  where  $V$  is any function of  $x$ ,  $x^m$  – Linear equations with Variable Co – efficient, Equations reducible to the linear equations.

**Unit III :** Simultaneous Differential equations : Simultaneous equations of the first order and first degree – Simultaneous linear differential equations: Linear equations of the second order : Complete solution given a known integral – Reduction to the normal form – Change of Independent Variables – Variation of Parameters – Methods of operations factors.

**Unit IV :** Formation of PDE – Lagrange method of solving linear PDE – Solution of PDE of type  $F(p,q)=0$ ,  $F(z,p,q)=0$ ,  $F(x,p) = G(y,q)$ , Clairaut's form and Charpit's method.

**Unit V :** Laplace Transforms : Definition, laplace transform of periodic functions – Some general theorems – The inverse Transform's.

#### Text Book:

**S. Narayanan and T.K. Manickavachagam pillai,**” Differential equations and its applications” S. Viswanathan Printers and Publishers Pvt. Ltd., Madras 2014.

Unit I - Chapter 2 and 4.

Unit II - Chapter 5 – Sec. 1 to 6.

Unit III- Chapter 6 and 8.

Unit IV –Chapter 12 Sec. 1 to 5.4 and 6.

Unit V- Chapter 9 – Sec. 1 to 7.

#### Reference Books:

**1. Arumugam and Isaac** - Differential equations and applications, - New gamma publishing house – 1999.

**2. P.Kandasamy and K. Thilagavathi** “Mathematics for Branch I: Volume III” S. Chand and Company Ltd., New Delhi - 2004.



## Semester III

UMTT31

STATICS

5 Hours / 4 Credits

### *Objectives*

- *To learn the application of geometric properties in equilibrium and motion of particles.*
- *To learn know to apply geometrical concepts in parallel forces, moments and couples*
- *Proficient in static equilibrium's three forces acting on a rigid body and friction.*
- *The learner to understand real time application.*

**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.

**Unit II:** 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. 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 III:** Unit of Moment – Varignon's theorem of moments – Generalised Theorem of Moments ( Principle of Moments)- Moment of a Force a 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 IV:** 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 V:** 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.

**Text Book:**

**M.K.Venkatraman**, ‘Statics’, 12<sup>th</sup> edn, Agasthiar Publications, Trichy, 2010.

Unit I - Chapter 2 – Sec. 1 to 13.

Unit II - Chapter 2 – Sec 15, 16 and Chapter 3 – Sec 1 to 10.

Unit III- Chapter 3 – Sec. 11 to 14 and Chapter 4.

Unit IV – Chapter 5 and Chapter 6 – Sec. 1 to 5.

Unit V – Chapter 7.

**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, New Delhi - 1985.
3. **Dr.P.P.Gupta**, ‘Statics’, Kedal Nath Ram Nath, Meerut, 1983-1984.

### Semester III

**UMTA32      ANCILLARY MATHEMATICAL STATISTICS-I      5 Hours / 4 Credits**

#### **Objectives**

- *To impart skills in various applications of statistical methods.*
- *Analyze the given data by using statistical methods.*
- *Understand the basic concepts of probability and related results.*
- *Use different probabilistic methods to solve problems arise in different situations.*

**Unit I :** Measures of Dispersion: Dispersion – range, quartile deviation – mean deviation – standard deviation – root mean square deviation – Relation between standard deviation and root mean square deviation – effect of change of origin and scale on moments – Karl pearson’s beta and gamma co-coefficient – measures of Skewness – Kurtosis.

**Unit II** Theory of Probability : Definition of various terms – Law of addition of probabilities for two events – statement of general law of addition of probabilities – Bayes Theorem.

**Unit III** Continuous random variables : Probability density function – various measures of central tendency, dispersion, Skewness and Kurtosis for continuous probability distribution.

**Unit IV** Mathematical Expectation : Addition and Multiplication Theorem – covariance – Expectation and variance of a linear combination of random variables – Expectation of continuous random variable – Moment generating function and its properties – uniqueness Theorem on Characteristic function- Chebyshev’s inequality – weak law and bernoulie’s law of large numbers.

**Unit V** Theoretical Discrete Distribution :Bernoulli Distribution and its moments – Binomial Distribution – moments, mean deviation about mean, mode, M.G.F and Characteristic function – recurrence relation for the moments – additive property of independent Poission variants – recurrence formula for the probability of the Binomial Distribution and Poission Distribution.

#### **Text Book :**

**S.C Gupta and V.K. Kapoor** , “Elements of Mathematical Statistics “,Sultan Chand Publishers, New Delhi. 2009.

Unit I - Chapter 3.

Unit II - Chapter 4.

Unit III- Chapter 5.

Unit IV- Chapter 6.

Unit V – Chapter 7.

#### **Reference Book:**

**P.R.Vittal**, “Mathematical Statistics ”, Margham Publications -2002- Reprint 2012.

## Semester III

### UMTE31 VECTOR CALCULUS, FOURIER SERIES AND FOURIER TRANSFORM 4 Hours / 3 Credits

#### Objectives

- To enhance basic skills in the areas of vector calculus , Fourier series and Fourier transforms
- Vectors and its product
- Multiple vector integration
- To study about Fourier series and their applications.

**Unit I:** Differentiation of Vector – Vector operator del - Grad, Div and Curl –Directional derivative - Solenoidal, Irrotational vector –formulas involving del operator – Angle between the surfaces.

**Unit II:** Vector Integration – Line, Surface and volume integrals – Gauss divergence, Green’s and Stoke’s theorems – Verification of theses theorems.

**Unit III:** Fourier Series: Definition- Dirchlet’s conditions- Fourier Series of periodicity  $2\pi$  and  $2l$  - Odd and even functions –Root mean square value of a function - Parseval’s theorem.

**Unit IV:** Half range series – Parseval’s theorem - Harmonic analysis- Complex form of Fourier Series.

**Unit V:** Fourier Transform – Properties – Fourier integral theorem – convolution theorem – problems.

#### Text Books:

1. **Arumugam and Issac** , “Analytical Geomentry 3D and vector calculus, Sci. Tech Publishers – 2011.  
Unit I – Chapter 5.  
Unit II – Chapter 6 – Sec 6.1,6.2.
2. **P. Kandasamy and K.Thilagavathy**, “ Mathematics, Vol IV, S.Chand and Company Ltd.,- 2004.  
Unit III – Chapter I .  
Unit IV – Chapter I.  
Unit V - Chapter IV.

#### Reference Book:

**T.K.Manickavasagam pillay and Narayanan** , “Vector Algebra and Analysis” Viswanathan printers and publishers Pvt Ltd.,

### Semester III

UMTN31      **RESOURCE MANAGEMENT TECHNIQUES**

**2 Hours / 2 Credits**

#### *Objectives*

- *To impart the basic concepts and applications of linear programming.*
- *The learner will analyze the different aspects of transportation problems , assignment problems and also sequencing problem.*
- *The learner will develop, organize, evaluate short, long term processes and solve problems*
- *The learner will acquire the knowledge of basics in game theory*

**Unit I:** Definition-Mathematical formation of the 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 .

**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:**

**Kanti Swarup, P.K .Gupta,Man Mohan**“Operations Research”, Sultanchand and sons , Edition - 2017.

Unit I – Chapter 2 and 4.

Unit II – Chapter 10.

Unit III – Chapter 11.

Unit IV - Chapter 12.

Unit V – Chapter 17.

#### **Reference Book :**

**P.R.Vittal and V.Malini**, “ Operations Research “ Margham Publishers – 2002.

## Semester III

UMTS31

ASTRONOMY- I

2 Hours / 2 Credits

### *Objectives*

- *The learner understand basic knowledge about natural science.*
- *The learner will acquire the knowledge of the celestial objects and origin of those objects and phenomena and their evolution*
- *The learner will acquire basic knowledge about morning , evening stars , circumpolar stars*
- *The learner will acquire basic knowledge about the diurnal motion of sun and stars.*

**Unit I:** Spherical trigonometry: Sphere - Great circles and small circles- Axis and poles of circle – distance between two points on a sphere-angle between two circles-secondaries-angular radius or spherical radius – spherical figures –spherical triangles –polar triangle –theorems - Relation between spherical triangles and its polar triangle- Some properties of Spherical triangles-principal of duality-colunar and anti podal triangles –Relation between sides and angles of a spherical triangle- Cosine formula- cotangent formula-supplemental cosine formula.

**Unit II:** Functions of half an angle- functions of half a side – Delambre's analogies –Napier's analogies- right angled spherical triangle –Napier's rules- Spherical Coordinates – relation between the Spherical and rectangular coordinates – general proof of the cosine formula – formula in plane trigonometry –Important note.

**Unit III:** Astronomy-celestial sphere – Diurnal motion, celestial axis and equator –celestial Horizon – Zenith and Nadir –celestial Meridian – Cardinal points – Northern and southern hemispheres – Eastern and southern hemispheres – Eastern and western hemispheres – visible and invisible hemispheres – Declination circles –verticals – parallactic angle –Rising and setting – transit or culmination- Due east and due west – due south and due north – annual motion of the sun, ecliptic , obliquity-first point of Aries and first point of libra – equinoxes and solstices – colours - Celestial Coordinates: Horizontal system – equatorial system- meridian system – ecliptic system – to represent the different systems of coordinates in the same figure – conversion of coordinates –relation between right ascension and longitude of the sun- to trace the changes in the coordinates of the sun in the course of a year – the longitude of the sun on any day. ( with worked examples)

**Unit IV:** Sidereal time –west hour angle of a body expressed in time units – theorem- latitude of a place – theorem- to determine – the R.A. and Declination of a body- to find the hour angle of a body at rising or setting – to find the duration of day time –to trace the changes in the azimuth of a star in the course of a day. ( with worked examples)

**Unit V:** Morning and evening stars –circumpolar stars – to find the condition that a star is circumpolar. ( with worked examples)

**Text Book:**

**S.Kumaravelu and Susheela Kumaravelu**, “Astronomy for degree classes, Rainbow Printers, Nagarcoil, Reprint 2000.(Copies can be had of S.Kumaravelu, Muruga Bhavanam, Chidambaranager, Nagercoil)

Unit I – Chapter I: Subsection 1- 24

Unit II – Chapter I: Subsection 25 -38

Unit III – Chapter II: Subsections: 39 – 68

Unit IV - Chapter II: Subsection 70 - 79

Unit V – Chapter II: Subsection 80 – 86

**Reference Book:**

**Prophet Muhammad**, “Astronomy: Supplemental Guide”, Core Knowledge Foundation, 2013

## Semester IV

UMTT41

DYNAMICS

4 Hours / 4 Credits

### *Objectives*

- Proficient in Newton's laws of motion and projectiles
- Proficient in collision of elastic bodies
- Proficient in motion under action of central forces
- To defines the path of orbiting body around central body relative to , without specifying position as a function of time.

**Unit I:** Newton Laws of Motion and Applications.

**Unit II:** Projectiles – Equation of path range etc. –Range of a particle projected on an inclined plan etc.

**Unit III:** Impulses – Impact in a fixed plane – Direct and Oblique impact.

**Unit IV:** Simple harmonic motion – Equation of motion – composition of two simple harmonic motions – simple pendulum.

**Unit V:** Central Orbits – components velocity and accelerations along and perpendicular to the radius vector – differential equations of a central orbit pedal equation.

### **Text Book:**

**M.K.Venkatraman**, 'Dynamics', 9<sup>th</sup> edn, Agasthiar Publications, Trichy,1997.

Unit I – Chapter 4 – Sec. 4.1 to 4.37

Unit II – Chapter 6 – Sec. 6.1 to 6.17.

Unit III – Chapter 8 – Sec. 8.1 to 8.10.

Unit IV – Chapter 10 – Sec. 10.1 to 10.16.

Unit V – Chapter 11 – Sec. 11.1 to 11.15.

### **Reference Books:**

1.**A.V.Dharmapadam**, 'Dynamics', S.Viswanathan Printers and Publisher Pvt.,Ltd.,Chennai 1993.

2. **K.Viswantham Naik and M.S.Kasi**, 'Dynamics', Emerald Publishers, 1992 .

3. **Narayanamurthy and N.Nagarathnam** , 'Dynamics', National Publishers, New Delhi,1991..



## Semester IV

UMTT42

### SEQUENCES AND SERIES

4 Hours / 4 Credits

#### *Objectives*

- *To enhance basic skills in the areas of sequences and series.*
- *Types of sets, inequalities and sequences*
- *Behavior of sequences and its subsequences*
- *Infinite series and various tests for finding rearrangements its convergence*

**Unit I :** Sequences: Definition – Bounded sequences – Monotonic sequences – Convergent sequences – Divergent and Oscillating sequences – Solved problems – Behaviour of monotonic sequences.

**Unit II :** Some theorems on Limits – subsequences – Limit points – Cauchy sequences – the upper and Lower limits of a sequence – solved problems.

**Unit III :** Series of Positive terms : Definition – Cauchy's general Principle of convergence – comparison test – Kummer's Test – D' Alembert's ratio test – Raabe's Test – De morgan and Bertrand's test , Gauss's test.

**Unit IV :** Cauchy's root test – Cauchy's Condensation test – Integral test – Series of arbitrary terms: Alternating series – Leibnitz's test – Absolute convergence – Test for Convergence of Series of Arbitrary terms – Dirichlet's test – Abel's test.

**Unit V :** Rearrangement of series: Definition – Riemann's theorem – multiplication of series : Definition – Abel's theorem – Merten's theorem – Power series.

#### **Text Book:**

**Arumugam and Issac**, "Sequences and series", New Gamma publishing House, December 2015. **Brouch(refeold writes Algebra,)**

Unit I – Chapter 3 – 3.1 to 3.7.

Unit II – Chapter 3 – 3.8 to 3.12.

Unit III – Chapter 4 – 4.1 to 4.3.

Unit IV –Chapter 4 – 4.4 and 4.5, Chapter 5 – 5.1 to 5.3.

Unit V – Chapter 5 – 5.4 to 5.6.

#### **Reference Book:**

**S.C.Malik ,Savita Arora.,**"Mathematical Analysis", New Age International Private Limited.

## Semester IV

UMTA42      ANCILLARY MATHEMATICAL STATISTICS - II      3 Hours / 4 Credits

### *Objectives*

- *To impart skills in various applications of statistical methods.*
- *Analyze the given data by using statistical methods.*
- *Construct and evaluate hypothesis tests.*
- *Apply sampling techniques to real life situations.*

**Unit I:** Theoretical Continuous Distributions – Rectangular Distribution – Normal Distribution as Limiting form of Binomial Distribution – Chief Characteristic of Normal Distribution and Normal Probability curve – Mode, Median, M.G.F, Moments, Mean Deviation from the Mean of Normal Distribution – A linear combinations of Independent Normal variants – Points of Inflection of Normal Curve – Area property- Fitting of Normal distribution.

**Unit II :** Curve fitting – Fitting of a straight Line, Second degree Parabola Polynomial of  $k^{\text{th}}$  degree change of Origin – fitting of power curve  $y=ax^b$  fitting of Exponential curves  $y=ab^x$ ,  $y=ae^{bx}$  - Theory of attributes – Notations – Dichotomy Classes and Class frequencies – order – relation between class frequencies – class symbols as operators – Condition, for consistency of data – Independence of Attributes and its criterion – association of Attributes – Yules – Co-efficient of association.

**Unit III :** Correlation and regression bivariate Distribution – Correlation – Scatter diagram- Karl Pearson Co-efficient for correlation and Limits – calculation of Correlation Co-efficient for a bivariate frequency Distribution- Rank Correlation- Repeated Ranks – Regression – Line of Regression – Regression Co-efficient and Its Properties – Angles between two lines of regression.

**Unit IV:** Sampling and Large sample test – Introduction- Types of sampling – parameters and Statistics – Test of Significance – Null – Hypotheses – test of Significance for single mean, Difference of Means – Difference of standard Deviation, Exact Sampling Distribution – Chi-square variate – Derivation- M.G.F.Mode, Skewness of Chi-square Distribution – additive property of Chi-square variates – Application Chi-square Distribution – Chi-square test for population Variance and Goodness of Fit – Independence of Attributes.

**Unit V:** Exact Sampling distribution – t,f and z distribution, definitions and Applications to t,f and z distribution – test for single mean, differencesw of mean, Observed Correlation Co-efficient – f test for quality of population on variance .

**Text book :**

**S.C.Gupta&V.K.Kapoor** ,”Elements of Mathematical Staistics”, course of Madras: Madurai University, Sultan Chand Publishers, New Delhi 2009.

Unit I - Chapter 8 -8.1 to 8.2.11,8.2.14.

Unit II -Chapter 9- 9.1 to 9.3 and chapter 11

Unit III -Chapter 10.

Unit IV - Chapter 12.

Unit V -Chapter 13 and 14.

**Reference Books :**

1. **Arumugam and Thangpandi** “Probability and Statistics”, New Gamma Publishing House,2006.
2. **P.R. Vittal**, “ Mathematical Statistics”, Margham Publications, 2012.

## Semester IV

UMTE42

DISCRETE MATHEMATICS

3 Hours / 3 Credits

### Objectives

- To study of and, or and nor logics by truth tables.
- To study of normal forms.
- Analysis Free and Bound variable formulas.
- Understand Types of Grammar, function of Pushdown automata.

**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.

**Unit III:** Theory of Inference – Truth Table Technique – Rules of Inference - Inconsistent Premises – Indirect Method of Proof – Predicate calculus- Free and Bound Variables – Valid Formulas and Equivalences – Inference Theory of Predicate Calculus.

**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 Automation – Non-Deterministic Automates – Conversion of NDFSA to DFSA- Pushdown automata.

### Text Book:

1. **J.P.Tremblay, R. Manohar** – “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw – Hill Edition 1997. (Ref) **Murukesan from Kovai**  
Unit I- Chapter :1- 1-1,1-2:1-2.1 to 1-2.11.  
Unit II-Chapter :1-3.1 to 1-3.4  
Unit III- Chapter: 1-4.1to 1- 4.3 .1-5 to1-5.4,1-6:1-6.1 -1-6.4
2. **Dr.Rani Siromoney, Formal Languages and Automata, The Chiristian Literature Society, Revised Edition 1979.**  
Unit IV-Chapter2 : 2.1 to 2.6  
Unit V-Chapter 5: 5.1 and Chapter 6

### Reference Books:

1. **B.S.Vatssa**, “Discrete Mathematics”, WISHWA PRAKASHAN,1993.
2. **V.Sundaresan,K.S.Ganapathy Subramanian, K.Ganesan**, “Discrete Mathematics”, A.Rd.Publications, 1998.
3. **T.Veerarajan**, “Discrete Mathematics”, McGraw Hill Education (India)Pvt.Ltd,New Delhi, 2014.

## Semester IV

UMTN42

MATHEMATICAL APTITUDE

2 Hours / 2 Credits

### *Objectives*

- *To impart skills in numerical and quantitative techniques.*
- *able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.*
- *able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.*

**Unit I :** Numbers – HCF – LCM – Problems on numbers. (Chapters 1, 2 & 7)

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

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

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

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

### **Text Book:**

**R.S.Aggarwal**, Scope and treatment as in “Quantitative Aptitude” , S.Chand & Company Ltd., Ram Nagar, New Delhi -2007.

## Semester IV

UMTS42

ASTRONOMY-II

2 Hours / 2 Credits

### *Objectives*

- *Learnre able to knowledge about the Earth's pole, it is counterclockwise rotation.*
- *Knowledge of equation of Time, seasons from earth rotation*
- *Calculation to prepar calender and conservation of Time.*
- *It applies mathematics, physics, and chemistry.*

**Unit I:** The zones of earth –to trace the variations in the durations of day and night during the year at different stations –to find the duration of perpetual day in a place of latitude – to find analytically the conditions for perpetual day and night –Terrestrial latitudes and longitudes – Phenomena depending on the change of latitudes and longitudes-Date line – Shape of Earth – Geographical and geocentric latitudes of a place – to find the reduction of latitude –Ellipicity – to prove that reduction of latitude is  $c \sin^2\phi$ - to find the geocentric distance of a station of geographical latitude  $\phi$  - to find the radius of curvature of the earth at a station of geographical latitude  $\phi$  - Geographical and Nautical mile.

**Unit II:** Radius of earth – Another method to determine the radius of earth -arguments in favour of earth's rotation- experimental proofs for the rotation of earthDip of Horizon –to find a expression for Dip.

**Unit III:** To find the distance between two mountains whose tops are just visible from each other – Effects of Dip- to find the acceleration in the time of rising of a star due to dip-Twilight –tofind the duration of twilight- to find the condition that twilight may last throughout night –to find the number of consecutive nights having twilight throughout night – to find the duration of twilight when it is shortest- civil, nautical and astronomical twilights.

**Unit IV:** Equation of time: Introduction- Dynamical mean sun- equation of time – analytical expression for the equation of time –effect of equation of time on the lengths of morning and evening-to prove that the equation of time vanishes four times a year –seasons –causes of seasons.

**Unit V:** Calendar:Different kinds of year –civil year, Julian calendar – Gregorian calendar – Julian date –Besselian year -Conversion of Time: Relation between sidereal and mean times –to convert mean solar time into sidereal time - to convert sidereal time into mean solar time – to find the sidereal time at a given instant of mean solar time on a given date at Greenwich – to find the mean time corresponding to a given instant of sidereal time at Greenwich – the difference between local times – to find the sidereal time from local mean time for a given place- to find the

mean time from the sidereal time for a given place- given the right ascensions of a star and the mean sun, to find the mean time of transit of the star.

**Text Book:**

**S.Kumaravelu and Susheela Kumaravelu** , Astronomy for degree classes, Rainbow Printers, Nagarcoil,2005.

Unit I : Chapter III: Subsection 87 -101

Unit II : Chapter III: Subsection 102 -107.

Unit III : Chapter III: Subsection 108-116

Unit IV : Chapter VII: Subsection 166- 170 and 172-174

Unit V : Chapter VII: Subsection 175- 184 and 186- 189.

**Reference Book:**

**Prophet Muhammad**, “Astronomy: Supplemental Guide”, Core Knowledge Foundation,2013

## Semester V

UMTT51

ABSTRACT ALGEBRA

5 Hours / 4 Credits

### *Objectives*

- *To provide some knowledge about various algebraic structures.*
- *recognize the basic properties of groups and subgroups.*
- *understand the types of homomorphism and use them to classify groups.*
- *apply the theorems to study the structure of groups.*
- *recognize the basic properties of rings, fields and integral domains.*
- *using the algebraic methods for solving problems.*

**Unit I:** Groups – Definition and Examples – Elementary Properties of a Group Quaternion group Groups of symmetries - Order of an Element.

**Unit II:** Subgroups – Homomorphism- Cayley's Theorem - Group of Permutation - Cyclic Groups- Automorphism .

**Unit III:** Cosets and Lagranges Theorem – Normal Subgroups and Quotient Groups- Fundamental theorem of homomorphism.

**Unit IV:** Rings-Definitions and Examples - Elementary properties of rings – division rings and fields Ordered integral domain –subring and sub field-prime fields.

**Unit V:** Homomorphism of rings and their types- Ideals – Quotient structure and Isomorphism theorems- Maximal and Prime Ideals-Field of quotient of an integral domain.

### **Text Book:**

**T.K.Manickavasagampillai and Narayanan** , “Modern Algebra”volume I & II Viswanathan printers and publishers Pvt Ltd., Edition 1982.

Unit I- Chapter 6 – 6.1 to 6.2

Unit II- Chapter 6 – 6.3 to 6.7

Unit III- Chapter 6 – 6.8 to 6.10

Unit IV- Chapter 7 – 7.1 to 7.4

Unit V- Chapter 7 – 7.5 to 7.9

### **Reference Books:**

1. **Arumugam S and Thangapandi Issac** ,” Modern Algebra”, SCITECH Publications, Chennai, Edition 2003.
2. **A.R.Vasishtha**, “Modern Algebra”, Krishna Prakashan Mandir, Meerut, 1994 – 95.



**Objectives**

- Understand the basic concepts of sets
- To provide knowledge about Metric Spaces
- The learner will acquire knowledge of open/closed sets and its properties
- The learner will acquire knowledge of Continuity, Connectedness, and Compactness and apply theorem

**Unit I:** Countable and Uncountable sets- Inequalities of Holder and Minkowski- Metric spaces- Definition and Examples-Bounded set in a metric spaces- Open balls in a metric spaces- open sets-subspaces- Interior of a set.

**Unit II:** Closed sets – Closure- Limit point- Dense sets- Complete metric space- Introduction- Completeness-Baire's Category theorem.

**Unit III:** Continuity: Introduction- Continuity-Homeomorphism-Uniform continuity –Discontinuous function on  $\mathbb{R}$ .

**Unit IV:** Connectedness: Introduction- Definition and Examples –Connected subset of  $\mathbb{R}$  – connectedness and continuity.

**Unit V:** Compactness: Introduction- compact space –compact subset of  $\mathbb{R}$ -equivalent characterisation for compactness –Compactness and continuity.

**Text Book:**

**Arumugam S and Thangapandi Issac ,** "Modern Analysis", New gamma Publishing house , Edition 2013.

Unit I – Chapter 1 & 2 – 1.2 to 2.6)

Unit II – Chapter 2 & 3 – 2.7 to 3.2)

Unit III – Chapter 4 – 4.1 to 4.4)

Unit IV –Chapter 5

Unit V – Chapter 6

**Reference Books:**

1. **Walter Rudin**, "Principles of Mathematical Analysis", McGraw-Hill International. Editions (3<sup>rd</sup>) – 1976.
2. **V.Karunakaran**, "Real Analysis", Pearson Publications, Edition-2012.
3. **Appostol**, "Mathematical Analysis", Narosa Publishing House-Second Edition-2002.

## Semester V

UMTT53

OPERATIONS RESEARCH – I

5 Hours / 4 Credits

### Objectives

- To impart the basic concepts and applications of linear programming.
- The learner will formulate a linear programming problem and solve them graphically and simplex method
- The learner will be able to understand the concepts of duality programming
- The learner will analyze the different aspects of transportation problems and also assignment problems
- Students will be able to identify the basic analysis of various inventory models.
- The learner will develop, organize, evaluate short, long term processes and solve problems

**Unit I:** Linear Programming : Mathematical formulation of linear programming problem- Graphical solution- Simplex method - Use of Artificial Variables: – Big M Method – Two Phase Method .

**Unit II:** 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-Minimization case Routing problem.

**Unit V:** 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.

### Text Book:

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

Unit I- Chapter 2,3,and 4 - 4.1 to 4.5  
Unit II- Chapter 5 -5.1 to 5.7  
Unit III- Chapter 10  
Unit IV- Chapter 11  
Unit V- Chapter 19 – 19.1 to 19.10,19.12

### Reference Books:

1. **J.K.Sharma**, “Operations Research”, Macmillan India Ltd. 1997.
2. **Prem Kumar Gupta, D.S. Hijra**, “Operations Research”, S. Chand & Company Ltd, 2002.
3. **P.R.Vittal**, “Operations Research”, Margham Publications, 2002.

## Semester V

UMTT53

NUMBER THEORY

5 Hours / 4 Credits

### Objectives

- The learner will acquire knowledge of basic concepts of number theory
- The learner will become proficient in various types of functions
- The learner will be know the primitive roots
- apply the theorems to study the numbers.

**Unit I:** Well – Ordering Principle(WOP)- Principle of Finite Induction- The Division Algorithm – Basis Representation Theorem- Binomial Coefficients- Divisibility Theory : Greatest Common Divisor-Least common Multiple- Linear Diophantine Equations- Fundamental Theorem of Arithmetic - Some Question Regarding Primes.

**Unit II:** Congruences: Definition – Residue System – Test of Divisibility – Linear congruences - Solving Polynomial congruences – An Application of Congruences to Diophantine Equations - Fermat’s Little theorem –Euler’s Generalisation of  $FLT_1$  .

**Unit III:** Wilson’s Theorem- Euler’s  $\Phi$ -Function- Arithmetic Functions: The Function  $\tau$  and  $\sigma$  – The Möbius Function- Multiplicative Arithmetic Functions- Inversion Formula- Greastest Integer Function.

**Unit IV:** Primitive roots : Exponents – Primitive roots Modulo a Prime – Determination of Integers having Primitive roots – Indices – Euler’s Criterion – Legendre Symbol and its Properties – Gauss Lemma.

**Unit V:** Quadratic Reciprocity Law and its applications – Jaccobi Symbol – Perfect Numbers – Mersenne Primes-Fermat Numbers-Phythagorean Triples-Fermat’s Last Theorem.

### Text Book:

**S.B.Malik** ,” Basic Number Theory”,Second Revised Edition, Vikas Publishing House PVT LTD, 2009

Unit I – Chapter : 1&2

Unit II – Chapter Chapter : 3 , Chapter : 4 – 4.1 ,4.2

Unit III – Chapter : 4 – 4.3 , 4.4 & Chapter : 5

Unit IV – Chapter :6 ,7- 7.1 to 7.3

Unit V – Chapter : 7- 7.4 to 7.6 , Chapter : 8

### 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.

## Semester V

UMTT55

NUMERICAL METHODS

5 Hours / 4 Credits

### Objectives

- To develop efficient algorithms for solving problems in Science, Engineering and Technology.
- The learner will analyze the different aspects of numerical solution of algebraic and transcendental equations.
- Students will be able to identify the basic concept of numerical differentiation and integration, principle of least squares.
- The learner will become knowledgeable in solving solution to simultaneous linearequations.

**Unit I:** Solution of Algebraic and Transcendental Equations: Bisection Method – Iteration Method – Condition for Convergence-Regula Falsi Method-Newton’s 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 – Gauss 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<sup>rd</sup> and 3/8<sup>th</sup>

### Text Book:

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

Unit I – Chapter 3 -3.1 to 3.4

Unit II – Chapter 4 -4.1 ,4.2,4.4,4.7 to 4.9

Unit III – Chapter 5- 5.1 to 5.4,5.7

Unit IV –Chapter 6, 7 -7.1 to 7.5 & 8

Unit V – Chapter 9

### Reference Books:

1. **Arumuga, Issac, Somasundaram**,”Numerical Analysis”, New Gamma Publishing House, Palayam Kottai 2003.
2. **G. Balaji**, “Numerical Methods”, G.Balaji Publishers, Chennai 2007.

## Semester V

UMTE53

### PROGRAMMING IN C

3 Hours / 3 Credits

#### Objectives

- To develop programming skills in C and its object oriented concepts.
- The learner will become proficient in object oriented programming concept and proficient in C tokens
- Proficient in C operators , class declaration and definition and its objects
- Proficient in conditional statements and loop concept

**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:

**E.Balagurusamy**, “Programming in ANSI C” , 4<sup>th</sup> Edition , Tata McGraw- Hill Publishing Company Ltd., New Delhi, Ninth Reprint 2009.

Unit I – Chapter 1&2

Unit II – Chapter 3

Unit III – Chapter 4

UnitIV–Chapter

5

Unit V – Chapter 6

#### Reference Books:

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.

## Semester V

**UMTS53 MATHEMATICAL APTITUDE**

**2 Hours / 2 Credits**

### ***Objectives***

- *To impart skills in numerical and quantitative techniques.*
- *able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.*
- *proficient in applying graphs, charts and probability techniques on various problems.*
- *proficient in the problems on relations, coding and decoding.*
- *able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.*
- *able to do fast calculation.*

**Unit I:** Problems on Ages-Time and Work-Time and Distance- Problems on Trains

**Unit II:** Permutation and Combination-Odd Man out Series

**Unit III:** Coding-Decoding- puzzle test .

**Unit IV:** Direction sense test –Logical venn diagrams.

**Unit V:** Logic- Statement – Assumptions-Arguments- Statements-Conclusion-Deriving conclusion from passages.

### **Text Books:**

1. **R.S.Agarwal**, “Quantitative Aptitude For Competitive exams” 7 th revised edition
  2. **R.S.Agarwal**,”A Modern Approach to Verbal and Non-verbal Reasoning “3 th revised edition
- Unit I- TB1: Chapter 8,15,17,&18  
Unit II- TB1:Chapter 30&35  
Unit III- TB2:Part I-Section I-Chapter 4&6  
Unit IV- TB2:Part I-Section I-Chapter 7&9  
Unit V- TB2:Part I-Section I-Chapter 1,2,3,5&6

## Semester VI

UMTT61

LINEAR ALGEBRA

5 Hours / 4 Credits

### Objectives

- *To introduce the fundamentals of Vector spaces.*
- *recognize the basic properties of vector spaces*
- *understand the concepts of linear algebra in geometric point of view*
- *visualize linear transformations as a matrix form*
- *formulate the importance and applications of linear algebra in many branches of mathematics*

**Unit I:** Vector spaces: Definition and examples – Properties of vector space-Linear combination –linear span – linear dependence and independence .

**Unit II:** Basis and Dimension – Quotient space – Isomorphism of vector spaces –Direct sums.

**Unit III:** Matrix of a linear transformation - Rank and nullity of a Linear transformation-characteristic equation of a matrix- Matrix Polynomial – Elementary matrix and transformations.

**Unit IV:** Row rank ,column rank and rank of a matrix-Row space and column space – linear equation –consistency of equation – non homogeneous linear system.

**Unit V:** Similar and Congruent matrices-Inner product spaces : Definition and examples – Orthogonality –Orthogonalization - Orthogonal complement

### Text Book:

**T.K.Manickavasagampillai and Narayanan** , “Modern Algebra”volume II Viswanathan printers and publishers Pvt Ltd., Edition 1982.

Unit I- Chapter 8 -8.1 to 8.5

Unit II- Chapter 8 -8.6 to 8.10

Unit III- Chapter 8 -8.14 to 8.18

Unit IV- Chapter 8 -8.20 ,8.21

Unit V-Chapter 8 -8.22 to 8.24

### Reference Books:

1. **Arumugam S and Thangapandi Issac** ,” Modern Algebra”, SCITECH Publications, Chennai, Edition 2003.
2. **A.R.Vasishtha**, “Modern Algebra”, Krishna Prakashan Mandir, Meerut, 1994 – 95

## Semester VI

UMTT62

COMPLEX ANALYSIS

5 Hours / 4 Credits

### Objectives

- To introduce the concepts of complex numbers and analytic functions.
- The learner will acquire basic concepts of analytic function and its properties
- The learner will acquire basic knowledge about conformal and bilinear transformation
- The learner will gain knowledge of integration of complex valued function
- The learner will become proficient in series of analytic function
- The learner will acquire skills of finding integral values of complex function using residues

**Unit I:** Analytic functions – Cauchy-Riemann equations – Sufficient conditions – Harmonic functions – Cauchy- Riemann equations in polar co-ordinates – Milne Thomson's method. - Conformal Mapping- Bilinear Transformation.

**Unit II :** Complex integration – Cauchy's integral theorem – Cauchy's integral formula – Derivatives of analytic functions – Morera's theorem – Cauchy's inequality – Liouville's theorem – Fundamental theorem of algebra

**Unit III :**Expansion of functions in power series– Taylor's theorem – Taylor's series and Laurent's series

**Unit IV :**Zero s of an analytic function-singular points - essential singularity - study of the function for the infinite value of Z- Argument Principle – Rouché's theorem - Fundamental theorem of algebra

**Unit V :** Calculus of Residues – Introduction- Residues - Cauchy's Residue Theorem - evaluation of definite integrals .

### Text Book:

**Arumugam S and Thangapandi Issac ,** "Complex Analysis", Scitech Publication pvt ltd, Edition 2014.

Unit I – Chapter 2&3

Unit II – Chapter 6

Unit III – Chapter 7 -7.0 to 7.2

Unit IV – Chapter 7 -7.3 ,7.4

Unit V – Chapter 8

### Reference Books:

- 1.Santhinarayan, "Theory of functions of Complex Variable", S.Chand and Company, Meerut,1995.
2. T.K.M.Pillay, Dr.S.P.Rajagopalan & Dr.R.S. Sattanathan,"Complex Analusis", S. Viswanathan (Printers & Publisers),Pvt.Ltd. Revised Edition 2007 Reprint 2013.
3. Lars V Ahlfors "Complex Analysis" McGraw – Hill Kogakusha, Ltd. 3<sup>rd</sup> Edition, 1999.



## Semester VI

UMTT63

OPERATIONS RESEARCH - II

5 Hours / 4 Credits

### Objectives

- To impart mathematical modeling skills through operations research techniques.
- The learner will become proficient in sequence modeling and processes in mathematics and engineering.
- The learner will acquire the knowledge of Simulation
- The learner will acquire the knowledge of basics in game theory and replacement problems
- The learner will become to understand the role and application of PERT/CPM for project scheduling.

**Unit I:** Sequencing models and related problems: Sequencing Problems- assumption in Sequencing Problems – processing n jobs through one machine - processing n jobs through two machines - processing n jobs through three machines - processing 2 jobs through m machines - processing n jobs through m machines – solution of complicated Sequencing Problems- problems related to sequencing(routing problem in networks) – minimal path problem(shortest acyclic route models).

**Unit II:** Simulation: Introduction-when to use Simulation?- what is Simulation?- advantage of the Simulation technique- limitation of the Simulation- application of Simulation- Monte Carlo Simulation – generation of random numbers – Simulation languages.

**Unit III:** 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.

**Unit IV:** Replacement Problem: Replace problem and System Reliability – Replacement of Equipment that Deteriorates Gradually- Replacement of Equipment that Fails Suddenly.

**Unit V:** Network Scheduling by PERT/CPM: Introduction network and Basic Components- Rules of Construction – Critical Path Analysis – Probability Considerations in PERT – Distinction between PERT and CPM.

### Text Book:

Kantiswarup, Gupta, P.K.Manmohan, “**Operations Research**” , Sultanchand and sons Edition 2002 ,Reprint 2017.

Unit I – Chapter 12

Unit II – Chapter 22

Unit III – Chapter 17

Unit IV – Chapter 18

Unit V – Chapter 25

### Reference Books:

1. P.K.Gupta and D.Shira, **OPERATIONS RESEARCH** (S.Chand and Company Ltd New Delhi-.1992, Reprint 1994.
2. Taha H.A. ,**OPERATIONS RESEARCH** , “An introduction Prentice Hall of India Private Ltd 1<sup>st</sup> Edition New Delhi (2008) .

## Semester VI

UMTT64

GRAPH THEORY

5 Hours / 4 Credits

### **Objectives**

- To acquire knowledge of different types of graphs.
- To understand different Models of a graph
- To understand how to solve different real life problems
- To understand many techniques to solve a particular problem
- To understand directed graphs.

**Unit I:** Graphs –Pictorial representation- subgraphs-Isomorphism and degrees- Walks and connected graphs- cycles in graphs –cut –vertices and cut edges.

**Unit II:** Eulerian and Hamiltonian graphs:Eulerian graphs - Fleury's Algorithm - Hamiltonian Graphs – Weighted graphs.

**Unit III:** Bipartite Graphs: Bipartite graphs-Marriage problem-trees.Matrix representations.

**Unit IV:** Planar Graphs: Planer graphs- Euler's Formula –Platonic solids-Dual of a plane graphs-Characterization of planer graphs.

**Unit V:** Directed Graphs:Directed graphs-Connectivity in diagraphs-Strong orientation of graphs-Eulerian digraphs-Tournaments.

### **Text Book:**

**S.A.Choudum**, “A first Course in Graph Theory”, Macmillan india limited,1999.

Unit I: Chapter 1

Unit II: Chapter 2

Unit III: Chapter 3 -3.1 to 3.3 &4-4.1

Unit IV: Chapter 5

Unit V: Chapter 7

### **Reference books:**

**1.Arumugam S and Thangapandi Issac** ,” Graph theory”, Scitech Publication pvt ltd, Edition 2014.

**2. S.A.Choudum**, “A first Course in Graph Theory”, Macmillan india limited,2007.

## Semester VI

UMTT65

**FUZZY SETS AND FUZZY NUMBERS**

**5 Hours / 4 Credits**

### **Objectives**

- *recognize the concept of fuzzy sets and its properties.*
- *distinguish fuzzy sets from crisp sets.*
- *perform various types on fuzzy sets.*
- *understand the fuzzy numbers and fuzzy Lattice relations.*

**Unit I:** From classical (crisp) sets to Fuzzy sets – Introduction – Crisp sets: An overview – Fuzzy sets: Basic types - Fuzzy sets: Basic concepts.

**Unit II :** Fuzzy sets vs Crisp sets: Additional properties of  $\alpha(\alpha)$ -cuts – Representations of fuzzy sets- Extension Principle for fuzzy sets.

**Unit III :** Operations on fuzzy sets : Types of operations – Fuzzy complements- Fuzzy intersections:  $t$  – Norms- Fuzzy unions :  $t$  – Conorms - Combinations of operations.

**Unit IV :** Aggregation operations - Fuzzy Numbers – Linguistic Variables-Arithmetic Operations on Intervals - Arithmetic Operations on Fuzzy numbers.

**Unit V :** Lattice of Fuzzy numbers - Fuzzy equations- Crisp vs Fuzzy Relations – Projections and Cylindric Extension – binary Fuzzy Relations – Binary Relations on a Single Set- Fuzzy Equivalence Relations.

### **Text Book :**

**George J. Klir / Bo Yuan, Fuzzy sets and Fuzzy Logic, Theory and Applications**, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.

Unit – I : Chapter 1: Sections 1.1 – 1.4

Unit – II : Chapter 2: Sections 2.1 - 2.3

Unit – III: Chapter 3: Sections 3.1 - 3.5

Unit – IV: Chapter 3: Sections 3.6 and Chapter 4: Sections 4.1 -4.4

Unit – V : Chapter 4: Sections 4.6 and Chapter 5: Sections 5.1 – 5.5

### **Reference Book:**

1. George J. Klir & Tina A. Folger “Fuzzy Sets, Uncertainty & Information” PHI Learning Private Limited, 2012.
2. D. Driankov, Hellendoorn & M. Reinfrank “An Introduction to Fuzzy Control” Narosa Publishing House, Reprint 2001.

## Semester VI

UMTE64

PROGRAMMING IN C++

3 Hours / 3 Credits

### *Objectives*

- *To develop programming skills in C++ and its object oriented concepts.*
- *The learner will become proficient in object oriented programming concept and proficient in C++ tokens*
- *Proficient in C++ operators*
- *Proficient in C++ class declaration and definition and its objects*
- *Proficient in constructors, destructors*

**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-Destructors .

**Text Book:**

**E.Balaguruswamy**, “Object - Oriented Programming with C++”, Tata McGraw Hill Education Private Limited, New Delhi, Tenth Reprint 2010.

Unit I – Chapter 1 & 2

Unit II – Chapter 3

Unit III -Chapter 4 & 10

Unit IV – Chapter 5-5.1 to 5.10

Unit V – Chapter 6-6.1 to 6.7,6.11`

**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.

## Semester VI

UMTS64

NUMERICAL METHODS LAB USING C++

2 Hours / 2 Credits

1. Write a Program to find the Smallest positive / Largest negative root using simple iteration method
2. Write a Program to find the Smallest positive / Negative root using Regula Falsi method.
3. Write a Program to find the Smallest positive / Negative root using Newton-Raphson's method.
4. Write a Program to find the solution of system of equation using Gauss Jacobi method..
5. Write a Program to find the Matrix inversion using Gauss Jordan method
6. Write a Program to interpolate y for given x from the given sets of values of x and y by Newton's forward method.
7. Write a Program to find interpolate y for given x from the given sets of values of x and y by Newton's backward method.
8. Write a Program to find interpolate y using the Lagrange's method
9. Write a Program to derivative at initial point by Newton's forward method
10. Write a Program to integration using Trapezoidal & Simpson's method

### Text Book:

1. **T.VEERARAJAN & T.RAMACHANDRAN**, "Theory and Problems in Numerical Methods with Programs in C and C++", Tata McGraw Hill Publishing Company Ltd, 2004.

**B.Sc. Physics / Chemistry**  
**Semester I**

**ANCILLARY MATHEMATICS I**

**5 Hours/ 4 credits**

***Objectives***

- *The learner will become proficient in expansion and summation of function*
- *The learner will acquire knowledge of solving problems in matrices*
- *The learner will be capable of solving the interpolation problems.*
- *The learner will gain knowledge of trigonometric functions and related problems*
- *The learner will become proficient in various types of hyperbolic functions*

**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.

**Unit IV:** 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.

**Semester II**  
**ANCILLARY MATHEMATICS II**

**5 Hours /4 Credits**

**Objectives**

- *To learn methods of integration and properties and its solving related problems.*
- *Understand the basic concepts of first order differential equation and its applications.*
- *Find solutions by applying Laplace transform methods.*
- *Vectors and its product and its integrations.*

**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.