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 TANSCHE 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
		Semester I					
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
		Total	**30**	**21**			**600**
		Semester II					
7.	ULTA22	Part I-Tamil	6	3	25	75	100
8.	ULEN22	Part II-English	6	3	25	75	100
9.	UMTT21	Core III -Analtical 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
		Total	**30**	**20**			**600**
		Semester III					
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
		Total	**30**	**21**			**700**

	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
		Total	**30**	**25**			**800**
	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
		Total	**30**	**25**			**700**
	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^{++}	3	3	25	75	100
41.	UMTS64	Skill Based Studies IV: Numerical Methods Lab using C^{++}	2	2	25	75	100
42.	UEAS61	Extension Activity	-	3	25	75	100
		Total	**30**	**28**			**800**
		Total credits		**140**		**Total**	**4200**

SCHEME OF EXAMINATION

Internal (Theory)	**- 25**
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 Γ(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 –Recuring series – Gernerating 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.Raisinghania,** "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 it 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. 1to 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 andCompany 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 – Varigon'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', 12th 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 2π 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 – convulution 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 leaner will analyze the different aspects of transportation problems , assignment problems and also sequencing problem.*
- *The leaner will develop, organize, evaluate short, long term processes and solve problems*
- *The leaner 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 leaner 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 formuls- cotangent formula-supplemental cosine formula.

Unit II: Functions of half an angel- functions of half a side – Delambre's analogies –Napier's analogies- right angled spherical triangle –Napier's rules- Sphereical Coordinates – relation between the Sphereical 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 Meridan – Cardinal points – Northern and souther hemispheres – Eastern and southern hemispheres – Eastern and western hemispheres – visible and invisible hemispheres – Declination circles –verticals – parallacte 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 – equinozes and solstices – coloures - 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: Sideral time –west hour angle of a body expressed in time units – theorem- latitude of a place – theorem- to determine – tee 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 –circumploar 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', 9th 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.Viswanntham 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 form the Mean of Normal Distribution – A linear combinations of Independent Normal variants – Points of Inflexion of Normal Curve – Area property- Fitting of Normal distribution.

Unit II : Curve fitting – Fitting of a straight Line, Second degree Parabola Polynomial of k^{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 symbles 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 Distrubution- 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, Differnce of Means – Difference of standard Deviation, Exact Sampling Distribution – Chi-square variate – Derivation- M.G.F.Mode, Skewness of Chisquare Distribution – additive property of Chi-square variates – Application Chi-square Distribution – Chi-square test for population Varaince 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 Grammer, 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 sin2ϕ- to find the geocentric distance of a station of geographical latitude ϕ - to find the radius of curvature of the earth at a station of geographical latitude ϕ - 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.*
- *useing 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.

Semester V

UMTT52 REAL ANALYSIS 5 Hours / 4 Credits

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, Connetedness, 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- Interier 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 –Dis continuous function on R.

Unit IV: Connetedness: Introduction- Definition and Examples –Connected subset of R – connectedness and continuity.

Unit V: Compactness: Introduction- compact space –compact subsetsof 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^{rd}) – 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 leaner will formulate a linear programming problem and solve them graphically and simplex method*
- *The leaner will be able to understand the concepts of duality programming*
- *The leaner 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 leaner 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-Minimazation 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
UnitV- 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 Publicatioons, 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 Diophatine Equations - Fermat's Little theorem –Euler's Generalisation of FLT_1 .

Unit III: Wilson's Theorem- Euler's Φ-Function- Arithmetic Functions: The Function τ and σ – The Möbius Function- Multiplicative Arithemetic 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", 3rd 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 leaner 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 Δ ,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 $1/3^{rd}$ and $3/8^{th}$

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 to5.4,5.7
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" , 4th 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 Aptitute For Competitive exams" 7 th revised edition
2. **R.S.Agarwal**,"A Modern Approach to Verbal and Non-verbel 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 Congruvant 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 – Rouche‟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. 3rd 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 leaner will acquire the knowledge of Simulation*
- *The leaner 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- limitatioin 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 2×2 rectangle game- Graphical Method.

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: Introduction network and Basic Components- Rules of Construction – Critical Path Analysis – Probability Considerations in PERT – Distinction between PERT andCPM.

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 Prennce Hall of India Private Ltd 1st 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(α)-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 operationsIntroduction – 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. **Bjarme 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 i 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 xfrom 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

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- *The learner will become proficient in expansion and summation of function*
- *The learner will acquire knowledge of solving problems in matrices*
- *The learner will 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 nθ and sin nθ –Expansion of sin θ ,cosθ and tanθ in powers of θ.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 MathematicsPaper I", 1st 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 it 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", 2nd Semester . S. Chand Publishing, A Division of S. Chand & Company Pvt. Ltd, Edition 2013.