ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN, PALANI

(AUTONOMOUS)

RE-ACCREDITED WITH B^{++} GRADE BY NAAC

(Affiliated to Mother Teresa Women's University, Kodaikanal)

PG AND RESEARCH DEPARTMENT OF MATHEMATICS

CURRICULUM FRAMEWORK AND SYLLABUS FOR OUTCOME BASED EDUCATION

IN

B.Sc., (MATHEMATICS)

&

EXTRA-CREDIT COURSES

UNDER

CHOICE BASED CREDIT SYSTEM

2019-2022

Department of Mathematics
Outcome Based Education Syllabus / 2019-2022

Preamble:

The Department of Mathematics was established in 1971. Our Department pursues a mission of excellent service with the vision of imparting quality teaching, developing sound mind and sound body inculcating social responsibilities and helping in the blossoming of human values for moral excellence.

Bloom's Taxonomy in fixing the Learning Objectives:

Since the Academic year 2019 – 2020, the curriculum for B.Sc.,., (Mathematics) has been designed and the learning objectives and outcomes of the programmes are set, following the Bloom's Taxonomy Cognitive Domain. Accordingly, it is broken into six levels of learning objectives of each course. They are -

K1 / Knowledge = Remember

K2 / Comprehension = Understanding

K3 / Application = Applying

K4 / Analysis = Analyzing

K5 / Evaluation = Evaluating

K6 / Synthesis = Create

Bloom's Taxonomy Action Verbs:

K1 / Knowledge: Arrange, Define, Describe, Duplicate, Identify, Label, List, Match, Memorize, Name, Order, Outline, Recognize, Relate, Recall, Repeat, Reproduce, Select, State

K2 / Comprehension: Classify, Convert, Defend, Describe, Discuss, Distinguish, Estimate, Explain, Express, Extend, Generalize, Give example(s), Identify, Indicate, Infer, Locate, Paraphrase, Predict, Recognize, Rewrite, Review, Select, Summarize, Translate

K3 / Application: Applying, Change, Choose, Compute, Demonstrate, Discover, Dramatize, Employ, Illustrate, Interpret, Manipulate, Modify, Operate, Practice, Predict, Prepare, Produce, Relate, Schedule, Show, Sketch, Solve, Use, Write

K4 / Analysis: Analyzing, Appraise, Breakdown, Calculating, Categorize, Compare, Contrast, Criticize, Diagram, Differentiate, Discriminate, Distinguish, Examine, Experiment, Identify, Illustrate, Infer, Model, Outline, Point out, Question, Relate, Select, Separate, Subdivide, Test

K5 / Evaluation: Appraise, Argue, Assess, Attach, Choose, Compare, Conclude, Contrast, Defend, Describe, Discriminate, Estimate, Evaluating, Explain, Judge, Justify, Interpret, Relate, Predict, Rate, Select, Summarize, Support, Value

K6 / Synthesis: Arrange, Assemble, Categorize, Collect, Combine, Comply, Compose, Construct, Create, Design, Develop, Devise, Explain, Formulate, Generate, Plan, Prepare, Rearrange, Reconstruct, Relate, Reorganize, Revise, Rewrite, Set up, Summarize, Synthesize, Tell, Write

Mapping COs with POs:

For each programme, the Educational objectives and the Specific objectives are specified. The programme outcomes are designed according to the curriculum, teaching, learning and evaluation process. For each course, the definite outcomes are set, giving challenge to the cognitive domain. The course outcomes are mapped with the programme outcomes. The performance of the stakeholders is assessed and the attainment rate is fixed, by using the measurements 'high', 'medium' and 'low'. The restructuring of the curriculum is done based on the rate of attainment.

Institutional Objectives:

- Women Education
- Women Empowerment
- Self-reliance and
- Making Model Citizens.

Program Specific Outcomes:

PSO1	Graduates will Acquiring a comprehensive knowledge and sound Understandinging of fundamentals of Mathematics.
PSO2	Graduates will develop numerical, analytical and mathematical skills.
PSO3	Graduates will be prepared to Acquiring a range of general skills, solve problems, Evaluating information using computers productively to develop software programming and analog, communicate with the society effectively and learn independently.
PSO4	Graduates will Acquiring a job efficiently in diverse fields such as Science and Engineering, Education, Banking, Public Services, Business etc.,

COMMON ACADEMIC STRUCTURE

B.Sc., (Mathematics) 2019 - 2022

Part no.	Course Code	Title of the paper	Hours	Credits	Duration of Exam Hrs	Marks/Grade		
						CIA	CE	Total
SEMESTER-I								
I	MUGT1	Tamil Paper -I	6	3	3	25	75	100
II	MUGE1	English Paper -I	6	3	3	25	75	100
III	MUMC1	Core Paper I-Calculus	5	4	3	25	75	100
	MUMC2	Core Paper II-Theory of equations Trigonometry &Fourier Series	5	4	3	25	75	100
	MUPA1	Allied : Physics Paper-I Theory Practical	 3 2	 3 -	 3 -	 25 -	 75 -	 100 -
IV	MUMMC1	Skill Based Course: Mathematics for competitive Examinations-I	2	2	3	25	75	100
	MUVE	Skill Based Course: Value Education(theory - practical)	1	2	3	25	75	100
		Total	30	21				700
SEMESTER-II								
I	MUGT2	Tamil Paper -II	6	3	3	25	75	100
II	MUGE2	English Paper -II	6	3	3	25	75	100
III	MUMC3	Core Paper III-Analytic Geometry & Vector Calculus	6	4	3	25	75	100
	MUMC4	Core Paper IV-Sequences and Series	5	4	3	25	75	100
	MUPA2 MUPAP	Allied Physics Paper-II Theory Practical	 3 2	 3 4	 3 3	 25 40	 75 60	 100 100
IV	MUMTN2	Skill Based Course: Theory of Numbers	2	2	3	25	75	100
		Total	30	23				700

Part no.	Course Code	Title of the paper	Hours	Credits	Duration of Exam Hrs	Marks/Grade		
						CIA	CE	Total
SEMESTER-III								
I	MUGT3	Tamil Paper –III	6	3	3	25	75	100
II	MUGE3	English Paper –III	6	3	3	25	75	100
III	MUMC5	Core Paper V- Modern Algebra	5	4	3	25	75	100
	MUMC6	Core Paper VI-Statics	4	4	3	25	75	100
	MUMA3	Allied Paper III : Statistics -I	5	5	3	25	75	100
IV	MUMN1	Non Major Elective-I: Quantitative Aptitude-I	2	2	3	25	75	100
	MUMMC3	Skill Based Course: Mathematics for competitive Examinations-II	2	2	3	25	75	100
		Total	30	23				700
SEMESTER-IV								
I	MUGT4	Tamil Paper –IV	6	3	3	25	75	100
II	MUGE4	English Paper –IV	6	3	3	25	75	100
III	MUMC7	Core Paper VII- Differential Equations and It's Applications	6	5	3	25	75	100
	MUMC8	Core Paper VIII-Dynamics	5	4	3	25	75	100
	MUMA4	Allied Paper IV : Statistics -II	5	5	3	25	75	100
IV	MUMSS4	Skill Based Course: Solar System And Stellar Universe	2	2	3	25	75	100
V	MUEA4	Extension Activities	-	1	-	100	-	100
		Total	30	23				700

Part no.	Course Code	Title of the paper	Hours	Credits	Duration of Exam Hrs	Marks/Grade		
						CIA	CE	Total
SEMESTER-V								
III	MUMC9	Core Paper IX : Real Analysis	6	5	3	25	75	100
	MUMC10	Core Paper X-Linear Algebra	6	4	3	25	75	100
	MUMCP11	Core Paper X1-Programming in 'C' Theory Practical	 4 2	 3 1	 3 3	 25 -	 50 25	 75 25
	MUME1	Elective-I: Operations Research-I / Combinatorics	5	5	3	25	75	100
	MUME2	Elective –II : Numerical Methods / Discrete Mathematics	5	5	3	25	75	100

IV	MUMNU5	Skill Based Course: Practical- Numerical Problems Using C-Programming.	2	2	3	40	60	100
		Total	30	25				600
SEMESTER-VI								
III	MUMC12	Core Paper XII :Complex Analysis	7	5	3	25	75	100
	MUMC13	Core Paper XIII Graph Theory	6	5	3	25	75	100
	MUMCP14	Core Paper XIV: Object Oriented Programming With C++ Theory Practical	 4 2	 3 1	 3 3	 25 -	 50 25	 75 25
	MUME3	Elective-III: Operations Research-II / Astronomy	5	5	3	25	75	100
IV	MUMPR	Skill Based Course: Group Project	2	2	-	75	25	100
	MUES6	Skill Based Course: Environmental Studies	2	2	3	25	75	100
	MUMN2	Non Major Elective-II: Quantitative Aptitude-II	2	2	3	25	75	100
		Total	30	25				700

Extra Credit Courses

Semester	**Course Code**	**Title**	Credits	Marks
I	UGEMCE	Extra Credit Paper-I : Mathematics for competitive Examinations	2	100
III	UGEQA	Extra Credit Paper-II: Quantitative Aptitude	2	100
V	UGESTL	Extra Credit Paper-III : Set Theory and Logic	2	100

SEMESTER – I

Programme: B.Sc., **Subject:** Mathematics

Semester: I **Course:** Calculus

Course Type: Core Paper -II **Course Code: MUMC1**

C**redits**: 4 **Contact Hours**: 5 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Gaining the ability to solve the problems related to multiple integrals, Beta and Gamma functions.
- Gaining basic knowledge of differentiation.
- Understanding the concepts of Beta and Gamma functions
- Analyzing the concept of differential equations and use various methods of finding the radius of curvature

COURSE CONTENT

Unit I:

Successive Differentiation - Expansion of Functions - Leibnitz Formula - Maxima and Minima of Functions of Two Variables

Unit II:

Curvature –Circle, Radius and Centre of Curvature –Evolutes and Involutes-Radius of Curvature in Polar Coordinates- p-r Equations.

Unit III:

Definite Integrals and their Properties –Integration by Parts–Reduction Formula $Sin^{n}x$, $Cos^{n}x$, $Sin^{m}xCos^{n}x$-Bernoulli's Formula.

Unit IV:

Double and Triple Integrals – Change of Variables .

Unit V:

Beta and Gamma functions : Definitions–Convergence of ʃ(n)-Recurrence formula of Gamma functions-Properties of Beta functions-Relation between Beta and Gamma functions-Definite Integrals by using Gamma functions.

Prescribed Text Books:

- K.S.Narayanan & T.K.Manicavachagom Pillay, *Calculus:* Vol – I, S. Viswanathan Printers & Publishers, Chennai , 2008 .
- K.S.Narayanan & T.K.Manicavachagom Pillay, *Calculus:* Vol – II, S. Viswanathan Printers & Publishers, Chennai , 2010.

Programme: B.Sc., **Subject:** Mathematics

Semester: I **Course:** Theory of Equations, Trigonometry and Fourier Series

Course Type: Core Paper II **Course Code:** MUMC1

C**redits**: 4 **Contact Hours**: 5 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Gaining basic knowledge of Theory of Equations, Trigonometry and Fourier series
- Understanding how to find the Fourier co-efficient for Periodic functions
- Analyzing different methods like Descartes Method, Cardan's method, Ferrari's method in theory of equations

COURSE CONTENT

Unit I:

Theory of equations - Imaginary roots- Rational roots - Relation between the roots and co-efficient of equation - Symmetric functions of the roots - Sum of the power of the roots of an equation - Newton's theorem.

Unit II:

Transformation of equations - Roots multiplied by a given number - Reciprocal roots-Reciprocal equations - Standard forms to increase and decrease the roots of given equation by a given quantity.

Unit III:

Descarte's rule of signs - Numerical solution by Horner's method and Newton's method -Solution of cubic-Cardon's method and Trigonometry method and bi-quadratic equations-Ferrari's method.

Unit IV:

Expansion of functions – sinnx, cosnx, tannx, $\sin^n x$, $\cos^n x$, series of sinx, cosx, tanx – Hyperbolic functions - Logarithm of complex numbers.

Unit V:

Definition – Even and odd functions – Half range Fourier series – Expansion in any interval.

Prescribed Text Books:

- .K.Manickavachagom Pillay, T.Natarajan and K.S. Ganapathy. *Algebra Vol I* : S. Viswanathan Printers & Publishers, Chennai. 2008
- Dr. S. Arumugam & others, *Trigonometry & Fourier Series* **:** Gamma Publishing House, Palayamkottai.

Reference Book:

- Dr. S. Arumugam & others, *Theory of Equations and Trigonometry* : Gamma Publishing House, Palayamkottai.2006

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Programme: B.Sc., **Subject:** Mathematics

Semester: I **Course:** Mathematics For Competitive Examinations-I

Course Type: SBC **Course Code:** MUMMC1

C**redits**: 2 **Contact Hours**: 2 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Remembering the meaning of HCF and LCM of numbers
- Understanding the concepts of odd man out & series.
- Applying the concepts of profit & loss in real life problems
- Analyzing the concepts of ratio & proportion

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COURSE CONTENT

Unit I:

Operation on numbers: Introduction - Face value - Place value - Various types of numbers - Simple problems.

UNIT II:

HCF and LCM of numbers: Factors and multiples - HCF and GCD – Factorization method - Division method - Simple problems.

Unit III:

Ratio and Proportion: Ratio - Proportion - Simple problems.

Unit IV:

Profit and loss: Introduction - Cost price - Selling price - Profit and loss – Simple Problems.

Unit V:

Odd man out and Series: Directions for odd man out and series.

Prescribed Text Book:

- R.S. Aggarwal, *Quantitative Aptitude, VII* Ed. S.Chand, & Company Ltd.

Reference Books:

- Edgar Thorpe**.** *Test of Reasoning for Competitive Examinations* **,** III Ed. Tata McGraw-Hill Publishing Company Ltd, New Delhi.

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SEMESTER – II

Programme: B.Sc., **Subject:** Mathematics

Semester: II **Course:** Analytical Geometry And Vector Calculus

Course Type: Core Paper - III **Course Code:** MUMC3

C**redits**: 4 **Contact Hours**: 5 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Recollecting the properties of circle, sphere and can able to gain a deep knowledge in it.
- Understanding the relation between polar and rectangular Cartesian co-ordinates.
- Applying the concept of skew lines in evaluating the shortest distance between them and applying the concepts of Gradient, Divergence and Curl in solving vector differentiation problems.
- Calculating line, surface, double and triple integrals and use Green's theorem in the plane, Gauss' divergence theorem and Stokes' theorem

COURSE CONTENT

Unit I:

Two Dimensional Analytic Geometry: #Polar Co-ordinates# – Distance between the points – Area of Triangles – Equation of straight line, Circle, Conic – Simple Problems involving chords and Tangents.

Unit II:

The straight line – Symmetrical form – Image of a point – Image of a line about a plane – The plane and straight line – Angle between a plane and a straight line- Coplanar lines – Shortest distance between two lines.

Unit III:

The sphere – Equations of the sphere, tangent line – Plane section of a sphere – Equation of the circle on a sphere – Intersection of a two spheres – Equation of a tangent plane- Equation and Properties of a cone.

Unit IV:

Differentiation – Gradient – Divergent- Curl and Connected Identities.

Unit V:

Vector Integration – Line integeral – Surface integrals – Volume integerals – Green's theorem – Gauss's theorem- Stoke's theorem (proof not expected) – Simple problems.

Self-study portion

Prescribed Text Books:

- T.K. Manicavachagom Pillay & .Natarajan. *Analytical Geometry Of 2D* S.Viswanathan printers & Publishers.
- Dr.S. Arumugam & Others, *Analytical Geometry Of 3D And Vector Calculus,* Gamma Publishing House, Palayamkottai.2008

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Programme: B.Sc., **Subject:** Mathematics
Semester: II **Course:** Sequences And Series
Course Type: Core Paper – IV **Course Code:** MUMC4
C**redits**: 4 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring the basic knowledge of convergence and divergence.
- Understanding the behavior of monotonic sequences
- Analyzing the behavior of convergence of series by using tests

COURSE CONTENT

Unit I:

Sequences – Limit of sequence – Bounded sequences – Monotonic sequences – Convergent Sequences – Divergent and Oscillating Sequences - Algebra of limits..

Unit II:

Behavior of monotonic sequences – Some Theorems on Limits- Subsequence – Limit Points -Cauchy's Sequences - Cauchy's general principle of convergence..

Unit III:

Series – Convergence, divergence, oscillation of a series – Comparison test.

Unit IV:

Kummer's Test- D' Alembert's ratio test — Raabe's test- Root Test - Condensation test

Unit V:

Integral Test - Alternating series – Absolute convergence – Conditional convergence – Leibnitz's test.

Prescribed Text Book:

- Dr. S.Arumugam Issac**,** *Sequences and Series,* Gamma Publishing House, Palayamkottai..

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Programme: B.Sc., **Subject:** Mathematics
Semester: II **Course:** Theory of Numbers
Course Type: SBC **Course Code:** MUMTN2
C**redits**: 2 **Contact Hours**: 2 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring the basic knowledge of divisibility, congruence, greatest common divisor, prime and prime-factorization.
- Exploring various techniques to congruencies of various types.
- Applying the concept of Euler's function, Fermat's theorem and Wilson's theorem.
- Evaluating the product of r consecutive integers is divisible by r!

COURSE CONTENT

Unit I :

Theory of numbers – Prime and Composite numbers – The sieve of Eratosthenes – Divisors of a given number – Simple problems .

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Unit II :

Euler's function – Integral part of a real number –The highest power of a prime p contained in n! - Simple problems --Product of r consecutive integers is divisible by r!

Unit III :

Congruence - Criteria of divisibility of number - Simple problems - Numbers in arithmetic progression .

Unit IV :

Fermat's theorem – Simple problems – Generalization of Fermat's theorem.

Unit V :

Wilson's theorem—Lagrange's theorem—Simple problems.

Prescribed Text Book:

- T.K.Manicavachagompillay, T.Natarajan, K.S.Ganapathi, *Algebra* : *Vol II,* S.Viswanathan printers & publishers, 2011.

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SEMESTER – III

Programme: B.Sc., **Subject:** Mathematics
Semester: III **Course:** Modern Algebra
Course Type: Core Paper – V **Course Code:** MUMC5
C**redits**: 4 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring the basic knowledge and the structure of Group, Subgroup and Cyclic Groups
- Describing the characteristics of a ring, quotient rings and Ideals
- Applying the concepts of homomorphism and isomorphism for groups and rings
- Analyzing and demonstrate examples of subgroups, normal subgroups and quotient groups

COURSE CONTENT

Unit I:

Subgroup-Examples-Centre-normalize-Intersection and union of subgroups-Permutations-Cycles and transposition-Permutations as a product of disjoint cycles and transpositions-Even and odd permutations-S_n and A_n –Cyclic groups-Examples- properties-Number of generators of cyclic groups

Unit II:

Cosets and their properties – Congruence relation modulo a subgroup – Lagrange's theorem and its consequences – Euler's theorem – Fermat's theorem – Normal subgroups – Centre is a normal subgroup – Quotient groups.

Unit III:

Homomorphism – Kernel of a homomorphism – Isomorphism, Automorphism – Cayley's theorem – Fundamental theorem of homomorphism.

Unit IV:

Rings – Definition and examples – Elementary properties of rings – Division rings and fields – Zero divisors of a ring – Zero divisors of Z_n – Integral domain – Cancellation laws – Any field is an integral domain – Any finite integral domain is a field – Characteristic of a ring – Characteristic of integral domain is either zero or a prime number.

Unit V:

Ideals – Quotient rings – Maximal and prime ideals – Homomorphism of rings – Field of quotients of an integral domain.

Prescribed Text Book:

- Dr.S.Arumugam & Others, *Modern Algebra,* Gamma Publishing House, Palayamkottai.

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Programme: B.Sc., **Subject:** Mathematics
Semester: III **Course:** Statics
Course Type: Core Paper – V **Course Code:** MUMC6
C**redits**: 4 **Contact Hours**: 4 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Gaining knowledge of Laws of friction and deploy them in solving the respective problems.
- Understanding the concepts of forces and moments.
- Applying the concepts of forces in finding the resultant of more than one force acting on a surface.
- Analyzing the basics of coplanar forces and equilibrium of three forces acting on a rigid body and can solve the simple problems related to it.

COURSE CONTENT

Unit I:

Forces acting a point – Parallelogram law – Triangle law of forces - Polygon law of forces - Lami's Theorem –Resolution of a force – conditions of equilibrium.

Unit II:

Forces action on a rigid body parallel forces- Moment of forces – Varigon's theorem - Couples- Equilibrium of two couples-Equivalence of two couples - Resultant of a couple and a force

Unit III :

Three equilibrium forces acting on a rigid body – Three coplanar forces theorem – Two trigonometrically theorems – problems on parallel forces.

Unit IV:

Laws of friction – Co-efficient of friction - Angle of friction – Cone of friction - Equilibrium of a particle on a rough inclined plane- Equilibrium of a body on a rough inclined plane under a force parallel to the plane.

Unit V:

Equilibrium of a body on a rough inclined plane under any force Problems on Frictions.

Prescribed Text Book:

- M.K. Venkataraman**,** *Statics,* Eleventh Edition**,** Agasthiar Publications.2005.

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Programme: B.Sc., **Subject:** Mathematics
Semester: III **Course:** Statistics – I
Course Type: Allied Paper III **Course Code:** MUMA3
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Gaining the knowledge by using Binomial distribution, Poisson distribution etc..
- Understanding random variables and probability distributions.
- Use the different methods of finding the correlation coefficient.

COURSE CONTENT

Unit I:

Skewness - Definition of skewness -Tests of Skewness-Measure of Skewness-Karl Pearson's Coefficient of Skewness-Kurtosis Moments-Simple problems only**.**

Unit II:

Correlation - Karl Pearson's coefficient of correlation - Correlation of grouped data, Rank correlation - Regression, Regression equations.

Unit III:

Conditional Probability - Baye's theorem - Mathematical Expectation-Random Variables and Probability distribution-simple problems only .

Unit IV:

Binomial Distribution - Properties of Binomial Distribution - Mean, Mode, Variance, Moment, Moment Generating Function - Fitting a Binomial Distribution

Unit V:

Poisson Distribution-Mean & Variance - Role of the Poisson Distribution - Fitting a Poisson Distribution - Poisson Distribution as an Approximation of the Binomial Distribution.

Prescribed Text Book:

S.P.Gupta S.Chand & sons. *Statistical Methods,* 2002.

Reference Books:

- Veerarajan .T, Yes Dee , *Fundamentals of Mathematical Statistics,* Publishing Pvt.Ltd, 2017.
- Vital P. R, *Mathematical Statistics,* Margham publications, 2004

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Programme: B.Sc., **Subject:** Mathematics
Semester: III **Course:** Quantitative Aptitude – I
Course Type: NME - I **Course Code:** MUMN1
C**redits**: 2 **Contact Hours**: 2 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Remembering the meaning of HCF and LCM of numbers.
- Understanding the concepts of odd man out & series.
- Applying the concepts of profit & loss in real life problems.
- Analyzing the concepts of ratio & proportion

COURSE CONTENT

Unit I:

Operation on numbers: Introduction - Face value - Place value - Various types of numbers - Simple problems.

Unit II:

HCF and LCM of numbers: Factors and multiples - HCF and GCD – Factorization method - Division method - Simple problems.

Unit III:

Ratio and Proportion: Ratio - Proportion - Simple problems.

Unit IV:

Profit and loss: Introduction - Cost price - Selling price - Profit and loss – Simple Problems.

Unit V:

Odd man out and Series: Directions for odd man out and series.

Prescribed Text Book:

- R.S. Aggarwal**.** *Quantitative Aptitude,* Seventh Edition. S.Chand & Company Ltd.

Reference Books:

- Edgar Thorpe**,** *Test of Reasoning for competitive examinations***,** III Ed. Tata McGraw-Hill Publishing Company Limited, New Delhi.

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Programme: B.Sc., **Subject:** Mathematics

Semester: III **Course:** Mathematics for Competitive Examinations – II

Course Type: SBC **Course Code:** MUMMC3

C**redits**: 2 **Contact Hours**: 2 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Remembering the meaning of BODMAS rule.
- Understanding the concept of percentage on simple problems.
- Applying the concept of time and work on real life problems
- Analyzing the problem on trains with solved examples..

COURSE CONTENT

Unit I:

Percentage: Introduction - Important facts and family - Concept of percentage - Simple problems.

Unit II :

Simplification: Introduction - BODMAS rule - Modulus of a real number - Simple problems.

Unit III: Problems on ages: Problems on ages - Simple problems.

Unit IV : Time and work: Time and work - Simple problems.

Unit V : Problems on trains: Problems on trains with solved examples.

Prescribed Text Book:

- R. S. Aggarwal**,** *Quantitative Aptitude,* S. Chand & Company Ltd, Ram Nagar, New Delhi, 2013.

Reference Books:

- Edgar Thorpe**,** *Test of Reasoning for competitive examinations***,** III Ed. Tata McGraw-Hill Publishing Company Ltd, New Delhi.

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SEMESTER – IV

Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course:** Differential Equations And Its Applications

Course Type: Core Paper – VII **Course Code:** MUMC7

C**redits**: 5 **Contact Hours**: 6 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Identifying and obtaining the solution of Clairaut's equation
- Understanding the basic knowledge of complimentary function , particular integral,
- Laplace Transform and its inverse and solving method of Partial differential equations.
- Applying Laplace Transforms to Solve ordinary differential equations with constant co-efficient and simultaneous linear equations
- Analyzing the application of differential equations in the field of Science

COURSE CONTENT

Unit I:

Exact differential equations – equations of the first order but of higher degree – equations solvable for p, x and y – Clairaut's form – equation that do not contain x, y explicitly – equation homogeneous in x and y.

Unit II:

Linear equations with variable co-efficient – removal of the first derivative – variation of parameters – simultaneous linear differential equation.

Unit III:

Partial differential equations – formation of partial differential equations – classification of integrals – standard form Pp + Qq = R – standard types – Charpit's method.

Unit IV:

Laplace transform – theorems – problems – inverse Laplace transforms – results – problems – Solving ordinary differential equations with constant co-efficient and simultaneous linear equations by using Laplace transform.

Unit V:

Applications of differential equations –growth, decay and chemical reactions – falling bodies and other rate problems – simple electric circuits – dynamical problems with variable mass – Newton's law of gravitation and motion of planets.

Prescribed Text Book:

- Dr.S. Arumugam & others, *Differential Equations And Its Applications,* Gamma Publishing House, Palayamkottai.

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Programme: B.Sc., **Subject:** Mathematics
Semester: IV **Course:** Dynamics
Course Type: Core Paper – VIII **Course Code:** MUMC8
C**redits**: 4 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Remembering the notions which were studied under Simple harmonic motion and seconds pendulum
- Understanding the concept of projectiles and its properties by solving some simple problems related to it..
- Applying Newton's law in their real life.
- Analyzing the concept of impulse, impulsive forces and the collision of elastic bodies and able to solve the simple problems regarding it.

COURSE CONTENT

Unit I:

Newton laws of motion and applications.

Unit II:

Projectiles – Equation of path of a projectile – Characteristics – Maximum horizontal range – Two possible directions of projections to obtain a given horizontal range – Range of a particle projected on an inclined plane – Maximum range on an inclined plane.

Unit III:

Impulses – Impact in a fixed plane – Direct and oblique impacts – Loss in kinetic energy.

Unit IV:

Simple harmonic motion: Equation of motion – Composition of two simple harmonic motions – Simple Pendulum.

Unit V:

Central orbits – Component of velocity and accelerations along and perpendicular to the radius vector – Differential equations of a central orbit - Pedal equation.

Prescribed Text Book:

M.K. Venkataraman, *Dynamics,* XII Ed. Agasthiar Publications.

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Programme: B.Sc., **Subject:** Mathematics
Semester: IV **Course:** Statistics - II
Course Type: Allied Paper – IV **Course Code:** MUMA4
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring knowledge of continuous random variables and testing hypothesis
- Understanding the concepts of t, F, z-distributions and its applications and Acquiring the knowledge by using Normal distribution.
- Demonstrating the use of Chi-square distribution
- Analyzing the concepts of sampling techniques and procedure for testing of hypothesis for large samples

COURSE CONTENT

Unit I:

Normal distribution - Importance of Normal Distribution -Properties of Normal Distribution - Condition for normality - Area under the normal curve - Fitting of normal distribution (Method of Ordinates and Method of Areas)

Unit II:

Hypothesis Testing - Procedure of Testing Hypothesis - Standard Error and Sampling Distribution - Tests of Significance for Attributes - Test of Significance for Large Samples.

Unit III:

Test of Significance for Small Samples - Student's t-Distribution and its Applications - To Test the significance of Single Mean Difference of two Means for both Dependent and Independent Samples - Testing the Significance of an Observed Correlation Coefficient –The Variance Ratio Test-F-test.

Unit IV:

Uses of Chi-Square Test-1-Chi-Square test as of Independence - 2.Chi-square test as a test of goodness of fit - 3.Chi-square test as a test of Homogeneity - Chi-Square test for Specified value of Population Variance.

Unit V:

Analysis of Variance-One Way Classification-Two Way Classification -Latin Squares.

Prescribed Text Book:

S.P.Gupta S.Chand & sons. *Statistical Methods,* 2002.

Reference Books:

- Veerarajan .T. Yes Dee , *Fundamentals of Mathematical Statistics,* 2017.
- Vital P. R, *Mathematical Statistics,* Margham Publications, 2004

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Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course:** Solar System and Stellar Universe

Course Type: SBC **Course Code:** MUMSS4

C**redits**: 2 **Contact Hours**: 2 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring knowledge of Sun and Planets .
- Understanding the concept of the Solar System.
- Demonstrating the different kinds of Eclipses
- Analyzing the various constellations.

COURSE CONTENT

Unit I: Sun and Planets.

Unit II: Comets – Asteroids – Meteors – Zodiacal light.

Unit III: Eclipses – causes – conditions – comparison – different kinds of Eclipses.

Unit IV: The Stellar Universe.

Unit V: Constellations – Zodiacal Constellations.

Prescribed Text Book:

- Kumaravelu & Suseela Kumaravelu, *Astronomy.*

Reference Books :

- G.V. Ramachandran., *Astronomy.*

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SEMESTER - V

Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Real Analysis
Course Type: Core Paper – IX **Course Code:** MUMC9
C**redits**: 5 **Contact Hours**: 6 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Identifying the relation between completeness and compactness sets in metric space.
- Understanding the countable, uncountable, open, closed and compact sets.
- Applying the properties of real numbers.
- Analyzing the nature of sets under limits and continuity.

COURSE CONTENT

Unit I:

Introduction – Countable and uncountable sets – Inequalities of Holder & Minkowski – Metric space – Definition and examples – Open sets – Equivalent metric.

Unit II:

Closed sets – Closure – Limit point – Dense sets – Completeness – Definition and examples – Cantor's intersection theorem – Baire's category theorem.

Unit III:

Continuity : Definition and examples – Uniform continuity – Homeomorphism

Unit IV:

Connectedness – Definition and examples – Connected subsets of R – Connectedness and continuity – Intermediate value theorem.

Unit V:

Compactness – Definition and examples – Compact subsets of R-
equivalent characterization for compactness, continuity and compactness.

Prescribed Text Book:

- Dr.S. Arumugam & Issac, *Modern Analysis.* Gamma Publishing House, Palayamkottai.

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Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Linear Algebra
Course Type: Core Paper – X **Course Code:** MUMC10
C**redits**: 4 **Contact Hours**: 6 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Understanding the basic ideas of vector spaces and the concepts of span, linear independence basis dimension and applying these concepts to vector spaces and subspaces.
- Solving systems of linear equations and to reduce the augmented matrix and Compute the characteristic polynomial, eigen values and eigenvectors
- Computing inner products and determine orthogonality on vector spaces, including Gram-Schmidt orthogonalization.
- Applying the principles of matrix algebra to linear transformations

COURSE CONTENT

Unit I: Vector spaces:

Linear Transformation – Definition and examples – Subspaces - Span of a set.

Unit II: Basis and Dimension:

Linear Independence – Basis and Dimension – Rank and Nullity.

Unit III: Matrix and Inner product space:

Matrix of a linear transformation – Inner product space – Definition and examples – Orthogonality - Orthogonal Complement.

Unit IV: Theory of Matrices:

Algebra of Matrices - Types of Matrices – The Inverse of a Matrix – Elementary Transformations – Rank of a matrix

Unit V: Characteristic equation and bilinear forms:

Characteristic equation and Cayley Hamilton theorem – Eigen values and Eigen vectors – Bilinear forms – Quadratic forms.

Prescribed Text Book:

- Arumugam S and Thangapandi Isaac, *Modern Algebra* SciTech Publications (India) Ltd., Chennai, Edition 2012.

Reference Book:

- N. Herstein, *Topics in Algebra* Second Edition, John Wiley & Sons (Asia), 1975.
- S.Kumaresan, *Linear Algebra* .

Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Programming In C
Course Type: Core Paper – X1 **Course Code:** MUMCP11
C**redits**: 6 **Contact Hours**: 4 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Understanding the use of structured program development in C as applied to small programming projects.
- Analyzing the use of decision making statement and loop structures.
- Gaining a high level understanding of the structure of 'C' functions.
- Acquiring knowledge about arrays & pointers.

COURSE CONTENT

Unit I:

Constants, Variables and Data Types : Introduction – Character Set – C tokens – Keywords and identifiers – Constants – Variables – Data types – Declaration of variables – Assigning values to variables – Defining symbolic constants-Declaring a variable as constant-Declaring a variable as Volatile - Overflow and underflow of data.

Unit II:

Operators and Expression : Introduction – Arithmetic of operators – Relational operators – Logical operators – Assignment operators – Increment and decrement operators – Conditional operators – Bitwise operators – Special operators – Arithmetic expressions – Evaluation of expressions – Precedence of arithmetic operators – Some Computational Problems – Types conversions in expressions – Operator precedence and associativity – Mathematical functions. Managing input and output operators: Reading a character – Writing a character – Formatted input – Formatted output

Unit III:

Decision Making and Branching : Decision making with IF statement – simple IF statement – The IF ELSE statement – Nesting of IF……ELSE statement – The ELSE IF ladder – The Switch statement – The ? : Operator – The GOTO statement. Decision Making and Looping : The WHILE statement – The DO statement – The FOR statement – Jumps in loops-Concise Test Expressions .

Unit IV:

Arrays : One- dimensional arrays – Two – dimensional arrays – Initialization of one – dimensional arrays and two – dimensional arrays – Multidimensional arrays-Dynamic Arrays-

More about Arrays. Character Arrays and Strings : Introduction-Declaring and initializing string variables – Reading strings from terminal – Writing strings to screen.

Unit V:

User – defined functions : Need for user – defined functions – A multi-function program – The form of C functions – Return values and their types – Calling a function – category of functions- No arguments and no return values – handling of non–-Accessing the address of a variable – declaring and initializing pointers – Accessing a variable through its pointers – Pointer expressions

Prescribed Text Book:

- E. Balagurusamy, *Programming In Ansi C* , Sixth Edition.
  Tata Mc Graw - Hill Publishing company limited , New Delhi, 2012.

PRACTICALS IN C

1. Write a program to Calculating the Simple Interest.
2. Write a program to find the mean and S.D. of n values
3. Write a program to find Correlation coefficients.
4. Check whether the given number is prime or not.
5. Write a program to find the roots of the quadratic equation.
6. Write a program to find L.C.M. and G.C.D. of two numbers
7. Write a program to find Fibonacci sequence
8. Write a program to find the nc_r value using functions.
9. Write a program to sort the numbers (Ascending & Descending)
10. Write a program to add & subtract the two given matrices.
11. Write a program to multiply the two given matrices.
12. Write a program to find the determinant of the given matrix.
13. Write a programme to find angle between two lines.

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Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Operations Research – I
Course Type: Elective – I **Course Code:** MUME1
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring the knowledge of Transportation and Assignment problems.
- Understanding duality theorems and dual simplex method.
- Use the Simplex Method or the Big-M Method to solve linear programming problems.
- Analyzing the concept of complementary slackness and its role in solving primal / dual problem.

COURSE CONTENT

Unit I:

Mathematical formulation of a LPP – Graphical solution to a LPP – extreme points – Convex sets simplex method.

Unit II:

Artificial variables – Big M method – Two phase method.

Unit III:

Duality – Formulation of primal – Dual pairs – Duality and simplex method – Dual simplex method – Fundamental theorem of duality.

Unit IV:

Mathematical formulation of transportation problem – Finding initial basic feasible solution – Degeneracy in LPP – Optimum solution – Modi method – Unbalanced transportation problem.

Unit V:

Mathematical formulation of Assignment problem – Assignment algorithm – Travelling salesman problem

Prescribed Text Book:

- Kanti swaroop, P.K. Gupta & Manmohan**.** *Operations Research,*

Sixteenth Edition ,Sultan Chand & Sons. New Delhi, 2014.

Reference Book :

- Taha H. A, *Operations Research -An introduction* , Prentice Hall of India Pvt. Ltd, New Delhi, 2006.

Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Combinatorics
Course Type: Elective – I **Course Code:** MUME1
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring knowledge in Recurrence Relations.
- Understanding the ideas of permutations and combinations.
- Applying combinatorial ideas to practical problems.
- Identifying the Generalization of the pigeonhole principle.

COURSE CONTENT

Unit I:

Introduction – Permutations and Combinations – Pascals Identity.

Unit II:

Vandermonde's Identity – Permutations with Repetition- Circular Permutation.

Unit III:

Pigeonhole Principle – Generalization of the pigeonhole principle – principle of Inclusion – Exclusion – Worked Examples.

Unit IV:

Mathematical Induction – Recurrence Relations – Particular Solutions.

Unit V:

Solution of Recurrence Relations by using Generating Functions – Worked Examples.

Prescribed Text Book:

- T. Veerarajan, *Discrete Mathematics,* Tata Mc Graw - Hill Pub. Company Ltd.

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Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Numerical Methods
Course Type: Elective – II **Course Code:** MUME2
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring knowledge about the basic concepts of numerical algorithms using appropriate technology.
- Understanding the numerical methods for approximating the solution of the problems of algebraic and transcendental equations, ordinary differential equations.
- Solving the ordinary differential equations by using the methods like Euler's, Runge Kutta, Modified Euler and Improved Euler.
- Comparing the viability of different approaches to the numerical solution of problems arising in roots of solution of non-linear equations, interpolation and approximation

COURSE CONTENT

Unit I:

Solution of algebraic and transcendental equations – Iteration method – Newton Raphson method – method of false positions – solutions of simultaneous linear equations – Direct method – Gauss elimination method, Gauss Jordan method – Iteration method – Jacobi method , Gauss – Seidel method.

Unit II:

Newton's forward and backward interpolation formula – Central Difference Interpolation Formulae(For equal intervals) – Gauss's forward and backward formula – Stirling's formula.

Unit III:

Interpolation with unequal intervals – Divided differences – Lagrange's formula – Numerical differentiation up to second order– Maxima and minima

Unit IV:

Numerical integration – Quadrature (Cote's) formula – Trapezoidal rule – Simpson's one-third rule – Three-eight rule – Weddle's rule.

Unit V:

Numerical solution of differential equation – Taylor series method – Euler's method – Modified Euler's method – Runge –Kutta method - second and fourth order Runge - Kutta - method.

Prescribed Text Book:

- Dr.P.Kandasamy , Dr.K.Thilagavathy & Dr.K.Gunavathi, *Numerical Methods* S.Chand & Company Ltd, 2012.

Books for Reference:

- Venkataraman M. K, *Numerical Methods in Science and Engineering,* National Pub. Company, Madras, 2009.

Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Discrete Mathematics
Course Type: Elective – II **Course Code:** MUME2
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring knowledge about the basic concepts of Discrete Mathematics and its applications.
- Understanding abstract algebra, posets, lattices, Boolean algebra and their applications in the field of engineering and computer science.
- Applying logically valid forms of arguments to avoid logical errors by studying mathematical logic.
- Analyzing the concepts of mathematical logic and relation.

COURSE CONTENT

Unit I:

Statement and notation – Connectives – Negative – Conjunctive – Disjunctive – Statement Formulae and Truth tables – Conditional and Bi-conditional statements – Well defined formulae – #Tautologies# – Contradictions – Other connectives.

Unit II:

Normal forms – Disjunctive Normal forms – Conjunctive Normal forms – Principal Conjunctive Normal forms - Ordering and uniqueness of Normal forms.

Unit III:

Predicate calculus – Inference theory of the predicate calculus - Binary and n-ary operations – Characteristic function of a set – Hashing functions – Recursive functions**.**

Unit IV:

Lattice as partially ordered set – Some properties of lattices – Lattices as algebraic systems – Sub lattice, Direct product and homomorphism – #Some special lattices#.

Unit V:

Boolean algebra – Boolean functions – Boolean forms and free Boolean algebras – Values of Boolean expressions and Boolean functions.

Self-study portion.

Prescribed Text Book:

- J.P. Tremblay and R. Manohar, *Discrete mathematical Structures with Applications to Computer Science*, Tata McGraw Hill, Thirty-ninth reprint (2011).

Books for Reference:

- Rakesh Dube, Adesh Pandey & Ritu Gupta, *Discrete Structures and Automata Theory*, Narosa Publishing House (2000).
- John E. Hopcroft, Jeffery D. Ullman, *Introduction to Automata Theory, Languages and Computation* ,Narosa Publishing House, New Delhi (1995)

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course:** Practical- Numerical Problems Using C- Programming

Course Type: SBC **Course Code:** MUMNU5

C**redits**: 2 **Contact Hours**: 2 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Learning to write C programs to solve numerical, algebraic and transcendental equations and to solve simultaneous linear equations using numerical methods.
- Writing C programs for numerical Integration.
- Writing C programs to Solve Ordinary Differential Equations numerically and Interpolation.
- Learning to rectify the errors in 'C' Programming.

LIST OF PROGRAMS

1. Find the root of the equation using Bisection method
2. Find the root of the equation using Regula-Falsi method
3. Find the root of the equation using Newton-Raphson method
4. Solve the equation using Gauss-Elimination method
5. Solve the equation using Gauss-Jacobi method
6. Solve the equation using Gauss-Seidal method
7. Find the mission term using Newton's Forward Interpolation formula
8. Find the mission term using Newton's Backward Interpolation formula
9. Find the mission term using Newton's Divided Difference Interpolation formula
10. Find the mission term using Lagrange's Interpolation formula
11. Problem solving using Trapezoidal rule.
12. Problem solving using Simpson $1/3^{rd}$ rule.
13. Problem solving using Euler's method
14. Problem solving using Runge-Kutta method

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SEMESTER – VI

Programme: B.Sc., **Subject:** Mathematics
Semester: VI **Course:** Complex Analysis
Course Type: Core Paper – XII **Course Code:** MUMC12
C**redits**: 5 **Contact Hours**: 7 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Identifying the isolated singularities of a function and determine whether they are removable, poles, or essential.
- Understanding the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations.
- Applying the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra.
- Analyzing functions as Taylor, power and Laurent series, classify singularities and poles, find residues and Evaluating complex integrals using the residue theorem.

COURSE CONTENT

Unit I:

Continuous function – Differentiability – C-R equations in Cartesian and polar co-ordinates – Analytic function – Harmonic functions – Conformal mapping.

Unit II:

Circles and straight lines – Elementary transformations – Bilinear transformation – Cross ratio – Fixed points-Special bilinear Transformations

Unit III:

Complex integration - Cauchy's integral theorem- Cauchy's integral formula – Higher derivatives – Cauchy's inequality – Liouville's theorem – fundamental theorem.

Unit IV:

Taylor's series – Laurent's series – zeros of an analytic function – singularities. **Unit V:**

Residues – Cauchy's residue theorem – Argument theorem – Rouche's theorem – Evaluation of definite integrals.

Prescribed Text Book:

- Dr. S. Arumugam, *Complex Analysis,* Scitech Publication (India) PVT Ltd., Chennai 2007.

Reference Books:

- S. Narayanan and T.K.Manickavasagam Pillai, *Complex Analysis,* S.Viswanatha Pub. Pvt.Ltd., 2007.
- P.Duraipandian, Laxmi Duraipandian, D.Muhilan, *Complex Analysis,* Emerald Pub. 2001.

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Programme: B.Sc., **Subject:** Mathematics
Semester: VI **Course:** Graph Theory
Course Type: Core Paper – XIII **Course Code:** MUMC13
C**redits**: 5 **Contact Hours**: 6 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Identifying vertices, edges and paths with specific properties such as cut vertices, bridges, Eulerian, etc
- Understanding the concepts of Eulerian graphs , Hamiltonian graphs and Planar graph.
- Identifying trees and their properties.
- Illustrating the fundamental applications of Graph Theory in different walks of life

COURSE CONTENT

Unit I:

Graphs – Pictorial representation –Sub graphs – Isomorphism and Degree –Connectedness: Walks Trails and paths –Cycle –Connectedness and Components – Cutpoint and Cutedge.

Unit II:

Blocks - Connectivity– Eulerian graphs – Fleury's algorithm.

Unit III:

Hamiltonian graphs –Matching- Matching in Bipartite graphs – Marriage problem.

Unit IV:

Trees- Characterisation of Trees-Centre of a Tree-– Planar graphs – Euler formulas.

Unit V:

Director graphs – Connectivity in Digraphs strong orientation of graphs – Eulerian Digraphs

Prescribed Text Book:

- S. Arumugam, *Invitation to Graph Theory* : Scitech Pub, India Pvt. Ltd, Chennai, 2006.

Reference Book:

- Narsingh Deo, *Graph Theory with Applications to Engineering and Computer Science*: Prentice Hall of India, 2004.

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Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course:** Object-oriented Programming with C++

Course Type: Core Paper – XIV **Course Code:** MUMCP14

C**redits**: 4 **Contact Hours**: 6 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Identifying the concept of classes and objects.
- Understanding the practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements.
- Applying C++ programming and program development within an integrated development environment.
- Analyzing the use of operator overloading and type conversions

COURSE CONTENT

Unit I:

Fundamentals of C++ - Structure of C++ program – Creating of source file – Compiling and linking – Tokens – Keywords identifiers – Basic data types – User defined data types – Derived data types – Symbolic constants – Types compatibility – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators – C++ - Conversions operator overloading – Control structures.

Unit II:

The main function – Function prototyping – Inline – Inline functions – Function overloading – Friend and virtual function.

Unit III:

Specifying a class – Defining member functions – Marketing an outside function inline – Nesting of member functions – Private member functions arrays within a class-Memory allocation for objects – Static data members static member functions arrays of objects – Objects as function – Arguments friendly functions – Returning objects constant member functions – Pointers to members.

Unit IV:

Constructors – Parameterized constructors – Multiple – Constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Constructing two dimensional arrays – Destructors - Defining operator overloading – Overloading unary operators – Overloading binary operators – overloading binary operators using friends – Manipulation of strings using operators – rules for overloading operators – Type conversions .

Unit V:

Inheritance: Defining derived classes – Single inheritance – Making a private member inheritable – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid

inheritance-Virtual base classes-Abstract classes-Constructors in derived classes-Nesting of classes.

Prescribed Text Book:

- E. Balagurusamy, *Object Oriented Programming with C++* : VI Ed, Tata Mc Graw - Hill Publishing Company Ltd.

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PRACTICALS IN C++

1. Write a program to convert temperature Fahrenheit into Celsius.
2. Write a program to print the following output using for loops.

   1

   2 2

   3 3 3

   4 4 4 4 and so on.
3. Write a program to Calculating variance and standard deviation of n numbers.
4. Write a macro that obtains the largest of three numbers.
5. Write a program to maintain the stock details using class.
6. Write a program to add complex numbers using operator overloading.
7. Write a program to multiply complex numbers using operator overloading.
8. Write a program to the unary minus operator is overloaded.
9. Write a program to maintain the employees information using inheritance.
10. Write a program to find the largest value of two numbers using nesting of member function.
11. Write a program for shopping list using classes and objects.
12. Write a program to maintain the library details using constructor and destructor.
13. Write a program to overloading operators using friends

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Programme: B.Sc., **Subject:** Mathematics
Semester: VI **Course:** Operations Research-II
Course Type: Elective – III **Course Code:** MUME3
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Remembering various techniques to solve real life problems
- Understanding the theory of games for solving simple games..
- Applying the fundamental concept of inventory control and some of the Queuing models.
- Analyzing distinction between PERT & CPM

COURSE CONTENT

Unit I:

Sequencing problem – Problems with n jobs 2 machines – n jobs 3 machines – #n jobs m machines# – Replacement problem – Replacement of items whose maintenance cost increase with time (with/without change in the value of money) – Replacement of items which fail completely – Individual and group replacement.

Unit II:

Game theory- two person zero -sum game – Maxmin – Minimax principle – Games without Saddle points –Mixed strategies-Graphic solution of 2xn and mx2 games-General solution of mxn Rectangular games.

Unit III:

Queuing theory – Introduction – Types of Queue discipline – Steady state probabilities in each classification of queuing problem.

1) (M/M/1) : (∞/FIFO)
2) (M/M/1) : (N/FIFO)
3) (M/M/C) : (∞/FIFO)
4) (M/M/C): (N/FIFO).- Simple Problems

Unit IV:

Inventory control – Selective control techniques — Economic lot size problem – Problem of EOQ with shortage –Inventory control technique (uncertain demand) - ABC analysis.

Unit V:

Network-Basic components-Logical sequencing –Rules of Network construction-Concurrent activities-Probability consideration in PERT-Distinction between PERT and CPM.

Self-study portion

Prescribed Text Books:

- Kanti Swarup, P.K Gupta & Manmohan, *Operations Research***: VI** Ed. Chand Pub, Delhi, 2014
- Dharani Venkatakrishnan. *Operations Research*

Reference Book :

- Taha H. A, *Operation Research - An Introduction*: Prentice Hall of India Pvt. Ltd, New Delhi, 2006.

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Programme: B.Sc., **Subject:** Mathematics
Semester: VI **Course:** Astronomy
Course Type: Elective - III **Course Code:** MUME3
C**redits**: 5 **Contact Hours**: 5 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Identifying the basic knowledge of the Moon.
- Understanding the concept of solar and lunar ellipses.
- Applying the concept of Kepler's laws of planetary motion
- Analyzing the variation in duration of day and night in various zones of earth

COURSE CONTENT

Unit I:

Celestial sphere and diurnal motion – Celestial coordinates - Sidereal time.

Unit II:

Morning and evening stars – circumpolar stars - zones of earth – perpetual day -twilight**..**

Unit III:

Refraction – laws of refraction – tangent formula - horizontal refraction - geocentric parallax – horizontal parallax

Unit IV:

Kepler's laws - Anomalies – Kepler's equation - Calendar.

Unit V :

Moon - sidereal and synodic months – elongation – phase of moon – eclipses -umbra and penumbra – lunar and solar eclipses – maximum and minimum number of eclipses in a year.

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Prescribed Text Book:

- S. Kumaravelu and Susheela Kumaravelu, *Astronomy* **:** SKV Publications,2004.

Reference Book :

- G V Ramachandran, *Astronomy* **:** Mission Press, Palayamkottai, 1965.

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Programme: B.Sc., **Subject:** Mathematics
Semester: VI **Course:** Group Project
Course Type: SBC **Course Code:** MUMPR
C**redits**: 2 **Contact Hours**: 2 hours/Week
CIA: 25 **CE:** 75

- **One Group Contains 6 or 7 students**

- **Total Marks : 100**

Internal Marks: 75

Topic Selection : 30 marks
Data Processing : 30 marks
Regularity : 15 marks

Viva-Voce: 25 marks

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Programme: B.Sc., **Subject:** Mathematics
Semester: VI **Course:** Quantitative Aptitude - II
Course Type: NME – II **Course Code:** MUMN2
C**redits**: 2 **Contact Hours**: 2 hours/Week
CIA: 25 **CE:** 75

Course Outcomes:

- Remembering the meaning of BODMAS rule.
- Understanding the concept of percentage on simple problems.
- Analyzing the problem on trains with solved examples.
- Applying the concept of time and work on real life problems

COURSE CONTENT

Unit I:

Simplification: Introduction - BODMAS rule - Modulus of a real number - Simple problems.

Unit II:

Percentage: Introduction - Important facts and family - Concept of percentage - Simple problems.

Unit III:

Problems on ages: Problems on ages - Simple problems

Unit IV:

Time and work: Time and work - Simple problems.

Unit V:

Problems on trains: Problems on trains with solved examples.

Prescribed Text Book:

- R. S. Aggarwal**,** *Quantitative Aptitude* : S. Chand & Company Ltd, Ram Nagar, New Delhi, 2013.

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[ANCILLARY COURSES TO OTHER DISCIPLINES]

Programme: B.Sc., **Subject:** Physics & Chemistry

Semester: I **Course:** Theory Of Equations, Matrices, Finite Differences, Trigonometry and Differential Calculus

Course Type: Allied Mathematics **Course Code:** MUMA1

C**redits**: 5 **Contact Hours**: 5 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Understanding the concepts of Algebra & Finite Differences.
- Gaining fundamental concepts of Trigonometry & Differential Calculus.

COURSE CONTENT

Unit I:

Theory of equations : n^{th} degree has exactly n roots – Relation between roots and co-efficient – Transformation of equations- Reciprocal equations – Newton - Raphson Method.

Unit II:

Matrices: Fundamental Concepts – Type of Matrices – Inverse of the Matrices –Rank of Matrices –Linear equations –Homogeneous and Non- Homogeneous linear equations.

Unit III:

Interpolations: Newton's forward, backward interpolation – Lagrange's interpolation.

Unit IV:

Trigonometry: Hyperbolic functions - Logarithm of Complex Quantities.

Unit V:

Differential Calculus: Jacobians -Polar Curves - Curvature – Radius of curvature in Cartesians – Parametric Form.

Prescribed Text Book:

- P . Kandasamy , K . Thilagavathy, *Allied Mathematics Paper-I I Semester***:** S.Chand, 2008.

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Programme: B.Sc., **Subject:** Physics & Chemistry

Semester: II **Course:** Integral Calculus, Differential Equations, Laplace Transforms & Vector Analysis

Course Type: Allied Mathematics **Course Code:** MUMA2

C**redits**: 5 **Contact Hours**: 5 hours/Week

CIA: 25 **CE:** 75

Course Outcomes:

- Acquiring familiarity with tools in Mathematics to understand problems.

COURSE CONTENT

Unit I:

Integral calculus : Methods of integration-Definite integrals of the form

$\int \frac{f'(x)}{f(x)}$ dx , $\int \frac{f'(x)}{\sqrt{f(x)}}$ dx $\int \frac{a\cos x+b\sin x}{a\cos x+\beta\sin x}$ dx , $\int e^x$ [f(x)+f '(x) dx] only - Integration by parts-Properties of Definite Integrals - Reduction formulae $\sin^n x$,$\cos^n x$ only.

Unit II:

Fourier series – Even and Odd functions.

Unit III:

Equations of first order and of degree higher than one –Total Differential Equation-Partial Differential equations.

Unit IV:

Laplace Transforms – Inverse Laplace Transforms.

Unit V:

Vector Analysis : Differentiation of Vectors - Gradient , Divergence and Curl **.**

Prescribed Text Book:

P . Kandasamy , K . Thilagavathy**,** *Allied Mathematics Paper-II: II Semester,* S.Chand 200 8.

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EXTRA-CREDIT COURSES

Programme: B.Sc., **Subject:** Mathematics

Semester: I **Course:** Mathematics for Competitive Examinations

Course Type: Extra Credit Paper – I **Course Code:** UGEMCE

C**redits**: 2 **Semester**: I

COURSE CONTENT

Unit I:

Non – verbal Reasoning Tests – Completion of series, Classification, Non- verbal analogy. (TB 1)

Unit II:

Verbal Reasoning tests – Series completion- verbal classification – Verbal analogy. (TB 1)

Unit III:

Coding and decoding – Blood relationship. (TB 1)

Unit IV:

Permutation and Combinations. (TB 2)

Unit V:

Banker's Discount. (TB 2)

Reference Books:

- Edgar Thorpe**,** *Test of Reasoning for Competitive Examinations*, III Ed. Tata McGraw-Hill Publishing Company Ltd, New Delhi.
- R.S. Aggarwal**,** *Quantitative Aptitude. VII* Ed. S.Chand & Company Ltd.

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Programme: B.Sc., **Subject:** Mathematics
Semester: III **Course:** Quantitative Aptitude
Course Type: Extra Credit Paper – II **Course Code:** UGEQA
C**redits**: 2

COURSE CONTENT

Unit I:

Partnership**:** Partnership-Ratio and Division of gains-working and sleeping partners . (Chapter 13).

Unit II:

Boats and Streams: Speed downstream- Speed upstream. (Chapter 19).

Unit III :

Area: Area of four walls of room- Area of parallelogram and Semicircle. (Chapter 24).

Unit IV:

Volume and Area of Solid figures. (Chapter 25)

Unit V:

Heights and Distance: Trigonometrical Identities --Area of Elevation and Depression . (Chapter 34.)

Prescribed Text Book:

- R. S. Aggarwal**,** *Quantitative Aptitude.* S. Chand & Company Ltd, Ram Nagar, New Delhi, 2013.

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Programme: B.Sc., **Subject:** Mathematics
Semester: V **Course:** Set Theory And Logic
Course Type: Extra Credit Paper – III **Course Code:** UGESTL
C**redits**: 2 **Semester:** V

COURSE CONTENT

Unit I:

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

Unit II:

Reflexive – Symmetric – Transitive – Equivalence relation.

Unit III:

Logic – statements – conjunction – disjunction – negation – conditional – bi-conditional.

Unit IV:

Propositions and truth table – Tautology and Contradiction.

Unit V:

Logical Equivalence, Algebra of Propositions, logically true and logically Equivalent statement.

Prescribed Text Book:

- B.S. Vatssa, *Discrete Mathematics.*

Reference Book:

- Shyam, *Discrete Mathematics 2000 Solved Problems.*

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