B.Sc.,Mathematics

Programme Code – UMA (Aided&SF)

Programmeoutcome-PO (AlignedwithGraduateAttributes)-

BachelorofScience(B.Sc.)

Scientific Knowledge and Critical Thinking

Apply the knowledge of Life Science, Physical and Chemical Science, Mathematics, statistics, Computerscience and humanities for the attainment of solutionsto the problems that come across in our day-to-daylife/activities.

Problem Solving

Identify and analyze the problem andformulate solutions for problems using the principles of mathematics,naturalscienceswithappropriateconsiderationforthepublichealth,safetyandenvironmentalconsiderations.,

Communication and Computer Literacy

Communicatethefundamentalandadvancedconceptsoftheirdisciplineinwrittenandoralform.Abletomakeappropriate andeffectiveuse ofinformationandinformation technologyrelevantto theirdiscipline

Life-Long Learning

Recognize the need for and have the preparation and ability to engage in independent and life-long learning inthebroadest context of technological change.

Ethical, Social and Professional Understanding

Commitment to principles, codes of conduct and social responsibility in order to behave consistently withpersonalrespect.Acquiretheresponsibilitytocontributeforthepersonaldevelopmentandforthe developmentofthe community.Respectthe ethical values, social responsibilities anddiversity.

Innovative, Leadership and Entrepreneur Skill Development

Function as an individual, and asa member or leader in diverse teams and in multidisciplinary settings.Becomean entrepreneurbyacquiringtechnical, communicative, problemsolving, intellectualskills.

Vission

To createn academically so undenvironmentthatnurtures,motivates and inspires excellence in research and teaching in Mathematics along with concernforsociety.

Mission

- ToimpartqualityeducationinMathematicstoruralandeconomicalweakerstudents
- Toinspire, prepare and empower studentsto succeed in the ever-changingworld.
- To make the students creative and research oriented
- To educate and form the youth as liberated lifelong learners who are sensitive to gender andecology,empowered to respondtoglobal challenges.

Programme Educational Objectives (PEO) for B.Sc.Mathematics

The objectives of this programme is

PEO1	Toprovidestudentswithathoroughknowledgeoffundamentalmathematicalfacts andsolveproblemswhichcanbe analyzedmathematically.
PEO2	Toprovidehigh qualityandrelevant educationinthefieldofMathematics
PEO3	Toprovidegroundinginacoherentbodyofknowledge,abroadcoverageofrelated academicskills,personal developmentandsocialskills.
PEO4	TodevelopconfidencetoappearforSSC(CGL),IBPS,RRBandCivilservice examinationsandwilloccupyhigher postsinadministrativelevel.
PEO5	Toexposethemtovariouscontemporaryissueswhichwillenablethemtobecome ethicalandresponsible towardsthemselves,co-workers, theSocietyand the Nation

Programme Specific Outcomes (PSO) for B.Sc.Mathematics

On the successful completion of B.Sc. Mathematics, the students will be able to

PSO1	Communicatemathematicseffectivelyusingvariousinstructionalstrategies.
PSO2	Demonstrateacomputationalabilityinsolvingawidearrayofmathematical problems.
PSO3	Developmathematicalideasfrombasicaxiomsandanalyzevalidmathematical reasoning.
PSO4	Utilizemathematicalskillstosolvetheoreticalandappliedproblems.
PSO5	Identifyapplicationsof mathematicsinvariousdisciplinesandsociety.

COURSE STRUCTURE (w.e.f.2020 batch onwards)

Semester– I

Course	CodeNo.	Subject	Contact Hours /Week	Credits	TotalNo. of Hours Allotted	Max. Marks CA	Max. MarksSE	Total
Part I-Tamil	U20P1211	Tamil	6	3	90	25	75	100
PartII-English	U20EN11	English	6	3	90	25	75	100
Core1	UMA20C11	Calculus	5	4	75	25	75	100
Core2	UCO20C12	FinancialAccounting	5	5	75	25	75	100
Allied(C)-1	UCH20GE11M	GeneralChemistry-I	4	4	60	25	75	100
Allied(C)-1Lab	UCH20GL21M	Ancillary ChemistryLab	2	-	30	-	-	-
AECC	U20ES11	Environmental Studies	2	2	30	15	35	50
TOTAL			**30**	**21**				

Semester–II

Course	CodeNo.	Subject	ContactHours /Week	Credits	Total No. of HoursAllotted	Max. MarksCA	Max. MarksSE	Total
PartI–Tamil	U20P121	Tamil	6	3	90	25	75	100
Part II–English	U20EN21	English	6	3	90	25	75	100
Core3	UMA20C21	Algebraand Trigonometry	5	4	75	25	75	100
Core4	UCO20C22	Cost andManagement Accounting	5	5	75	25	75	100
Allied(C) – 1	UCH20GE21M	General Chemistry-II	4	4	60	25	75	100
Allied(C)-1Lab	UCH20GL21M	Ancillary Chemistry Lab	2	2	30	40	60	100
AECC	U20VE21	Value Education	2	1	30	15	35	50
TOTAL			**30**	**22**				

Semester–III

Course	CodeNo.	Subject	ContactHours/ Week	Credits	Total No.ofHours Allotted	Max. Marks CA	Max. Marks SE	Total
PartI-Tamil	U20P131	Tamil	6	3	90	25	75	100
Part II–English	U20EN31	English	6	3	90	25	75	100
Core5	UMA20C31	DifferentialEquations andLaplace Transform	5	5	75	25	75	100
Core6	UMA20C32	AnalyticalGeometry of3Dand VectorCalculus	5	4	75	25	75	100
Allied(P)-2	UPH20GE31M	Physics–I	4	4	60	25	75	100
Allied(P)-2 Lab	UPH20GL41M	AlliedPhysics Practical	2	-	30	-	-	-
Non MajorElective NME	UMA20NE31	Fundamental Principles ofCounting	2	2	30	15	35	50
TOTAL			**30**	**21**				

Semester–IV

Course	CodeNo.	Subject	ContactHours /Week	Credits	Total No.of Hours Allotted	Max. MarksCA	Max. MarksSE	Total
Part ITamil	U20P141	Tamil	6	3	90	25	75	100
Part IIEnglish	U20EN41	English	6	3	90	25	75	100
Core7	UMA20C41	Algebraic Structures	6	5	60	25	75	100
Core8	UMA20C42	Sequences andSeries	4	4	60	25	75	100
Allied(P)-2	UPH20GE41M	Basic Electronics	4	4	60	25	75	100
Allied(P)-2 Lab	UPH20GL41M	AlliedPhysics Practical	2	2	30	40	60	100
NME	UMA20NE41	Mathematical Logic	2	2	30	15	35	50
TOTAL			**30**	**23**				

Semester–V

Course	CodeNo.	Subject	ContactHours /Week	Credits	Total No.of Hours Allotted	Max. MarksCA	Max. MarksSE	Total
Core9	UMA20C51	LinearAlgebra	6	5	90	25	75	100
Core10	UMA20C52	RealAnalysis	6	5	90	25	75	100
Core11	UMA20C53	LinearProgramming Problems	6	5	90	25	75	100
Core12	UMA20C54	Programmingin C	5	4	75	25	75	100
Core Elective1	UMA20CE51 ( )	Optionsgiven	5	5	75	25	75	100
SEC1	UMA20SE51 ( )	Optionsgiven	2	2	30	15	35	50
TOTAL			**30**	**26**				
	UMA20IN	**Internship**		**2**		15	35	50

Self Study Paper 05 Credits (extra)*

Semester– VI

Course	CodeNo.	Subject	ContactHours/ Week	Credits	Total No.ofHours Allotted	Max. Marks CA	Max. Marks SE	Total
Core13	UMA20C61	ComplexAnalysis	6	5	90	25	75	100
Core14	UMA20C62	Probabilityand Statistics	6	5	90	25	75	100
Core15	UMA20C63	Discrete Mathematics	6	5	90	25	75	100
Core16	UMA20C64	NumericalMethods	5	4	75	25	75	100
CoreElective2	UMA20CE61 ( )	Optionsgiven	5	5	75	25	75	100
SEC2	UMA20SE61 ( )	Optionsgiven	2	2	30	15	35	50
PartV		**NCC/NSS/Physical Education**	-	1	-	100	-	100
TOTAL			**30**	**27**				
TOTALCREDITS FORSEMESTERSItoVI				**140**				

SEC(2 Hours/ week)

1) ProgramminginC –Lab
2) Numerical Methods–Lab
3) Theroy of Numbers
4) TheoryofFinite Automata
5) StatisticalTestofSignificance

Non MajorElectivePapers (NME) (2Hours/week)

1) FundamentalPrinciplesofCounting
2) MathematicalLogic

Core Electives for SemesterV

1) Mechanics
2) Combinatorics
3) Cryptography

Core Electives for Semester VI

1) Resource Management Techniques
2) FundamentalsofComputerAlgorithms
3) FuzzySets

Self studypaper: Soft Skills

A) Consolidationof contacthoursandcredits:UG

Semester	ContactHrs/Week	Credits
I	30hrs	21
II	30hrs	22
III	30hrs	21
IV	30hrs	23
V	30hrs	26
VI	30hrs	26
Part– V	-	01
Total	**180hrs**	**140**
V	Internship	2
	Additionalcredit (Selfstudypaper)	5

B) CurriculumCredits:Partwise

		No.of papers	Creditsperpaper	Totalcredits
PartI	**Tamil**	**4**	**3**	**12**
PartII	**English**	**4**	**3**	**12**
PartIII	**CoreTheory**	**16**	**4 or5**	**74**
	CoreElective	**2**	**5**	**10**
	Generic ElectiveTheory	**4**	**4**	**16**
	Generic ElectiveLab	**2**	**2**	**4**
PartIV	**AECC**	**2**	**2**	**3**
	NME	**2**	**2**	**4**
	SEC	**2**	**2**	**4**
PartV(NSS/NCC/PhysicalEducation)				**1**
GrandTotal				**140**

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(For those who joined B.Sc. Mathematics on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UMA20C51	**Linear Algebra**	**Core**	**5**	**1**	**-**	**5**

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Fifth**	**25**	**75**	**100**

Preamble

The Course aims to develop an algebraic and geometric understanding of systems of linear equations and of linear transformations. It covers matrices, vector spaces, linear transformations, inner product spaces, Eigen values and Eigen vectors.

Course Outcomes

On successful completion of the course, the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Determine whether a system of equations is consistent and find its general solution	80	70
CO2	Demonstrate various Characterization of nonsingular matrices	75	70
CO3	Determine the dimension of a vector space	80	70
CO4	Find the matrix of a linear transformation	75	70
CO5	Define orthogonality in an inner product space and construct orthonormal basis	70	65

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M
CO2	S	S	L	M	M
CO3	L	M	M	S	S
CO4	M	L	M	S	S
CO5	S	M	S	M	M

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	M	M	L	M	M
CO2	S	M	M	M	M	M
CO3	S	M	M	M	M	S

CO4	M	S	M	S	S	S
CO5	M	M	M	S	M	S

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(18 Hours)**

Definition and examples of vector spaces– Subspaces - Linear transformation– Span of a set.

UnitII **(18 Hours)**

Linear independence - Basis and dimension – Rank and Nullity – Matrix of a linear transformation.

Unit III **(18 Hours)**

Definition and examples of inner product spaces - Orthogonality – Orthogonal Complement.

Unit IV **(20 Hours)**

Algebra of Matrices – Types of Matrices – The Inverse of a Matrix – Elementary Transformations – Rank of a Matrix – Simultaneous Linear Equations**.**

Unit V **(16 Hours)**

Characteristic Equation and Cayley-Hamilton theorem – Eigen values and Eigen Vectors – Bilinear forms – Quadratic forms

Text Book:

Arumugam. S. and Isaac. A.T., 2016, Modern Algebra, SCITECH publications (India) Pvt., Chennai.

Unit	Chapter/Section
I	5 (5.1 to 5.4)
II	5 (5.5 to 5.8)
III	6 (6.1 to 6.3)
IV	7 (7.1 to 7.6)
V	7 & 8 (7.7, 7.8, 8.1 & 8.2)

References:

1. Herstein. I.N., 2014, Topics in Algebra, Wiley India Pvt. Ltd, Second Edition, New Delhi.
2. Vijay K Khanna and Bhambri. S.K., 2011, A course in Abstract Algebra, Vikas Publishing House Pvt. Ltd., New Delhi.
3. Kenneth Hoffman and Ray Kunze, 2009, Linear Algebra, PHI Learning Pvt. Ltd., New Delhi.

Course Designers:

1. Dr. M. Senthilkumaran
2. Mrs. B. Ambika

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Course Code	Course Title	Category	L	T	P	Credit
UMA20C52	**Real Analysis**	**Core**	**5**	**1**	**-**	**5**

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Fifth**	**25**	**75**	**100**

Preamble

The course aims to study the various properties of limit of a function in a set of real numbers and in a metric space. It provides a thorough discussion of the properties of open sets and closed sets. It classifies the various types of metric spaces. Also it explores the concepts of measure of a set and Riemann integrable functions.

Course Outcomes

On the completion of the course the student will be able to

#	CourseOutcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall and analyze the fundamental properties of limit of a real function and limit of a function in a Metric space	85	70
CO2	Summarize and develop the properties of open sets and closed sets in a Metric space	80	70
CO3	Identify and classify metric spaces as Connected, Complete and Compact.	70	80
CO4	Construct and extend the properties of Riemann integral functions	75	75
CO5	Recall and demonstrate measure of a set and Riemann integral	80	75

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M
CO2	S	S	S	S	L
CO3	S	S	S	S	M
CO4	S	S	S	S	L
CO5	S	S	S	M	S

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	L	M
CO2	S	S	S	S	M	L
CO3	S	S	S	S	M	M
CO4	S	S	S	S	L	M
CO5	S	S	L	S	L	L

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit –I **(18 hours)**

Limits and metric spaces: Limit of a function on the real line – Metric spaces – Limits in metric spaces.

Unit -II **(18 hours)**

Continuous functions on metric spaces: Functions continuous at a point on the real line – Reformulation – Functions continuous on a metric space – Open sets – Closed sets – Discontinuous functions on R^1.

Unit -III **(18 hours)**

Connectedness, Completeness and Compactness: More about open sets – Connected sets – Bounded sets and totally bounded sets – Complete metric spaces.

Unit – IV **(18 hours)**

Connectedness, Completeness and Compactness: Compact metric spaces – Continuous functions on compact metric spaces – Continuity of the inverse function – Uniform continuity.

Unit - V **(18 hours)**

Calculus: Sets of measure zero – Definition of the Riemann Integral – Existence of the Riemann Integral – Properties of the Riemann Integral.

Text Book:

Richard R. Goldberg, 1970, Methods of Real Analysis, Oxford &IBH Publishing Co. Pvt. Ltd., New Delhi.

Unit	Chapter/section
I	4 (4.1 - 4.3)
II	5 (5.1 - 5.6)
III	6 (6.1 - 6.4)
IV	6 (6.5 - 6.8)
V	7 (7.1 - 7.4)

References:

1. Karunakaran. V, 2012, Real Analysis, Pearsons Publication,Chennai.
2. Arumugam. S. and Thangapandi Isaac. A., 2012, Modern Analysis, New Gamma publishing house, Palayamkkottai.
3. Somasundaram. D. and Choudary. B., 2011, A first course in Mathematical Analysis, Narosa Publishing House Pvt. Ltd., New Delhi.
4. ChandrasekaraRao. K. and Narayanan. K.S., 2008,Real Analysis, Vol.I, Second Edition, S. Viswanathan(Printers and Publishers) Pvt. Ltd., Chennai.

Course Designers:

1. Dr. G. Prabakaran
2. Dr. S. Vijaya

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Course Code	CourseTitle	Category	L	T	P	Credit
UMA20C53	**LinearProgramming Problems**	**Core**	**5**	**1**	**-**	**5**

L-Lecture T-Tutorial P–Practicals

Year	Semester	Int.Marks	Ext.Marks	Total
Third	Fifth	25	75	100

Preamble

The Course deals with the application of scientific methods for decision making and especially the allocation of scare resources. Itaidknowledge discoveryandimprovingefficiencyofthesystem by applying advanced analytical methods such as simplex method, Two-phase method,dualsimplexmethod, etc.

CourseOutcomes

On thecompletion ofthecoursethestudent will be able to

#	CourseOutcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	DemonstrateORapproachindecisionmaking	80	75
CO2	Apply the knowledge of linear programming concepts to formulate real life problems	80	75
CO3	Translate LPP usingdualityprincipleandfindtheirsolutions	75	70
CO4	Demonstrate the working of various methods to solve different type of linear programming problems	85	80
CO5	Apply operations research techniques and algorithms to solve linear programming problems such as Transportation and Assignment problems	85	80

Mapping of Cos with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	L	L	L
CO2	L	S	L	M	S
CO3	L	S	L	L	L

CO4	L	S	M	L	L
CO5	S	M	L	S	M

Mappingof COswithPOs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	M	M	S
CO2	S	S	S	L	M	L
CO3	L	S	M	S	L	M
CO4	L	S	S	S	M	M
CO5	S	S	L	S	L	S

Bloom's Taxonomy

	CA		End ofSemester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

UnitI **(18 Hours)**

Linear Programming Problem(LPP)- Mathematical formulation: Introduction – LinearProgrammingProblem–Mathematicalformulationoftheproblem– IllustrationonMathematicalformulationofLPPs.LinearProgramming Problem– GraphicalSolutionandExtension: Introduction – Graphical solution method – Some exceptional cases-General LinearProgramming Problem– Canonical and Standard forms of LPP–Insights into the simplexmethod.

UnitII **(18 Hours)**

Linear Programming Problem- Simplex method: Introduction– Fundamental propertiesof solutions- The computational Procedure- Use of Artificial variables- Degeneracy in LinearProgramming.

UnitIII **(18 Hours)**

Duality in Linear Programming: Introduction – General Primal – Dual pair – Formulatinga dual Problem – Primal–Dual pair in matrix form – Duality theorems – ComplementaryslacknessTheorem -Dualityand simplexmethod – Dual simplexmethod.

UnitIV **(18 Hours)**

Transportation Problem:Introduction - LP formulation of the Transportation Problem - The Transportation table- Loops in Transportation tables-Solution of a Transportation Problem- Finding an initial basic feasible solution- Test for optimality – Degeneracy in

TransportationProblem-TransportationAlgorithm (MODIMethod).

UnitV **(18 Hours)**

Assignment Problem: Introduction-Mathematical formulation of the problem – Solutionmethods of the Assignment problem – Special cases in Assignment Problem-The TravellingSalesmanProblem

TextBook:

KantiSwarup,Gupta.P.K.andManMohan, Reprint 2021,OperationsResearch, NineteenthRevised Edition,SultanChand &Sons, New Delhi.

Unit	Chapter/Section
I	2(2.1-2.4),3(3.1-3.6)
II	4(4.1-4.5)
III	5(5.1-5.7,5.9)
IV	10(10.1,10.2, 10.5, 10.6,10.8-10.10, 10.12, 10.l3)
V	11(11.1-11.4,11.7)

References:

1. Hamdy A. Taha, 2019, Operations Research – An Introduction, 10th Edition, Pearson Education Limited,NewDelhi.
2. Sharma.S.D., 2014,OperationsResearch: Theory, methods and applications,17th Edition,KedarNathRamnath&Co.,Meerat.
3. Kalavathy.S., 2013, OperationsResearch,4thEdition,VikasPublishingHousePvt. Ltd.,NewDelhi.

CourseDesigners:

1. Mrs.K. Ponmari
2. Ms. P. Vanmathy

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Course Code	CourseTitle	Category	L	T	P	Credit
UMA20C54	**Programming in C**	**Core**	**4**	**1**	**-**	**4**

L-Lecture T-Tutorial P–Practicals

Year	Semester	Int.Marks	Ext.Marks	Total
Third	Fifth	25	75	100

Preamble

The course deals with different data types, control statements, string functions, arrays, structures and unions in C Language.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall the basic concepts of constants, variables and data type.	80	75
CO2	Demonstrate the different types of operators in C programming language.	79	75
CO3	Develop programming skills using the fundamentals and basics.	71	68
CO4	Analyze the string handling functions and different types of functions	74	70
CO5	Design programs using Structures and unions.	70	65

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	L	M	S
CO2	M	S	L	M	M
CO3	M	S	S	S	S
CO4	S	M	M	L	L
CO5	L	L	S	M	M

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	L	S	M
CO2	M	S	S	M	L	L
CO3	S	S	S	S	M	S
CO4	S	L	M	L	L	M
CO5	L	S	L	M	M	L

Bloom's Taxonomy

	CA		End ofSemester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

Constants, Variable and Data Types: Introduction –Character set- C Tokens – Keywords and identifiers – Constants – Variables – Data types – Declaration of variables – Declaration of storage class–Assigning values to variables–Defining symbolic constants –Declaring a variable as Constant- Declaring a variable as volatile. Operators and Expressions: Introduction–Various types of operators - Arithmetic expressions – Evaluation of expressions – Precedence of arithmetic operators – Some computational problems- Type conversions in Expressions–Operator precedence and associativity.

Unit II **(15 Hours)**

Managing Input and Output Operations: Introduction – Reading and writing a character - Formatted input and output. Decision Making and Branching: Introduction- Decision Making with different types of if–statements – Switch statement -The?: operator-The goto statement.

Unit III **(15 Hours)**

Decision Making and Looping: Introduction – While, do and for statements – Jumps in loops – Concise Test expressions. Arrays: Introduction– One Dimensional Arrays(DeclarationandInitialization) – Two Dimensional and Multi- dimensional Arrays - Dynamic arrays- More aboutArrays.

Unit IV **(15 Hours)**

Character Arrays and Strings : Introduction – Declaring and initializing string variables – Reading strings from terminal – Writing strings to screen – Arithmetic operations on characters – Putting strings together – Comparison of two Strings – String handling functions – Table of strings –

Other features of strings. User defined functions: Introduction – Need for user Defined functions –A multi- function program – Elements of user defined functions – Definition of functions – Return values and their types – Function calls – Function declaration – Different categories of functions –Nesting of functions – Recursion – Passing arrays to functions **–** Passing strings to functions – The scope, visibility and life time of variables– Multifile Programs.

Unit V **(15 Hours)**

Structures and Unions : Introduction- Defining a structure – Declaring structure variables – Accessing structure members – Structure initialization – Copying and comparing structure variables – Operations on individual members – Arrays of structures – Arrays within structures – Structures within structures – Structures and functions – Unions –Size of structures – Bit fields.

TextBook:

Balagurusamy. E, 2019, Programming in ANSI C, Mc Graw Hill Education (India), Private Limited,NewDelhi.

Unit	Chapter/Section
I	2 & 3
II	4 & 5
III	6 & 7
IV	8 & 9
V	10

References:

1. YashavantKanetkar, 2016, Letus C, 14th Edition, BPB Publications, NewDelhi.
2. AshokN.Kamthane, 2009, Programming with ANSI and Turbo C, Pearson Education, New Delhi.
3. Pradip Dey, Manas Ghosh, 2008, Fundamentals of Computers with Programming in C, Oxford University Press, New Delhi.

CourseDesigners:

1. Mrs. S.Karpagam
2. Mr. G.Gowtham

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Course Code	Course Title	Category	L	T	P	Credit
UMA20CE51()	**Mechanics**	**Core Elective**	**5**	**-**	**-**	**5**

L - Lecture T - Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	25	75	100

Preamble

The course provides fundamentalknowledge in laws of mechanics and dynamic system such as Projectile, Collision of elastic bodies and Simple Harmonic Motion.

CourseOutcomes

On the completion of the course the student will be ableto

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall the conditions of equilibrium of forces acting on a body	80	75
CO2	Demonstrate laws of friction and solve related problems	80	75
CO3	Determine the motion on the surface of smooth inclined plane	75	70
CO4	Solve the problems on collision of elastic bodies	85	80
CO5	Discuss geometrical representation of simple harmonic motion	85	80

Mapping of COs withPSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	M
CO2	M	L	**S**	M	L

CO3	L	**S**	M	M	S
CO4	M	M	M	**S**	L
CO5	L	M	S	**S**	M

Mappingof COswithPOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	S	M	M	S	M	L
CO2	M	S	M	M	M	M
CO3	S	S	M	M	M	M
CO4	S	M	S	M	M	L
CO5	S	M	L	M	M	S

Bloom's Taxonomy

	CA		**End of Semester**
	First	**Second**	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

UnitI **(15Hours)**

Definition – Resultant and components - Parallelogram of forces – Resultant of two forces – Triangle of forces – Perpendicular triangle of forces – Converse of triangle of forces - Polygon of forces – Lami's theorem – Extended form of the parallelogram law of forces – Resolution of a force - Components of a force along two given directions –Theorem on Resolved Parts - Resultant of any number of forces – Resultant of any number of coplanar forces - Condition of equilibrium of any number of forces acting upon a particle.

UnitII **(15Hours)**

Friction:Introduction – Experimental results – Statistical, dynamical and limiting friction – Laws of friction – Friction-a passive force – Coefficient of friction – Angle of friction – Cone of friction – Numerical values – 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 – Equilibrium of a body on a rough inclined plane under any force- Problems on friction(simple problems only).

UnitIII **(15Hours)**

Projectiles: Definitions – Two fundamental principles - Path of a projectile is a parabola – Characteristic of the motion of a projectile – Maximum horizontal range –Two possible directions to obtain a given range– Velocity at the end of time t – Two possible directions to reach a given point Range on the inclined plane – Motion on the surface of smooth inclined plane.

UnitIV **(15Hours)**

Collision of elastic bodies: Introduction - Definition – Fundamental laws of impact – Impact of a smooth sphere on a fixed smooth plane – Direct impact of two smooth spheres - Loss of kinetic energy due to direct impact of two smooth spheres – Oblique impact of two smoothspheres - Loss of kinetic energy due to oblique impact of two smoothspheres.

UnitV **(15Hours)**

Simple harmonic motion: Introduction – Simple harmonic motion in a straight line – General solution of simple harmonic motion equation – Geometrical representation of SHM – Change of origin – Composition of two simple harmonic motion of same period in the same straight line – Composition of two simple harmonic motion of same period in the two perpendicular directions – Simplependulum – Period of oscillation of a Simple pendulum – Equivalent Simple pendulum – The Seconds Pendulum.

TextBooks:

1. Venkataraman. M.K., 2014, Statics, Agasthiar publications,Chennai.
2. Venkataraman. M.K., 2014, Dynamics, Agasthiar publications, Chennai.

Unit	Book	Chapter/Section
I	1	2(1 – 16)
II	1	7(1 – 13)
III	2	6(6.1 – 6.16)
IV	2	8(8.1 – 8.8)
V	2	10(10.1 – 10.7, 10.12 – 10.15)

References:

1. Duraipandian. P., LaxmiDuraipandian and MuthamizhJeyapragasam, 2012, Mechanics, S.Chand and Company Ltd.,Chennai.
2. Manichavasagham Pillay. T.K., 2009, Statics, National Publishing & Co.,Chennai.
3. Khanna. M.L., 2008, Dynamics, PragatiPragasam Ltd.,U.P.
4. Khanna. M.L., 2008, Statics, PragatiPragasam Ltd.,U.P.

Web Resources:

1. https://www.mvsrec.edu.in/images/friction_mm.pdf
2. https://www.slideshare.net/KhanSaif2/projectile-motion-of-a-particle
3. https://ocw.mit.edu/courses/physics/8-01sc-classical-mechanics-fall-2016/week-9-collision-theory/
4. *https://www.iop.org/sites/default/files/2019-11/Simple-harmonic-motion.ppt*

CourseDesigners:

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2. Dr. P. Krishnaveni

THIAGARAJAR COLLEGE, MADURAI – 9.

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

(For those who joined B.Sc. Mathematics on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UMA20CE51( )	**Combinatorics**	**Core Elective**	**5**	**-**	**-**	**5**

L - Lecture T - Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	25	75	100

Preamble

The course deals with the field of mathematics concerned with problems of selection, arrangement and operation within a finite or discrete system.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Relate and apply sum and product rules.	85	80
CO2	Analyze and solve problems related to Permutations and Combinations.	90	80
	Make use of Inclusion-Exclusion Principle to solve problems on generalized permutation	80	75
CO4	Demonstrate ordinary and exponential	85	75
CO5	Solve Problems using Recurrence Relations.	85	80

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S
CO2	M	S	S	S	S
CO3	S	M	M	S	M
CO4	M	S	M	S	S
CO5	S	S	M	M	M

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	S	M
CO2	S	S	M	M	M	S
CO3	S	S	S	M	M	M
CO4	S	M	M	S	S	M
CO5	S	S	S	M	M	S

Bloom's Taxonomy

	CA		End of Semester
	First	**Second**	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

The Sum Rule and the Product Rule – The Pigeonhole Principle - Solved Problems on The Sum and Product Rules - Solved Problems on The Pigeonhole Principle.

Unit II **(15 Hours)**

Permutations and Combinations - Solved Problems on Permutations and Combinations.

Unit III **(15 Hours)**

Generalized Permutations and Combinations –The Inclusion-Exclusion Principle - Solved Problems on Generalized Permutations and Combinations - Solved Problems on The Inclusion-Exclusion Principle - Solved Problems on Generalized Inclusion-Exclusion Principle.

Unit IV **(15 Hours)**

Ordinary and Exponential Generating Functions - Solved Problems on Ordinary Generating Functions - Solved Problems on Exponential Generating Functions.

Unit V **(15 Hours)**

Partitions of a Positive integer - Recurrence Relations- Solved Problems on Partitions of Integers and Their Generating Functions - Solved Problems on Recurrence Relations and Associated Generating Functions.

Text Book:

Balakrishnan. V.K., 2005, Combinatorics including concepts of Graph Theory, Schaum's Outlines, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Unit	Chapter/Sections
I	Chapter 1 (1.1,1.3)
II	Chapter 1(1.2)
III	Chapter 2 (2.1, 2.3)
IV	Chapter 3 (3.1)
V	Chapter 3 (3.2, 3.3)

References:

1. Richard A. Brualdi, 2019, Introductory Combinatorics, 5th Edition, Pearson Publishers, England.
2. Alan Tucker, 2012, Applied Combinatorics, 6th Edition, Wiley, New Jersey.
3. J.H. Van Lint, R.M. Wilson, 2008, A Course in Combinatorics, Second Edition, Cambridge University Press, New Delhi.
4. Vasudev. C, 2005, Theory and Problems of Combinatorics, New Age International Publishers, New Delhi.

Web Resources:

1. https://www.hackerearth.com/practice/math/combinatorics/basics-of-combinatorics/tutorial/
2. https://www.powershow.com/view1/21b3dd-ZDc1Z/Combinatorics_powerpoint_ppt_presentation
3. https://ocw.mit.edu/high-school/mathematics/combinatorics-the-fine-art-of-counting/lecture-notes/
4. https://mathigon.org/world/Combinatorics

Course Designers:

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS
(For those who joined B.Sc. Mathematics on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UMA20CE51( )	**Cryptography**	**Core Elective**	**5**	**-**	**-**	**5**

L-Lecture T-Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth	25	75	100

Preamble

The course deals with Cryptographic principles, traditional symmetric key and asymmetric key ciphers.Also mathematics of cryptography and Standard cryptography systems such as RSA, Rabin, Elgamal and Elliptic curves have been discussed.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall the fundamentals of Cryptography and solve some problems using Euclidean algorithm, Modular arithmetic, and Linear congruence	80	75
CO2	Summarize traditional symmetric key ciphers	75	70
CO3	Solve some problems in Groups, Rings, Fields	75	65
CO4	Recall primality testing algorithms and Solve some problems of primes , factorization, Chinese Remainder theorem and Quadratic congruence	80	75
CO5	Explain Asymmetric key cryptographic algorithms such as RSA, Rabin, Elgamal and Elliptic curves	75	70

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S
CO2	S	S	L	M	M
CO3	L	M	M	S	S

CO4	M	L	M	M	S
CO5	S	M	S	M	M

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	M	M	L	M	M
CO2	S	M	M	M	M	M
CO3	S	M	M	M	M	S
CO4	M	S	M	S	S	S
CO5	M	M	M	S	M	S

Bloom's Taxonomy

	CA		End of Semester
	First	**Second**	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

Introduction: Security Goals – Cryptographic Attacks – Services and Mechanism – Techniques for Security Goals Implementation.

Mathematics of Cryptography: Integer Arithmetic – The Extended Euclidean Algorithm – Modular Arithmetic – Matrices – Linear Congruence.

Unit II **(15 Hours)**

Traditional Symmetric–Key Ciphers: Symmetric–Key Ciphers – Categories of Traditional Ciphers – Stream and Block Ciphers.

Unit III **(15 Hours)**

Mathematics of Symmetric-Key Cryptography: Algebraic Structures – Group – Ring – Field – GF(2^n) Fields.

Unit IV **(15 Hours)**

Mathematics of Asymmetric-Key Cryptography: Primes – Primality Testing – Factorization – Chinese Remainder Theorem – Quadratic Congruence – Exponentiation and Logarithm.

Unit V **(15 Hours)**

Asymmetric-Key Cryptography: Difference between Symmetric-Key and Asymmetric-Key Cryptosystems - - RSA Cryptosystem – Rabin Cryptosystem – Elgamal Cryptosystem – Elliptic Curve Cryptosystems.

Text Book:

Behrouz A. Forouzan and DebdeepMukhopadhyay, 2015, Cryptography and Network Security, 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi.

Unit	Chapter/Section
I	1 & 2
II	3
III	4
IV	9
V	10

References:

1. William Stallings, 2018, Cryptography and Network Security: Principles and Practice, 7th Edition, Pearson Education, New Delhi, India.
2. AtulKhate, 2014, Cryptography and Network Security, 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi.
3. Bruce Schneier, 2012, Applied Cryptography: Protocols, Algorithms and Source code in C, 2nd Edition, Wiley India, New Delhi.

Course Designers:

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2.Mrs. B. Ambika

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS
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Course Code	Course Title	Category	L	T	P	Credit
UMA20C61	**Complex Analysis**	**Core**	**5**	**1**	**-**	**5**

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Sixth**	**25**	**75**	**100**

Preamble

The course aims to study the various properties of analytic functions. It provides a thorough discussion of the properties of singularities of a function. It classifies the various types of metric spaces. Also it explores the integration of complex function using residues.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall and analyze the properties of analytic function	**85**	**70**
CO2	Summarize and develop the properties of transformations in complex plane	**80**	**70**
CO3	Identify and classify singularities of a complex function	**70**	**80**
CO4	Construct and extend expansion of a function using Taylor and Laurntz series	**75**	**75**
CO5	Recall and demonstrate complex integral using Cauchy's integral formula and Residues	**80**	**75**

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M
CO2	S	S	S	S	L
CO3	S	S	S	S	M
CO4	S	S	S	S	L
CO5	S	S	S	M	S

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	L	M
CO2	S	S	S	S	M	L
CO3	S	S	S	S	M	M
CO4	S	S	S	S	L	M
CO5	S	S	L	S	L	L

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit – I **(18 Hours)**

Analytic functions : Functions of a complex variable – Limits – Theorems on limit – Continuous functions – Differentiability – The Cauchy – Riemann equations –Analytic functions – Harmonic functions – Conformal mapping.

Unit – II **(18 Hours)**

Bilinear transformations: Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of Bilinear transformations – Some special bilinear transformations – Mapping by elementary functions: The mappings $w = z^2$, $w = e^z$, $w = \sin z$ and $w = \frac{1}{2}(z + 1/z)$.

Unit – III **(18 Hours)**

Complex integration: Definite integral - Cauchy's theorem– Cauchy's integral formula – Higher derivatives.

Unit – IV **(18 Hours)**

Series expansions: Taylor's series– Laurent's series – Zeros of an analytic functions – Singularities.

Unit – V **(18 Hours)**

Calculus of residues: Residues– Cauchy's residue theorem – Evaluation of definite integrals.

Text Book:

Arumugam.S., ThangapandiIssac. A. and A. Somasundaram, 2015, Complex Analysis,

SciTech Publications(India) Pvt. Ltd. Chennai.

Unit	Chapter/Section
I	2(2.1 – 2.9)
II	3(3.1 – 3.5) 5(5.1, 5.3, 5.4, 5.7)
III	6(6.1 – 6.4)
IV	7(7.1 – 7.4)
V	8(8.1 – 8.3)

References:

1. Roopkumar. R, 2015, Complex analysis, Dorling Kinderley Pvt. Ltd, New Delhi.

2. ManickavasagamPillay T.K. and Narayanan. S., 2008, Complex Analysis, S. V.Publishers,India.

3. Karunakaran V, 2006, Complex Analysis, Narosa Publishing House Pvt. Ltd., Second Edition, New Delhi.

Course Designers:

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS
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Course Code	Course Title	Category	L	T	P	Credits
UMA20C62	ProbabilityandStatistics	Core	5	1	-	5

L - Lecture T - Tutorial P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Sixth	25	75	100

Preamble

The course provides the basic concepts of data analysis and statistical computation. It outlines the techniques to expose the students to many statistical ideas and rules that underlie statistical reasoning. It explains step by step development of fundamental principles of statistics, probability concepts and random variables. It recognizes and interprets Binomial, Poisson and Normal distribution.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Improve data handling skills and summarize statistical computations.	80	70
CO2	Determine the relationship between quantitative variables and extend regression analysis.	80	75
CO3	Recall and apply a comprehensive set of probabilistic ideas in generating expectations.	75	70
CO4	Find, interpret and analyze the measure of central tendencies, m.g.f. and characteristic function of random variables.	80	70
CO5	Relate and demonstrate the knowledge of using various distributions for statistical analysis.	80	70

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	M	M
CO2	S	S	S	M	M
CO3	S	S	S	M	L

CO4	M	S	M	M	M
CO5	S	S	M	S	M

Mapping of COs with POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	S	S	M	M	M	M
CO2	S	S	M	M	M	M
CO3	M	S	L	S	M	M
CO4	M	M	M	M	L	L
CO5	S	S	M	S	M	M

Bloom's Taxonomy

	CA		**End of Semester**
	First	**Second**	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(18 Hours)**

MeasuresofDispersion,SkewnessandKurtosis: Dispersion–Characteristicsforanidealmeasureof Dispersion–MeasuresofDispersion–Range –Quartile Deviation–Meandeviation - StandardDeviationandRootmeansquaredeviation-CoefficientofDispersion–Moments– Pearson'sβandγCo-efficients–Skewness–Kurtosis.

UnitII **(18 Hours)**

MathematicalExpectationandGeneratingFunctions: MathematicalExpectation– AdditiontheoremofExpectation–Multiplicationtheoremofexpectation–Co-variance–Expectation of a linear combination of random variables -Variance of a linear combination ofrandom variables - Expectation of a continuous random variable–Conditional expectation andConditionalvariance-Moment GeneratingFunction – Cumulants -CharacteristicFunction.

UnitIII **(18 Hours)**

Theoretical Discrete Distributions: Introduction - Bernoulli Distribution - BinomialDistribution-Poisson Distribution.

UnitIV **(18 Hours)**

Theoretical Continuous Distributions: Rectangular Distribution - Normal Distribution -Gamma Distribution - Beta Distribution of First Kind - Beta Distribution of Second Kind

- TheExponential Distribution**.**

UnitV (18 Hours)

Correlation and Regression: Bivariate Distribution, Correlation - Scatter diagram – KarlPearson's coefficient of correlation - Calculation of the correlation coefficient for a Bivariatefrequencydistribution - Probableerrorofcorrelationcoefficient-RankCorrelation -Regression.

Text Books:

Gupta. S.C. and Kapoor. V.K., 2019, Elements of Mathematical Statistics, Third Edition, SultanChand&Sons, Educational Publishers, New Delhi.

Unit	Chapter/ Section
I	3
II	6 (6.1-6.11)
III	7
IV	8
V	10

References:

1. Vittal. P.R., 2013,Mathematical Statistics, MarghamPublications, Chennai.
2. Arumugam.S.andThangapandi Isaac.A.,Statistics,2011,NewGammaPublishingHouse,Palayamkkottai.
3. Gupta. S.C. and Kapoor. V.K.,2007, Fundamentals of Mathematical Statistics, Eleventh edition, Sultan Chand &sons, New Delhi.

Web Resources:

1. https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/
2. https://www.researchgate.net/publication/272237355_Probability_and_Mathematical_Statistics
3. https://nptel.ac.in/courses/111/105/111105041/

Course Designers:

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

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Course Code	Course Title	Category	L	T	P	Credit
UMA20C63	**Discrete Mathematics**	**Core**	**5**	**1**	**-**	**5**

L - Lecture T - Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Sixth	25	75	100

Preamble

The course provides naïve view of graphs, trees, Eulerian graphs, Hamiltonian cycles, Lattices and Boolean Algebra and gives better understanding of formal statements and their proofs.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Recall and apply the fundamental concepts in Graph Theory	70	60
CO2	Develop proof writing skills for various results	65	60
CO3	Demonstrate graph theory based tools in solving practical problems	70	65
CO4	Determine whether a graph is planar	70	65
CO5	Formulate and interpret Boolean Algebras	75	68

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	L	M	M	L
CO2	M	M	S	L	M
CO3	M	S	M	M	M

CO4	L	M	L	M	S
CO5	M	M	S	M	M

Mapping of COs with POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	S	M	M	L	M	M
CO2	S	M	L	M	M	L
CO3	M	L	S	S	L	S
CO4	L	M	M	M	M	M
CO5	S	S	S	M	M	L

Bloom's Taxonomy

	CA		**End of Semester**
	First	**Second**	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents:

Unit I **(18 Hours)**

Logic: Introduction – TF-statements – Connectives – Atomic and compound statements – Well Formed (Statement) Formulae – Truth table of a Formula – Tautology – Tautological Implications and Equivalence of Formulae – Replacement Process – Functionally complete sets of connectives and Duality law – Normal Forms – Principal Normal Form

Unit II **(20 Hours)**

Lattices and Boolean Algebra: Lattices – Some Properties of Lattices – New Lattices – Modular and Distributive Lattices, Boolean Algebra.

Unit III **(16 Hours)**

Graphs: Varieties of graphs – Walks and connectedness – Degrees. Blocks: Cut points, bridges, and blocks.

Unit IV **(18 Hours)**

Trees: Characterization of trees – Centers and centroids. Connectivity: Connectivity and line-connectivity.

Unit V **(18 Hours)**

Traversability: Eulerian graphs – Hamiltonian graphs. Planarity: Plane and planar graphs.

Text Books:

1. Harary, 2001, Graph Theory, Narosa Publishing House, New Delhi.

2. Venkataraman. M.K., Sridharan. N. and Chandrasekaran. N., 2012, Discrete Mathematics, The National Publishing Company, Chennai.

Units	Book	Chapter / Sections
I	2	IX(1 – 12)
II	2	X (1–5)
III	1	2 (Pages 8–15), 3 (Pages 26 -29)
IV	1	4(Pages 32–36), 5 (Pages 43–47)
V	1	7 (Full),11 (Pages 102–106)

References:

1. Bondy. J.A. and Murty. U.S.R., 2008, Graph Theory, Springer, New York.
2. Seymour Lipschutz and Marc Lars Lipson, 2002, Discrete Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. Narsingh Deo, 2001, Graph Theory with Applications to Engineering and computer Science, Prentice – Hall of India.
4. Arumugam. S., and Ramachandran. S., 2001, Invitation to Graph Theory, Scitech Publications (India) Pvt. Ltd, Chennai.
5. Trembley. J.P. and Manohar. R., 2001, Discrete Mathematical Structures with Applications to Compute Science, Tata McGraw –Hill Publishing Company Ltd, New Delhi.

Course Designers:

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

(For those who joined B.Sc. Mathematics on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UMA20C64	**Numerical Methods**	**Core**	**4**	**1**	**-**	**4**

L-Lecture T-Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Sixth	25	75	100

Preamble

The course introduces fundamental concepts for solvingmathematical problems frequently encountered in engineering computations. Further Numerical solutions of Algebraic, transcendental equations and system of simultaneous linear equations has also been discussed.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Develop the skills in solving algebraic, transcendental, differential and integral equations numerically	85	80
CO2	Discuss and demonstrate the concept of interpolation	80	75
CO3	Extend the standard numerical techniques as a powerful tool in scientific computing.	75	70
CO4	Interpret, analyze and evaluate results from numerical computations	80	75
CO5	Choose, formulate and implement appropriate numerical methods for solving science and engineering problems	85	80

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	L
CO2	S	S	M	S	M
CO3	M	S	L	M	S
CO4	S	M	M	S	L
CO5	S	M	S	L	M

Mapping of Cos with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	L	M
CO2	M	S	L	M	M	M
CO3	S	S	M	M	M	M
CO4	S	M	S	M	S	L
CO5	M	S	L	M	M	S

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

Solution of Algebraic and Transcendental Equations: Introduction – Bisection method – Method of false position– Iteration method – Newton-Raphson Method – Some deductions from Newton-Raphson formula.

Unit II **(15 Hours)**

Solution of Simultaneous Algebraic Equations: Solution of linear simultaneous equations – Direct methods of solution: Gauss elimination method –Gauss-Jordan method – Iterative Methods of solution: Jacobi's iteration method – Gauss - Seidal iteration method.

Unit III **(15 Hours)**

Interpolation: Introduction – Newton's forward interpolation formula – Newton's backward interpolation formula – Interpolation with unequal intervals –Lagrange's interpolation formula – Divided differences – Newton's divided difference formula.

Unit IV **(15 Hours)**

Numerical Differentiation and Integration: Numerical differentiation – Formulae for derivatives: Derivatives using Newton's forward difference formula – Derivatives using Newton's backward difference formula – Maxima and minima of a tabulated function – Numerical integration – Newton-Cotes quadrature formula: Trapezoidal rule – Simpson's 1/3 rule – Simpson's 3/8 rule.

Unit V **(15 Hours)**

Numerical Solution of ordinary differential equations: Introduction – Taylor's series method – Euler's method – Modified Euler's method – Runge-Kutta method – Predictor Corrector methods – Milne's method.

Text Book:

Grewal. B.S., 2015, Numerical Methods in Engineering & Science, Khanna Publishers, New Delhi.

Unit	Chapter/section
I	2(2.1, 2.8, 2.9, 2.11-2.13)
II	3(3.3, 3.4(3, 4), 3.5(1, 2))
III	7(7.1-7.3, 7.11 – 7.14)
IV	8(8.1, 8.2(1, 2), 8.3, 8.4, 8.5(I, II,III))
V	10(10.1, 10.3 – 10.5,10.7-10.9)

References:

1. Arumugam. S., Thangapandi Isaac. A. and Somasundaram. A., 2015, Numerical Methods,Second Edition, SciTech Publications (India) Pvt. Ltd., Chennai.
2. Venkataraman.M.K.,2009, Numerical Methods in Science and Engineering, 5th Edition,The National Publishing company,Chennai.
3. Kandasamy.P.,Thilagavathy. K. and Gunavathy.K., 2006. Numerical Methods, 3rdEdition,S. Chand & Company Pvt. Ltd., NewDelhi.

Web Resources:

1. https://nptel.ac.in/content/storage2/courses/122104019/numerical-analysis/Rathish-kumar/ratish-1/f3node6.html
2. https://www.vssut.ac.in/lecture_notes/lecture1428550358.pdf
3. https://www.sjsu.edu/me/docs/hsu-Chapter%2010%20Numerical%20solution%20methods.pdf
4. https://www.math.hkust.edu.hk/~machas/numerical-methods.pdf

Course Designers:

1. Mr. M. Madhavan
2. Mrs. V. Kanchana Devi

THIAGARAJAR COLLEGE, MADURAI – 9.
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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

(For those who joined B.Sc. Mathematics on or after June 2020)

CourseCode	CourseTitle	Category	L	T	P	Credit
UMA20CE61( )	**Resource Management Techniques**	**Core Elective**	**5**	**-**	**-**	**5**

Year	Semester	Int.Marks	Ext.Marks	Total
Third	Sixth	25	75	100

Preamble

Resource Management Techniques dealwith the application of scientific methods for decision making.Thiscoursedealswiththesequencingproblems,queuingtheory,networksschedulingbyPERT/CPM, game theoryandInventoryControlProblems.

CourseOutcomes

On thecompletion ofthecoursethestudent will beableto

#	CourseOutcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Choosethemathematicaltoolsthatareneeded tosolvesequencing Problems.	80	75
CO2	Applyandextendqueuingmodelsto analyzerealworld models.	80	75
CO3	ApplyPERT and CPMtechniques to plan, scheduleand control project activities.	75	70
CO4	Recallmathematicalskillstoanalyze andsolveproblemsingame.	85	80
CO5	Apply and extend inventory models to analyze real world systems.	85	80

Mappingof COswithPSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	M
CO2	M	S	M	L	M
CO3	L	L	S	M	S
CO4	M	M	S	M	M
CO5	L	M	S	M	M

Mappingof COswithPOs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	M	M	S
CO2	S	S	M	L	S	L
CO3	M	S	L	M	M	S
CO4	S	M	L	M	M	L
CO5	S	S	S	S	L	M

Bloom's Taxonomy

	CA		End ofSemester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

UnitI **(15 Hours)**

SequencingProblem:Introduction-Problemofsequencing-Basictermsusedinsequencing - Processing n jobs through two machines - Processing n jobs through k machines –Processing 2 jobs through k machines.

UnitII(15 Hours)

Queuing Theory: Introduction – Queuing system – Elements of a queuing system - Operating characteristics of a queuing system – Probability distributions in queuing systems - Classification ofqueuingmodels– Definition oftransient andsteadystates– Poisson Queuingsystems(ModelsItoV).

UnitIII(15 Hours)

Network scheduling by PERT/CPM: Introduction **–** Network**:** Basic components – Rulesofnetworkconstruction–Criticalpathanalysis–ProbabilityconsiderationinPERT– Distinctionbetween PERT and CPM.

UnitIV(15 Hours)

GamesandStrategies: Introduction–Two-personzero**–**sumgames–Somebasicterms - Themaximin–minimaxprinciple-Gameswithoutsaddlepoints-Mixedstrategies-Graphicsolutionof 2 xn and mx 2 games -Dominanceproperty.

UnitV(15 Hours)

InventoryControl:Introduction**–**Typesofinventories-Reasonsforcarryinginventories-Theinventorydecisions-Objectivesofscientificinventorycontrol-Costsassociatedwithinventories-Factorsaffectinginventorycontrol-Aninventorycontrolproblem - The conceptof EOQ- Deterministic inventory problemswithnoshortages-Deterministicinventoryproblems with shortages – Problem of EOQwith pricebreaks.

TextBook:

KantiSwarup,Gupta.P.K.andManMohan, Reprint 2021,OperationsResearch, Nineteenth RevisedEdition,SultanChand &Sons, New Delhi.

Unit	Chapter/Sections
I	12(12:1– 12:6)
II	21(21:1– 21:4, 21:6–21:9)
III	25(25:1,25:2,25:4, 25:6, 25:7, 25:8)
IV	17(17:1– 17:7)
V	19(19:1– 19:12)

References:

1. Hamdy A. Taha, 2019, Operations Research – An Introduction, 10th Edition, Pearson Education Limited,NewDelhi.
2. Sharma.S.D., 2014,OperationsResearch: Theory, methods and applications,17th Edition, KedarNathRamnath&Co.,Meerat.
3. Kalavathy.S., 2013, OperationsResearch,4thEdition,VikasPublishingHousePvt. Ltd.,NewDelhi.

CourseDesigners:

1. Mrs. K. Ponmari
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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

(For those who joined B.Sc. Mathematics on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credit
UMA20CE61( )	**Fundamentals of Computer Algorithms**	**Core Elective**	**5**	**--**		**5**

L - Lecture T - Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Sixth	25	75	100

Preamble

Computer algorithms deals with designing and analyzing of algorithms and the basic principles of algorithm design techniques like divide and conquer, Greedy strategy, Dynamic programming and backtracking.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency	Expected Attainment
CO1	Recall some basic programming principles and Summarize algorithm design techniques	80	75
CO2	Demonstrate the correctness of divide and conquer algorithms and solve some problems	75	70
CO3	Classify Greedy strategy algorithms and solve some problems	75	65
CO4	Solve dynamic programming problems	80	70
CO5	Construct algorithms for 8- Queens problem, Sum of subsets and Graph coloring problems	80	75

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	**S**	M	L	M
CO2	S	M	M	S	L
CO3	S	M	M	M	S
CO4	S	L	M	M	**S**
CO5	S	M	S	M	L

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	L	M	S
CO2	S	L	M	S	L	M

CO3	S	M	M	M	S	M
CO4	S	L	L	L	S	S
CO5	S	M	L	M	L	S

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

Introduction

What is an algorithm? – Algorithm specification – Performance analysis – Randomized algorithms.

Unit II **(15 Hours)**

Divide – and – Conquer

General method – Defective chessboard –Binary search – Finding the maximum and minimum – Merge sort – Quicksort – Selection – Strassen's Matrix multiplication.

Unit III **(15 Hours)**

Greedy Method

The General method –Container loading- Knapsack problem – Tree vertex splitting – Job sequencing with deadlines – Minimum cost spanning trees.

Unit IV **(15 Hours)**

Dynamic Programming

The General method – Multistage graphs – All pairs shortest paths – Single source shortest paths: General weights– String editing - 0/1 knapsack.

Unit V **(15 Hours)**

Backtracking

The General method – The 8 – queens problem – Sum of subsets - Graph coloring– Hamiltonian cycles – Knapsack problem.

Text Book:

Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2019, Fundamentals of Computer Algorithms, 2nd Edition,Universities Press (India) Private Limited , Hyderabad

Unit	Chapter/Section
I	1 (1.1 – 1.4)
II	3 (3.1 – 3.8)
III	4 (4.1 – 4.6)
IV	5 (5.1 – 5.4, 5.6,5.7)
V	7 (7.1 – 7.6)

References:

1.R.C.T. Lee, S.S.Tseng, R.C.Chang, Y.T.Tsai,2013, Introduction to Design and Analysis of Algorithms A Strategic Approach, McGraw Hill Education (India) Private Limited, New Delhi

2. Thomas H.Corman, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein , 2010, Introduction to Algorithms , Third Edition, PHI Learning Private Limited, New Delhi

3. G.A.VijayalakshmiPai, 2008, Data Structures and Algorithms Concepts , Techniques and Applications , Tata McGraw- Hill Publishing Company Limited, New Delhi.

Course Designers:

1. Dr. B. Arivazhagan
2. Mrs. V. Kanchana Devi

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

(For those who joined B.Sc. Mathematics on or after June 2020)

Course Code	Course Title	Category	L	T	`P	Credit
UMA20CE61( )	**Fuzzy Sets**	**Core Elective**	**5**	**-**	**-**	**5**

L - Lecture T - Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Sixth	25	75	100

Preamble

The course deals with the fundamentals of fuzzy sets, fuzzy logic, fuzzy measures, fuzzy relations and its applications.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Explain the concept of fuzzy sets and crisp sets in brief	85	70
CO2	Demonstrate the operations on fuzzy sets	80	75
CO3	Define the relations in fuzzy sets	85	75
CO4	Analyze the relationship among fuzzy measures	80	75
CO5	Apply fuzzy theory in Engineering, Management and Medicine. Construct fuzzy sets and extend it to interpolation and curve fitting	80	70

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	M
CO2	L	S	M	M	M
CO3	S	M	L	L	M
CO4	L	M	S	M	M
CO5	S	M	M	M	S

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	S	S	S	L
CO2	S	S	M	M	L	L
CO3	M	M	S	L	L	M
CO4	M	S	S	M	M	M
CO5	S	S	S	S	S	S

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

Crisp Sets and Fuzzy Sets: Introduction – Crisp Sets: An Overview – The Notion of Fuzzy Sets – Basic Concepts of Fuzzy Sets - Classical Logic: An Overview – Fuzzy Logic.

Unit II **(15 Hours)**

Operations on Fuzzy Sets: General Discussion – Fuzzy Complement – Fuzzy Union – Fuzzy Intersection.

Unit III **(15 Hours)**

Fuzzy Relations: Crisp and Fuzzy Relations – Binary Relations – Binary Relations on a Single Set – Equivalence and Similarity Relations – Compatibility or Tolerance Relations – Orderings.

Unit IV **(15 Hours)**

Fuzzy Measures: General Discussion – Belief and Plausibility Measures – Probability Measures – Possibility and Necessity Measures – Relationship among Classes of Fuzzy Measures.

Unit V **(15 Hours)**

Applications: Engineering - Medicine – Management and Decision Making.

Text Book:

George J. Klir and Tina A. Folger, 2012. Fuzzy Sets, Uncertainty and Information, PHI Learning Private Limited, New Delhi – 110001.

Unit	Chapter/section
I	1(1.1 – 1.6)
II	2(2.1 – 2.4)
III	3(3.1 – 3.6)
IV	4(4.1 – 4.5)
V	6(6.3 – 6.5)

References:

1. Ganesh, M. 2015, Introduction to Fuzzy Sets and Fuzzy Logic, Prentice-Hall of India.
2. George J. Klir and Bo Yuan. 2012, Fuzzy Sets and Fuzzy Logic Theory and Applications, Prentice-Hall of India.
3. Zimmermann, H.J. 1996, Fuzzy Set Theory and its Applications, Allied Publishers Ltd., Chennai.

Course Designers:

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS
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Course Code	CourseTitle	Category	L	T	P	Credit
UMA20SE51()	Programming in C - Lab	SEC	-	-	2	2

Year	Semester	Int.Marks	Ext.Marks	Total
Third	Fifth/Sixth	15	35	50

Preamble

The course provides practicalknowledge to find solution for analytical problems using C language.

Course outcomes

On the completion of the course the student will be able to

#	CourseOutcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Illustrate Programming principles	80	75
CO2	Develop skills to solve mathematical problems	76	72
CO3	Relate conditional and looping statements	78	73
CO4	Design simple projects	68	62
CO5	Construct programs using strings and functions	65	60

Mapping of Cos with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	M	L
CO2	M	S	S	S	M
CO3	S	M	L	M	S
CO4	S	S	M	S	M
CO5	M	M	S	M	L

Mapping of Cos with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	L	M
CO2	M	S	S	M	M	M
CO3	S	L	S	S	S	M
CO4	S	S	M	M	L	S
CO5	M	S	L	M	M	L

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	40%	40%	40%

Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

List of Practicals

1. Fahrenheit to Celsius
2. Simple interest and Compound interest
3. Largest of three numbers
4. Odd/Even Number
5. Reverse the Number
6. Sum of Digits
7. Number of Multiples of 7 between 1 and 100
8. Prime Number
9. Quadratic Equation using switch case
10. Fibonacci Series
11. Average of n values
12. nCr value
13. Multiplication table
14. Standard deviation
15. Median
16. Ascending order
17. Descending order
18. Sorting a list of Names
19. Matrix addition and subtraction
20. Matrix multiplication

References:

1. Balagurusamy. E, 2019, Programming in ANSI C, McGraw Hill Education (India), Private Limited, New Delhi.
2. YashavantKanetkar, 2016, Letus C,14th Edition, BPB Publications, New Delhi.
3. AshokN.Kamthane, 2009, Programming with ANSI and Turbo C, Pearson Education, New Delhi.
4. Pradip Dey, Manas Ghosh, 2008, Fundamentals of Computers with Programming in C, Oxford University press, New Delhi.

Course Designers:

1. Mrs. S.Karpagam
2. Mr. G. Gowtham

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS
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Course Code	Course Title	Category	L	T	P	Credit
UMA20SE61()	**Numerical Methods - Lab**	**SEC**	**-**	**-**	**2**	**2**

L - Lecture T - Tutorial P–Practicals

Year	Semester	Int.Marks	Ext.Marks	Total
Third	Fifth/Sixth	15	35	50

Preamble

The Course is designed to develop practical skills for finding numerical solutions of algebraic and differential equations by using C Language.

Course Outcomes

On the completion of the course the student will be able to

#	Course outcomes	Expected Proficiency %	Expected Attainment %
CO1	Select appropriate method for finding numerical solutions of algebraic and transcendental equations using C programming	85	80
CO2	Develop the programme for various methods such as Bisection, Newton Raphson and Gauss Elimination.	75	70
CO3	Design programme for Evaluating definite integrals	80	75
CO4	Illustrate conditional and looping statements in solving numerical problems.	80	75
CO5	Construct programs to solve differential equation.	85	80

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	L	M	M
CO2	S	L	M	S	L
CO3	S	M	M	M	S
CO4	S	L	M	L	S
CO5	S	M	L	M	S

	PO1	PO2	PO3	PO4	PO5	PO6

Mapping of COs with POs

CO1	M	S	M	L	S	M
CO2	M	S	S	M	L	M
CO3	S	M	M	M	M	L
CO4	S	M	L	S	M	L
CO5	S	S	L	M	L	M

Bloom's Taxonomy

	CA		**End of Semester**
	First	**Second**	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

List of Practical

1. Finding a root of the given equation using Bisection method.
2. Finding a root of a given equation using Newton Raphson method.
3. Solving the given system of equation by Gauss elimination method.
4. Finding f(x) at given x using Newton's interpolation formula.
5. Finding f(x) at given x using Lagrange's interpolation formula.
6. Evaluating dy/dx, at a given x using Newton's differentiation formula.
7. Evaluating $\int$ f(x) dx using Trapezoidal rule.
8. Evaluating $\int$ f(x) dx using Simpson's 1/3 rule.
9. Solving the given differential equation by Euler's method.
10. Solving the given differential equation by Runge-Kutta method(4^{th}Order only)

References:

1. Grewal. B.S., 2015, Numerical Methods in Engineering & Science, KhannaPublishers, New Delhi.
2. Arumugam. S., ThangapandiIssac. A. and Somasundaram. A., 2014, Numerical Methods,Second Edition, SciTech Publications(India) Pvt. Ltd.,Chennai.
3. Kandasamy. P., Thilgavathy. K. and Gunavathy. S., 2007, Numerical methods, Chand and Co., NewDelhi.

Course Designers:

1. Mr. M. Madhavan
2. Mrs. V. Kanchana Devi

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS
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Course Code	Course Title	Category	L	T	P	Credit
UMA20SE	**Theory of Numbers**	**SEC**	**2**	**-**	**-**	**2**

L - Lecture T - Tutorial P – Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Third	**Fifth/Sixth**	**15**	**35**	**50**

Preamble

The course aims to study the various properties of divisibility of integers. It provides a thorough discussion of the properties of linear and simultaneous congruences.

Course Outcomes

On the completion of the course the student will be able to

#	Course outcomes	Expected Proficiency %	Expected Attainment %
CO1	Recall and analyze the properties prime numbers	85	70
CO2	Summarize and develop the properties divisibility of integers	80	70
CO3	Solve problems using mathematical induction	70	80
CO4	Construct and extend properties of congruences	75	75
CO5	Recall and demonstrate the properties of Euler's function	80	75

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**S**	**L**
CO3	**S**	**S**	**S**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**L**
CO5	**S**	**S**	**S**	**M**	**S**

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	S	L	M
CO2	S	S	S	S	M	L
CO3	S	S	S	S	M	M
CO4	S	S	S	S	L	M
CO5	S	S	L	S	L	L

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	40%	40%	40%
Understand(K2)	40%	40%	40%
Apply(K3)	20%	20%	20%

Contents

Unit - I **(15 Hours)**

Natural Numbers and the Principle of Induction – Equivalence relations – Divisibility in Z.

Unit – II **(15 Hours)**

Congruences – Linear Congruence – Simultaneous congruences – Euler's function.

Text Book:

Arumugam.S. and ThangapandiIssac. A., 2011, Algebra: Theory of Equations Theory of Numbers and Trigonometry, New Gamma Publishing House,

Unit	Chapter/section
I	1 and 2
II	3(3.1 – 3.4)

References:

1. ManicavachagomPillay. T.K., Natarajan. T. and Ganapathy. K.S., 2015, Algebra Volume II, S. Viswanathan(Printers and Publishers) PVT. Ltd., Chennai.

2. Martin Erickson and Anthony Vazzana, 2009, Introduction to Analytic Number Theory, Chapman and Hall /CRC publications.

3. George E. Andrews, 1992, Number Theory, Hindusthan Publishing Corporation (India).

Course designers:

1. Dr. G. Prabakaran
2. Mrs. P. KalaiMathy

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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS

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Course Code	Course Title	Category	L	T	P	Credit
UMA20SE	**Theory of Finite Automata**	**SEC**	**2**	**-**	**-**	**2**

L - Lecture T - Tutorial P–Practical

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth/Sixth	15	35	50

Preamble

The course providessimplest way to recognize patterns in machines. On the basis of input, finite automata with and without epsilon, transition/moves are discussed. Further the output in the form of Mealy and Moore Machines and extended transition function for stringsare also discussed.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Describe the basic principles of finite automata	70	60
CO2	Elaborate the concept of Deterministic finite automata	65	60
CO3	Solve simple problems in automata theory	70	65
CO4	Explain the concept of Moore & Mealy machines	70	65
CO5	Analyze the properties of Transition function and apply the ideas of automata to finite state machines	65	60

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	M

CO2	S	M	M	L	L
CO3	L	M	L	S	M
CO4	S	M	M	M	M
C05	M	S	S	S	S

Mapping of COs with POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	S	M	M	M	L	M
CO2	S	M	M	M	M	L
CO3	S	S	L	M	M	M
CO4	M	M	M	M	S	M
CO5	S	S	M	S	S	S

Bloom's Taxonomy

	CA		**End of Semester**
	First	**Second**	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

Finite Automata: Finite State Machines and its Model – Deterministic Finite Automata-Simplified Notation – FA with and without Epsilon Transitions – Languages of Deterministic Finite Automata – Acceptability of a string by a DFA –Processing of Strings by DFA – Nondeterministic Finite Automata – Language of NFA – Equivalence between DFA and NFA - NFA with and without Epsilon Transitions

Unit II **(15 Hours)**

Finite Automata: Two way Finite Automata – FA with output: Moore and Mealy machines – From finite automata to Moore machine – Interconversion between the machines – Equivalence between Moore and Mealy machines – Minimization of FA – Properties of Transition function –

Extending Transition function to strings – Applications of Finite automata – Limitations of finite state machines.

Text Book:

Rajendra Kumar, 2010,Theory of Automata, Languages and Computation, Tata Mc Graw Hill Educations Private Limited, New Delhi.

Unit	Chapter/Section
I	2(2.1 – 2.11)
II	2(2.12 – 2.21)

References:

1. Peter Linz., 2011, An Introduction to Formal Languages, Narosa Publishing company, New Delhi.

2. Dr. M. K. Venkatrman, Dr. N. Sridharan, N. Chandrasekaran, 2009,Discrete Mathematics**,** The National Publishing company, Chennai.

3. John E. Hopcroft Jeffrey D Ulman., 2002, Introduction to Automata Theory, Languages and Computation**,** Narosa Publishing House, New Delhi.

WebResources:

1. http://web.stanford.edu/class/archive/cs/cs103/cs103.1164/lectures/13/Small13.pdf

2. https://www.tutorialspoint.com/automata_theory/moore_and_mealy_machines.htm

3. https://levelup.gitconnected.com/an-example-based-introduction-to-finite-state-machines-f908858e450f

Course Designers:

1. Dr. R. Angeline ChellaRajathi

2. Dr. D. Murugeswari

THIAGARAJAR COLLEGE, MADURAI – 9.
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POST GRADUATE AND RESEARCH DEPARTMENT OF MATHEMATICS
(For those who joined B.Sc. Mathematics on or after June 2020)

Course Code	Course Title	Category	L	T	P	Credits
UMA20SE	**StatisticalTestofSignificance**	**SEC**	**2**	**-**	**-**	**2**

L - Lecture T - Tutorial P – Practical

Year	Semester	Int. Marks	Ext. Marks	Total
Third	Fifth/Sixth	15	35	50

Preamble

The course provides the familiarity with descriptive as well as analytical methods for understanding the variability in observed data. It develops skills in the selection of samples from the population and carryout different tests of hypothesis.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Analyze and study samples drawn from the population.	80	70
CO2	Interpretstatisticalandpracticalsignificance	75	70
CO3	Apply parametric tests in different real life data	70	65
CO4	Utilize and Interpret results from ANOVA	80	75
CO5	Relate and Demonstrate the knowledge of various techniques to compare more than two independent populations	85	75

Mapping of COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	M	S	M	M	L
CO3	S	M	L	M	M
CO4	M	S	M	S	M
CO5	S	M	L	S	M

Mapping of COs with POs

#	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	M	M	L	L
CO2	S	S	M	M	M	M
CO3	M	S	M	M	M	L
CO4	S	S	M	M	L	M
CO5	M	S	L	M	L	M

Bloom's Taxonomy

	CA		End of Semester
	First	Second	
Knowledge(K1)	**40%**	**40%**	**40%**
Understand(K2)	**40%**	**40%**	**40%**
Apply(K3)	**20%**	**20%**	**20%**

Contents

Unit I **(15 Hours)**

ExactSamplingDistribution(Chi-SquareDistribution): Chi-squareVariate Applicationsof Chi-square Distribution – Chi-square Test as a Test for Population Variance – Chi-square Test ofGoodness of Fit – Student's 't' (Definition) – Fisher's 't' (Definition) – Applications of t-distribution –Test for Single Mean – t-Test for Difference of Means – t-Test for Testing Significance of an ObservedSample Correlation Coefficient – F-statistic (Definition) –Applications of F-distribution – F-test forEqualityof Population Variance.

Unit II **(15 Hours)**

Analysis of Variance: Introduction – One-way Classification – Mathematical Analysis of theModel– Two-wayClassification.

Text Book:

Gupta.S.C. and Kapoor.V.K., 2019, Elements of Mathematical Statistics, Third Edition, Sultan Chand&Sons, Educational Publishers, New Delhi.

Unit	Chapter/Section
I	13(13.1,13.5-13.5.2), 14(14.2,14.2.2,14.2.5-14.3.2)
II	17(17.1-17.3)

References:.

1. Vittal.P.R.,2013, MathematicalStatistics,MarghamPublications,Chennai.
2. Arumugam.S.andThangapandi Isaac.A.,Statistics,2011, NewGammaPublishingHouse, Palayamkkottai.
3. Gupta.S.C.andKapoor.V.K., 2007,FundamentalsofMathematicalStatistics, Eleventh edition, SultanChand &sons,New Delhi. .

Web Resources:

1. https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/
2. https://www.researchgate.net/publication/272237355_Probability_and_Mathematical_Statistics
3. https://nptel.ac.in/courses/111/105/111105041/

Course Designers:

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VALUE ADDED COURSES

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Course Code	Course Title	Category	L	T	P	Credit
	Quantitative Aptitude – II	**Value Added**	-	-	-	-

L - Lecture T - Tutorial P–Practicals

Year	Semester	Int. Marks	Ext. Marks	Total
Second	Third & Fourth	-	100	100

Preamble

The course provides various mathematical aptitude techniques for the aspirants of graduate level competitive examinations.

Course Outcomes

On the completion of the course the student will be able to

#	Course Outcome	Expected Proficiency (%)	Expected Attainment (%)
CO1	Formulate the problem quantitatively and recall appropriate arithmetical methods to solve the problem.	90	80
CO2	Demonstrate various principles involved in solving mathematical problems.	85	80
CO3	Evaluate various real life situations by resorting to analysis of key issues and factors	90	85
CO4	Develop various mathematical skills to solve the problems	90	80
CO5	Improve and enhance arithmetic ability.	85	80

Mapping of COs with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S
CO2	M	S	M	S	M
CO3	M	S	M	S	S
CO4	M	S	S	S	M
CO5	S	M	S	M	M

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6

CO1	S	S	M	M	M	S
CO2	M	S	M	M	M	S
CO3	S	M	S	S	M	M
CO4	M	S	M	M	S	S
CO5	S	S	M	M	M	M

Contents

Unit I **(12 Hours)**

Time and Work- Time and Distance- Heights and distances.

Unit II **(12 Hours)**

Problems on trains- Alligation on mixture

Unit III **(12 Hours)**

Simple Interest – Compound Interest

Unit IV **(12 Hours)**

Area –Volume and Surface Area- Calendar

Unit V **(12 Hours)**

Permutations and Combinations - Probability

References:

1. Aggarwal. R.S., 2017, Quantitative Aptitude for competitive Examinations, S. Chand and Co., New Delhi.

2. Abhijit Guha, 2016,Quantitative Aptitude for Competitive Examinations, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi.

3. Arora. P.N. and Arora. S.,2009, Quantitative Aptitude Mathematics, Volume- 1 S Chand & Company Ltd., New Delhi.

4. Kothari. C.R., 1989, Quantitative Techniques, Vikas Publishing House Pvt. Ltd., New Delhi.5. Srinivasan. T.M., Perumalswamy. S. and Gopala Krishnan. M.D., 1985, Elements of Quantitative Techniques, Emerald Publishers, Chennai.

Web Resources:

1. https://examsdaily.in/quantitative-aptitude-study-material
2. https://pendulumedu.com/quantitative-aptitude/time-and-work-tricks-basic-concepts-formulas-examples
3. https://bankersway.com/quantitative-aptitude-maths-free-study-materials-pdf-competitive-exam/
4. https://www.careerbless.com/aptitude/qa/home.php
5. https://www.sawaal.com/aptitude-reasoning/quantitative-aptitude-arithmetic-ability/problems-on-ages- questions-and-answers.html

Course Designers:

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2. Mrs. B. Ambika