



PERIYAR UNIVERSITY

PERIYAR PALKALAINAGAR SALEM

-636011

DEGREE OF BACHELOR OF SCIENCE

CHOICE BASED CREDIT SYSTEM

Syllabus for

B.SC., MATHEMATICS

(SEMESTER PATTERN)

(For Candidates admitted in the Colleges affiliated to Periyar U

niversity from 2021-2022 onwards)

PERIYARUNIVERSITY,SALEM – 636011

B.Sc.,MATHEMATICS/B.Sc.,MATHEMATICS(CA)BOA

RDOF STUDIESMEMBERS 2021– 2022

1.	Tmt.V.EmimalNavajothi AssociateProfessor,DepartmentofMathematics, N.K.R.GovernmentArtsCollegeforWomen,Na makkal – 637 001. Ph:9442436670 E-mail:nkrgacin@rediffmail.com	Chairman
2.	Tmt.G.Vasuki Associate Professor, Department of Mathematics ,Sri Sarada College for Women(Autonomous),Fairlands,Salem– 636 016. Ph:9486482770	Member
3.	Thiru.G.Sivaram Associate Professor, Department of Mathematics,Government ArtsCollege(Autonomous), Salem– 636007. Ph:9443933465	Member
4	Ms.M.Sujatha AssistantProfessor,DepartmentofMathematics, K. S. Rangasamy College of Arts &Science,Tiruchengode– 637215.Namakkal(Dt).Ph: 9345166407.	Member
5	Dr.V.Sadhasivam Associate Professor, Department of Mathematics,ThiruvalluvarGovernmentArtsCollege,Anda gallurPost,Rasipuram– 637 401. Namakkal(Dt). Ph:9843554565	Member
6.	Thiru.R.Kodeeswaran Associate Professor, Department of Mathematics,KandaswamiKandar’s College, ParamathyVelur,Namakkal – 638 182.Ph:9442173425	Member
7.	Thiru.K.Thiagu Assistant Professor, Department of Mathematics,KandaswamiKandar’s College, ParamathyVelur,Namakkal – 638 182.	Invitee
8.	Dr.A.Muthusamy, Professor,DepartmentofMathematics,P eriyar University,Salem -636011.	UniversityNominee

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9.	Dr.D.Gunasekaran AssociateProfessor,DepartmentofMathematics, P.S.G College of Arts & Science, Avinashi Road, CivilAerodrome(Road), Coimbatore – 641 014.Ph:9790502357	ExternalMember
10.	Dr.R.Parvathi AssociateProfessor&Head,D epartmentofMathematics, Vellalar College for Women(Autonomous),Erode –638 012. Ph:9487323070	ExternalMember
11.	Mr.AjiithPaul,R@DEngineerSW BroadcomCommunicationTechnologiesPvt.LTD,S1,Wi bro Electronic City Special Economic Zone,Doddathogur Village, BegurHobli, Electronic City ,Bangalore– 560 100.	IndustrialPersonal
12.	Dr.R.Samidurai Assistant Professor, Department of Mathematics,ThiruvalluvarUniversity,Serkkadu, Vellore–632115,Mobile:9444876735.	Alumni

OBJECTIVES

Mathematics is a key to success in the field of science and engineering. Mathematics plays an important role in the context of globalization of Indian economy, modern technology, and computer science and information technology. Today, students need a thorough knowledge of basic principles, methods, results and a clear perception of the power of mathematical ideas and tools to use them effectively in modeling, interpreting and solving the real world problems. The syllabus of this program is aimed at preparing the students with the latest developments and put them on the right track to fulfill their requirements.

COMMENCEMENT OF THIS REGULATION

This regulation shall take effect from the academic year 2021 – 2022, i.e, for the students who are admitted to the first year of the course during the academic year 2021–2022 and thereafter.

ELIGIBILITY FOR ADMISSION

A Pass in the Higher Secondary Examination of Tamil Nadu Higher Secondary Board or some other Board accepted by the Syndicate as equivalent thereto with Mathematics (other than Business mathematics) as one of the subjects.

DEFINITIONS

Programme: Programme means a course of study leading to the award of the degree in a discipline.

Course: Course refers to the subject offered under the degree programme.

SYLLABUS

The syllabus of the UG degree has been divided into the following five categories: Part I

- : Tamil/Other Languages.
- Part II : English Language.
- Part III : Core Courses, Elective Courses and Allied Courses.
- Part IV : Skill Based Elective Courses, Non-Major Course, Environmental Studies and Value Education.
- Part V : Extension Activity.

- **Elective Course:** There are 2 Elective Courses offered for B.Sc. Mathematics students. One course from each set should be selected for each elective course.
- **Skill Based Elective Course:** This course aims to impart advanced and recent developments in the concerned discipline.
- **Non-Major Course:** Irrespective of the discipline the student can select a paper that is offered by other disciplines as a non-major course.
- **Extension Activity:** Participation in NSS/NCC/YRC/RRC/Sports or other co-circular activities are considered for Extension activity.

CREDITS

Weightage given to each course of study is termed as credit.

CREDITS SYSTEM

The weightage of credits are spread over to different semester during the period of study and the cumulative credit point average shall be awarded based on the credits earned by the students. A total of 148 credits are prescribed for the undergraduate programme.

DURATION OF THE COURSE

The candidates shall complete all the courses of the programme within 5 years from the date of admission. The programme of study shall consist of six semesters and a total period of three years with 148 credits. The programme of study will comprise the course according to the syllabus.

EXAMINATIONS

The course of study shall be based on semester pattern with Internal Assessment under Choice Based Credit System.

The examinations for all the papers consist of both Internal (Continuous Internal Assessment - CIA) and External (end semester) theory examination. The theory examination shall be conducted for three hours duration at the end of each semester. The candidates failing in any subjects (s) will be permitted to appear for the same in the subsequent semester examinations.

PROGRAMME OUTCOME

PO1	Good foundation in fundamentals of Mathematics subjects will be acquired.
PO2	Knowledge and skills to undertake further studies in Mathematics and its allied areas will be ensured
PO3	Scientific temper, analytical thinking, imagination, creativity and critical thinking will be developed.
PO4	Knowledge and confidence to face various competitive examinations will be gained.

COURSE OF STUDY AND SCHEME OF EXAMINATION

PART	Paper Code	SUBJECT TITLE	HOURS			Credit	Exam Hours	MARKS		
			Lecture	Practical	Total			CIA	EA	Total
SEMESTER- I										
I	Language	Tamil-I	6	-	6	3	3	25	75	100
II	Language	English -I	6	-	6	3	3	25	75	100
III	21UMA01/ 21UMACA01	CoreI- Classical Algebra	4	-	4	4	3	25	75	100
III	21UMA02/ 21UMACA02	CoreII- Calculus	5	-	5	5	3	25	75	100
III	Allied-I		5	-	5	4	3	25	75	100
III	Allied-I	Practical	-	2	2	-	*	-	-	-
IV	20UPES01	Professional English for Physical Sciences-I	6	-	6	4	3	25	75	100
IV	Value Education	Yoga	2	-	2	-	3	25	75	100
SEMESTER- II										
I	Language	Tamil-II	6	-	6	3	3	25	75	100
II	Language	English- II	4	-	4	3	3	25	75	100
II	NMSDC	Naan Mudhalvan SDC - Language Proficiency for Employability	2	-	2	2	3	25	75	100
III	21UMA03/ 21UMACA03	CoreIII- Analytical Geometry of 2D & 3D	4	-	4	4	3	25	75	100
III	21UMA04/ 21UMACA04	CoreIV- Trigonometry and Vector Analysis	5	-	5	5	3	25	75	100
III	Allied-II		5	-	5	3	3	25	75	100
III	Allied-II	Practical	-	2	2	3	3	40	60	100
IV	20UPES02	Professional English for Physical Sciences- II	6	-	6	4	3	25	75	100
IV	EVS	Environmental Studies	2	-	2	-	3	25	75	100
SEMESTER- III										
I	Language	Tamil- III	6	-	6	3	3	25	75	100
II	Language	English- III	6	-	6	3	3	25	75	100
III	21UMA05/ 21UMACA05	CoreV- Number Theory	3	-	3	3	3	25	75	100

III	21UMA06/ 21UMACA06	CoreVI–Differential Equations	4	-	3	4	3	25	75	100
III	Allied–II	Paper–I	5	-	5	4	3	25	75	100
III	Allied- Practical-II	Paper-III(Practical)		2	2	-	**	-	-	-
IV	NMSDC	Digital Skills for Employability- Microsoft office Essentials	2	-	3	2	3	25	75	100
IV	NMEC- I		2	-	2	2	3	25	75	100
SEMESTER– IV										
I	Language	Tamil–IV	6	-	6	3	3	25	75	100
II	Language	English–IV	6	-	6	3	3	25	75	100
III	21UMA07	CoreVII–LaplaceTransforms& FourierSeries	4	-	4	4	3	25	75	100
III	21UMA08	CoreVIII–NumericalMethods	3	-	3	3	3	25	75	100
III	Allied–II	Paper–II	5	-	5	3	3	25	75	100
III	Allied-II	Paper-III(Practical)	-	2	2	3	3	40	60	100
IV	NMSDC	Employability Skills-Microsoft	2	-	2	2	3	25	75	100
IV	NMEC- II		2	-	2	2	3	25	75	100
SEMESTER– V										
III	21UMA09/ 21UMACA09	CoreIX–ModernAlgebra	6	-	6	5	3	25	75	100
III	21UMA10/ 21UMACA10	CoreX– RealAnalysis–I	6	-	6	5	3	25	75	100
III	21UMA11/ 21UMACA11	CoreXI–OperationsResearch	5	-	5	5	3	25	75	100
III	21UMA12/ 21UMACA12	CoreXII– Mechanics	5	-	6	4	3	25	75	100
III	Elective - I GroupA		4	-	4	4	3	25	75	100
IV	21UMAS03	SBECIII–C-Programming (Theory)	2	-	3	2	3	25	75	100
IV	NMSDC	Computational Intelligence for Employability - Drone Pilot Techniques	2	-	2	2	3	25	75	100
SEMESTER–VI										
III	21UMA13/ 21UMACA13	CoreXIII–LinearAlgebra	5	-	5	5	3	25	75	100
III	21UMA14/ 21UMACA14	CoreXIV– RealAnalysis–II	6	-	6	6	3	25	75	100
III	21UMA15/ 21UMACA15	CoreXV–ComplexAnalysis	5	-	5	5	3	25	75	100

III	21UMA16/ 21UMACA16	CoreXVI– Graph Theory	5	-	5	5	3	25	75	100
III	Elective- II GroupB		4	-	4	4	3	25	75	100
III	NMSDC	Advanced Data Analytics & Visualization	2	-	2	2	3	25	75	100
IV	21UMASP04	SBEC IV–OfficeAutomation (Practical)	-	3	3	3	3	40	60	100
		Extension Activity	-	-	-	1	***	-	-	***

- # - Syllabus and Question paper are same for Bsc., Maths & Bsc., Maths (CA).
The exam should be conducted on the same day
- * - Examination at the end of Second Semester.
- ** - Examination at the end of Fourth Semester.
- *** - No Examination – Participation in NCC/NSS/RRC/YRC/Others if any.

ALLIED SUBJECTS FOR B.Sc. MATHEMATICS:

Any two of the following subjects (Physics/Chemistry/Statistics) can be chosen as Allied Subjects.

NAME OF THE COURSE	PAPER CODE
Allied Physics –	
I Allied Physics – II	
Allied Physics –	
Practical Allied	
Chemistry –	
I Allied Chemistry – II	
Allied Chemistry –	
Practical Allied Statistics – I	
Allied Statistics – II	
Allied Statistics – Practical	

ELECTIVE COURSES:

Select one paper from Group – A for Elective Course-I and one paper from Group – B for Elective Course II.

TABLE 1

NAME OF THE COURSE	PAPER CODE
Group A:	
Discrete Mathematics	21UMAE01
Astronomy	21UMAE02
Java Programming	21UMAE03
Group B:	
Fuzzy Sets and Fuzzy Logic	21UMAE04
Formal Languages and Automata Theory	21UMAE05
C++ Programming	21UMAE06

SKILL BASED ELECTIVE COURSES

E:

NAME OF THE COURSE	PAPER CODE
Financial Mathematics	21UMAS01
C Programming (Theory)	21UMAS02
Office Automation (Practical)	21UMASP03

ALLIED MATHEMATICS

NAME OF THE COURSE	PAPER CODE
Paper I: Allied Mathematics – I	21UMAA01
Paper II: Allied Mathematics – II	21UMAA02
Paper III: Allied Mathematics – Practical	21UMAAP01

NON-MAJORELECTIVECOURSES:

Non-Major Elective Course-I III Semester	PAPER CODE
Quantitative Aptitude-I	21UMAN01
Linear Programming	21UMAN02
Non-Major Elective Course-II IV Semester	
Quantitative Aptitude-II	21UMAN03
Numerical Methods	21UMAN04

UNIFORMITY IN THE NUMBER OF UNITS IN EACH PAPER:

Each theory paper shall consist of five units. The Question paper shall consist of questions uniformly distributed among all the units.

1. QUESTION PAPER PATTERN FOR THE THEORY PAPERS

Duration: **Three Hours**

Maximum Marks: **75**

Part A: (15 X 1 = 15 marks)

Answer ALL

Questions (Three Questions from Each Unit)

Part B: (2 X 5 = 10 marks)

Answer Any Two

Questions (One Question from Each

Unit) **Part C: (5 X 10 = 50 marks)**

Answer ALL Questions

(One Question from Each Unit with internal choice)

2. MARKS AND QUESTION PAPER PATTERN FOR PRACTICALS

MAXIMUM: **100 Marks**

INTERNAL MARK: **40**

marks

EXTERNAL MARK: **60 marks**

(Practical Exam - 45 marks + Record - 15 marks)

QUESTION PATTERN FOR THE PRACTICAL EXAM PAPERS

Answer any **THREE** questions out of 5 questions (3 x 15 = 45 marks)

PASSING MINIMUM

- i) The Candidates shall be **declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Theory Exam mark) with minimum of 30 marks in the Theory Exam conducted by the University.**
- ii) The Candidates shall be **declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 18 marks out of 45 marks in the Practical Exam conducted by the University.**

CONVERSION OF MARKS TO GRADE POINTS AND LETTER GRADE (Performance in a Programme/Paper)

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.	O	Outstanding
80-89	8.0-8.	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

C_i = Credits earned for course i in any semester

G_i = Grade Point obtained for course i in any semester

n = refers to the semester in which such course were credited

Grade point average (for a Semester):

Calculation of grade point average semester-wise and part-wise is as follows:

$$\text{GRADE POINT AVERAGE [GPA]} = \frac{\sum C_i G_i}{\sum C_i}$$

Sum of the multiplication of grade points by the credits of the courses offered under each part GPA =

Sum of the credits of the courses under each part in a semester

Calculation of Grade Point Average (CGPA) (for the entire programme):

A candidate who has passed all the examinations under different parts (Part-I to V) is eligible for the following part wise computed final grades based on the range of CGPA.

$$\text{CUMULATIVE GRADE POINT AVERAGE [CGPA]} = \frac{\sum n \sum C_{ni} G_{ni}}{\sum n \sum C_{ni}}$$

Sum of the multiplication of grade points by the credits of the entire programme under each part CGPA =

Sum of the credits of the courses of the entire programme under each part

CGPA	GRADE
9.5 – 10.0	O+
9.0and abovebutbelow9.5	O
8.5and abovebutbelow9.0	D++
8.0and abovebutbelow8.5	D+
7.5and abovebutbelow8.0	D
7.0and abovebutbelow7.5	A++
6.5and abovebutbelow7.0	A+
6.0and abovebutbelow6.5	A
5.5and abovebutbelow6.0	B+
5.0and abovebutbelow5.5	B
4.5and abovebutbelow5.0	C+
4.0and abovebutbelow4.	5C
0.0and abovebutbelow4.0	U

ClassificationofSuccessfulcandidates

A candidate who passes all the examinations in Part I to Part V securing following CGPA and Grades shall be declared as follows for **Part I or Part II or Part III**:

CGPA	GRADE	
9.5 – 10.0	O+	FirstClass –Exemplary*
9.0and abovebutbelow9.5	O	FirstClasswithDistinction*
8.5and abovebutbelow9.0	D++	FirstClass
8.0and abovebutbelow8.5	D+	
7.5and abovebutbelow8.0	D	
7.0and abovebutbelow7.5	A++	
6.5and abovebutbelow7.0	A+	
6.0and abovebutbelow6.5	A	
5.5and abovebutbelow6.0	B+	SecondClass
5.0and abovebutbelow5.5	B	
4.5and abovebutbelow5.0	C+	

Conferment of the Degree

No candidate shall be eligible for conferment of the Degree unless she/ she

- i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
- ii. Has completed all the components prescribed under Parts I to Part V in the CBCS pattern to earn 140 credits.
- iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

Ranking

A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking shall be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks. The improved marks shall not be taken into consideration for ranking.

NOTE:

- All the Papers (including computer papers) specified in this syllabus should be handled and valued by faculty of Mathematics Department only.
- Both Internal and External Examiners for University Practical Examinations should be appointed (including computer papers) from faculty of Mathematics only.

B.Sc.,
MATHEMATICS SEMESTER I
CORE I-CLASSICAL ALGEBRA

Paper Code: 21UMA01/21UMACA01

Max. Marks: 75

COURSE OBJECTIVE

The course aims to

1. Gain knowledge about binomial series, exponential series, logarithmic series and matrices.
2. Develop the ability of solving different types of algebraic equations.
3. Develop the ability to reflect critically on the methods they have chosen to solve problems.

UNIT-I

Binomial series: Binomial theorem for a positive integral index –
Binomial theorem for a rational index –
Summation of Binomial series. Exponential Series: Exponential series for all real values of x – Standard results for the exponential series – Logarithmic series.
Chapter 2 (Section 1, 2, 3), Chapter 3 (Section 1 & 2) & Chapter 4

UNIT-II

Matrices: Condition for consistency – Characteristic equation of a matrix – Cayley-Hamilton theorem – Similarity of matrices – Diagonalizable matrix.
Chapter 6

UNIT-III

Theory of equations: Rational integral equation of the n^{th} degree, Fundamental theorem in the theory of equations (without proof) – Relation between the roots and coefficients of an equation – Imaginary and Irrational roots – Symmetric functions of the roots of an equation in terms of its coefficients.
Chapter 7 (Sections 1 to 5)

UNIT-IV

Reciprocal equations – Transformation of equation – Multiplication of roots by m – Diminishing the roots of an equation – Removal of a term.
Chapter 7 (Section 6 to 10)

UNIT-V

Descartes' rule of signs – Descartes' rule of signs for negative roots of an equation – Horner's method for approximation of roots of a polynomial equation – Newton's method of evaluating a real root correct to given decimal places.
Chapter 7 (Section 11 to 14)

TEXTBOOK:

1. Algebra, Analytical Geometry & Trigonometry by Dr. P.R. Vittal & Malini, Margham Publications, Chennai – 17.

REFERENCE BOOKS:

1. Algebra Volume I by T.K. Manickavasagam Pillai & others, S.V. Publications, 1985.
2. Algebra Volume II by T.K. Manickavasagam Pillai & others, S.V. Publications, 1985.

COURSE OUTCOME

On completion of the course, students should be able to

CO1	Gain knowledge about binomial, exponential and logarithmic series
CO2	Examine the consistency of linear equations and application of Cayley-Hamilton theorem
CO3	Know the application of relations between the roots and coefficients of an equation
CO4	Analyse the method of solving reciprocal equations and diminishing the roots of an equation
CO5	Examine the existence of roots of an equation and determine the roots by using Newton's and Horner's methods

SEMESTER
ICOREII–CALCULUS

PaperCode:21UMA02/21UMACA02

Max.Marks:75

COURSEOBJECTIVE

To impart knowledge about curvatures, integrations and its geometrical applications. To enable the students to Differentiate and integrate any given functions, identify a special function and evaluate an Integral.

UNIT I

Curvature-radius of curvature in Cartesian and polar forms- evolutes and envelopes- pedal Equations, Chord of curvature.

Volume I: Chapter 10 (Section 2.1-2.7, 3.1)

UNIT II

Integration by parts, Reduction formulae, Bernoulli's formula, Integration by summation. Geometrical applications of integration: Areas under plane curves, Areas of a closed curve, Areas in polar coordinates.

Volume II: Chapter 1 (Section 12, 13.1-13.10, 15.1, 15.2) &
Chapter 2 (Section 1.1, 1.2, 1.4)

UNIT III

Evaluation of double and triple integrals- application to calculation of areas and volumes- areas in polar coordinates.

Volume II: Chapter 5 (Section 2.1, 2.2, 3.1, 3.2, 4, 5.1, 6.3)

UNIT IV

Change of Variables–Jacobians– change of variables in double and triple integrals notion of improper integrals.

Volume II: Chapter 6 (Section 1.1, 1.2, 2.1-2.4)
Chapter 7 (Section 1.1-1.5)

UNIT V

Beta and Gamma integrals- their properties, relation between them- evaluation of multiple integrals using Beta and Gamma functions.

Volume II: Chapter 7 (Section 2.1-2.3, 3, 4, 5)

TEXTBOOK

T.K. Manikavachagom Pillay, S. Narayanan, **Calculus–Volume I and Volume II**

REFERENCE BOOKS

1. P. Kandasamy and K. Thilagavathy, 2004–**Mathematics for B.Sc.–Vol. I and Vol.**

II

S. Chand and Company 2004

2. Shanthi Narayanan and J.N. Kapoor – **A Text book of Calculus** – S. Chand and Company

COURSE OUTCOME

- Gain knowledge about curvature and envelopes.
- Gain knowledge about integration and its applications.

SEMESTER II

CORE III - ANALYTICAL GEOMETRY OF 2D & 3D

Paper Code: 21UMA03/21UMACA03

Max. Marks: 75

COURSE OBJECTIVE

To enable the students to be familiar with the ideas of polar equations and enhance the knowledge of three-dimensional geometry.

UNIT I

Analytical Geometry of 2D: Polar Equations: Polar Co-ordinates – Polar equation of a conic - chord – tangent – normal – equation of the pair of tangents drawn from the point to the conic-problems.

Chapter IX: Section 1 -15

UNIT II

The Straight line: Symmetrical form – The plane and the straight line – Coplanar lines – Shortest distance between two given lines – The equation of two skew lines in a simplified form – problems.

Chapter III: section 1 – 8.2

UNIT III

Sphere: Equation of the sphere – Plane Section of a sphere – equation of a circle on a sphere – equation of a sphere passing through a given circle – equation of the tangent plane to the sphere.

Chapter IV: Section 1 – 8

UNIT IV

Cone – Right circular cone – Intersection of a straight line and quadric cone – tangent plane and normal – condition for the plane to touch the quadric cone – Angle between the lines in which the plane cuts the cone.

Cylinder: The equation of the cylinder – equation of the right circular cylinder – enveloping cylinder.

Chapter V: Section 1 – 8.3

UNIT V

Central quadrics: Definition – The intersection of a line and a quadric – Tangents and tangent planes – condition for the plane to touch the conicoid.

Chapter V: Section 9 – 12

TEXTBOOK:

1. A Text Book of Analytical Geometry part I – 2D, T.K. Manicavachagampillay and T. Natarajan, S. Viswanathan Pvt. Ltd. (Unit – I)
2. A Text Book of Analytical Geometry part II - 3D, T.K. Manicavachagampillay and T. Natarajan, S. Viswanathan Pvt. Ltd. (Unit – II to Unit V)

REFERENCE BOOK:

1. Analytical Geometry of 2D & 3D by P.R. Vittal, Pearson publications.
2. Analytical Solid Geometry by Shanti Narayan & Dr. P.K. Mittal, 16th Edition, S. Chand and Company Limited.

COURSE OUTCOME

CO1	To gain knowledge about Conic 2D
CO2	Understand the concept of coplanar lines and skew lines and find the shortest distance between them
CO3	To gain the knowledge about sphere and identify the characteristics of sphere
CO4	Enhance the fundamental concepts of cone and cylinder
CO5	To develop the concept of conicoides.

SEMESTER II
Core IV – TRIGONOMETRY & VECTOR ANALYSIS

Paper Code: 21UMA04/21UMACA04

Max. Marks: 75

COURSE OBJECTIVE

The course aims to

1. Acquire knowledge about the expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\cos^n \theta$, $\sin^n \theta$, $\tan^n \theta$, Hyperbolic functions, Inverse hyperbolic functions and Logarithms of a complex quantities.
2. Understand the concepts of divergence, curl and integration of vector point functions.
3. Analyse the various integral theorems in Vector Analysis

TRIGONOMETRY

UNIT-I

Expansion of $\sin n\theta$, $\cos n\theta$, and $\tan n\theta$ Expansions for $\cos^n \theta$, $\sin^n \theta$ Expansion of $\sin \theta$ and $\cos \theta$ in ascending powers of θ . Chapter 14 (page no: 14.1 to 14.30)

UNIT-II

Hyperbolic functions and Logarithms of complex numbers.
Chapter 14 (page no: 14.31 to 14.75)

VECTOR

ANALYSIS UNIT-III

Gradient of a scalar point function and Divergence and curl of a vector point function.
Chapter II (section 2.1 to 2.7)

UNIT-IV

Integration of point functions: Line Integrals – Surface integrals and Volume integrals.
Chapter III (section 3.1 to 3.8)

UNIT-V

Integral theorems: Gauss divergence theorem – Green's theorem – Stokes theorem (statement only).
Chapter IV (section 4.1 to 4.8)

TEXTBOOK:

1. Dr P.R. Vittal (Allied Mathematics), Margham publications, Chennai (for unit I and II).
2. P. Duraipandian and Laxmi Duraipandian, Emerald publishers, Chennai (for Unit III, Unit IV and Unit V).

REFERENCE BOOK:

1. T.K. Manickavasagam Pillai & others, Vector Analysis, Vijay Nicole Imprints Pvt. Ltd., Chennai-29, 2004.

COURSE OUTCOME

On completion of the course, students should be able to

CO1	Recall the basic concepts and understand the expansions of Trigonometric functions
CO2	Acquire knowledge on Hyperbolic functions and Logarithm of complex numbers
CO3	Gain knowledge on the concept of divergence, curl and integration of vector point functions
CO4	Analyse and work with the problems related to line integrals, surface and volume integrals
CO5	Solve the problems related to Gauss, Stoke's and Green's theorems

SEMESTER III
COREV: NUMBER THEORY

Paper Code: 21UMA05/21UMACA05

Max. Marks: 75

COURSE OBJECTIVE

On Completion of this course, the students are expected to know

- The concept of prime, composite, Fibonacci and Lucas numbers.
- The Euclidean algorithm, g.c.d, and l.c.m.
- To understand the method to solve linear Diophantine equations.
- To understand the method to apply Pollard Rho Factoring method.
- The concept of Wilson's theorem, Fermat's theorem, Euler's theorem.
- The concept of Continued Fractions.

UNIT-I

The Divisibility algorithm-Prime and Composite numbers-Fibonacci and Lucas numbers-Fermat numbers.

Section (2.1, 2.5-2.7)

UNIT-II

Greatest Common Divisor-The Euclidean algorithm-Fundamental theorem of arithmetic-Least Common Multiple-Linear Diophantine Equations.

Section (3.1-3.5)

UNIT-III

Congruences-Linear Congruences-The Pollard Rho Factoring method.

Section (4.1-4.3)

UNIT-IV

Wilson's theorem-Fermat's Little theorem-Pseudoprimes (optional)-Euler's theorem.

Section (7.1-7.4)

UNIT-V

Finite Continued Fractions-Infinite Continued Fractions-Pythagorean Triangles.

Section (12.1, 12.2, 13.1)

TEXT BOOK:

1. Elementary number theory with applications—Thomas Koshy, Academic Press, 2007

REFERENCE BOOKS:

1. Elementary Number Theory, D.M. Burton, Universal book stall, New Delhi, 2001.
2. Introduction to the theory of number, Ivan Niven, H.S. Zuckerman, Wiley Eastern New Delhi, 3rd edition, 1989.
3. A Classical Introduction to Modern Number Theory, K. Ireland & M. Rosen, Springer Verlag New York, 1972/

COURSE OUTCOME

After completing the course the students will be able to

- To understand the basic properties of integers.
- Formally understand and prove various theorems.
- Applying theoretical results acquired to solve different problems.

SEMESTER III
Core -VI DIFFERENTIAL EQUATIONS

Paper Code: 21UMA06/21UMACA06

Max. Marks: 75

COURSE OBJECTIVE

- To learn about formation differential equations, first order and first-degree differential equations.
- To learn the second order differential equation with constant coefficient and variable coefficients.
- To learn the partial differential equations, solution of equations standard types.

UNIT- I

Ordinary Differential Equations: Formation of Differential Equations- Equations of the First Order and of the First degree- Equations of the First Order, but of higher degree.

UNIT-II

Second Order Differential Equations with Constant Co-efficient- Particular Integrals of the form 'V', where V is of the form, X, X², sin ax, cos ax, X sin ax and X cos ax.

UNIT-III

Second Order Differential Equations with Variable Co-efficient- Both homogeneous linear equations and homogeneous non-linear equations- Total Differential Equations.

UNIT- IV

Partial Differential Equations: Definition- Formation of Partial differential equations- Complete solution- Singular solution- General Solution.

UNIT- V

Solution of equation of Standard types $f(p,q)=0$, $f(X,p,q)=0$, $f(Y,p,q)=0$, $f(Z,p,q)=0$, $f_1(x,p)=f_2(y,q)$ Clairaut's form- Lagrange's equation $Pp+Qq=R$.

TEXTBOOK:

1. S.Narayanan and T.K.Manickavachagam Pillay.
2. Differential Equations, Fourier and Laplace Transforms, Probability, by P.R. Vittal.

REFERENCE BOOKS:

1. T.K. Manikavasagam Pillai and S.Narayanan, Calculus, Vijay Nicole Imprints Pvt, Ltd. Nelson Chambers, 115 Nelson Manickan Road, Chennai-600029, 2004.

2.Engineering Mathematics by M.K. Venkatraman, National
PublishingCompany,Chennai.

COURSE OUTCOME

- Students will be able to classify the differential equations with respect to order and linearity.
- Students will be able to solve the second order differential equations, linear equations, linear differential equations with constant coefficients.
- Students will be able to understand the basic properties of standard PDE's and solve the problem in Clairaut's form.

SEMESTER IV
CORE VII: LAPLACE TRANSFORMS & FOURIER SERIES

Paper Code: 21UMA07/21UMACA07

Max. Marks: 75

COURSE OBJECTIVE

The transforms such as Laplace Transform, Fourier Transform are widely used in the theory of communication engineering, wave propagation and other branches of applied Mathematics. Fourier series find its application with the study of vibration and heat diffusion.

UNIT I: Laplace Transform

Laplace transforms – Definition and properties – Elementary theorems with proof – Periodic function - Problems.
Chapter 7: Sections 1 to 3

UNIT II: Inverse Laplace Transform

Inverse Laplace transforms – Standard formulae – Elementary theorems problems – Application to solving second order differential equations with constant coefficients - Application to solving first order simultaneous differential equations.
Chapter 7: Sections 4 & 5

UNIT III: Fourier Series

Fourier series – Definition – To find the Fourier coefficients of periodic functions of period 2π – Fourier Series for odd and even functions – Half range Fourier series – problems. (For the intervals 0 to 2π & $-\pi$ to $+\pi$)
Chapter: 6

UNIT IV: Fourier Series

Change of Interval $(0, 2l)$ – Even and odd functions – Half range sine and cosine series - Simple problems.
Chapter: 6

UNIT V: Fourier Transform

Fourier integral theorem (Statement only) – Complex Fourier Transform and its inverses - Properties of Fourier transforms – Linearity property – Change of scale – Shifting property – Sine and cosine transforms - Properties - Simple problems.
Chapter: 8

TEXTBOOK:

1. P.R. Vittal, Differential Equations, Fourier and Laplace Transforms, Probability – Year of Publication 2000, Margham Publications, 24, Rameshwaram Road, T. Nagar, Chennai – 600 017.

REFERENCE BOOKS:

1. T.K. Manickavasagam Pillai and S. Narayanan: Calculus (Vol III) – Year of Publication 2004. Vijay Nicole Imprints Pvt Ltd, # C-7 Nelson Chambers, 115, Nelson Manickam Road, Chennai – 600029
2. K. Shankar Rao: Introduction to partial differential equations – (Pp-278 to 291) – Year of Publication 1997. Prentice Hall India – New Delhi – 110001.

COURSE OUTCOME

After completion of these chapters the student is expected to

- a. Have a sound knowledge of Laplace Transform and its properties.
- b. Have sufficient exposure to get the solution of certain linear differential equation using Laplace Transform and inverse Laplace Transform.
- c. Have an idea of periodic function and come to know how to expand the given functions as a series of sines and cosines which are simple periodic functions.
- d. Have an idea of Fourier Transform and its properties which can be applied in future for solving Partial Differential equations by reducing the number of independent variables.

SEMESTER IV
CORE VIII: NUMERICAL METHODS

Paper Code: 21UMA08/21UMACA08

Max. Marks: 75

COURSE OBJECTIVE

The aim of this course is to introduce numerical techniques that can be used on computer, rather than to provide a detailed treatment of accuracy or stability. The solution of some of the main problems of the scientific computing are introduced and their implementation and analysis are given by using interactive environments for computing and the scientific visualization.

UNIT I: Solution of Algebraic & Transcendental equations

The Bisection method – The Iteration method - The method of False Position – Newton-Raphson method – Generalized Newton's method - Ramanujan's Method - Muller's method.

Chapter 2: Sections 2.1 to 2.7

UNIT II: Interpolation with equal intervals

Finite differences – Forward differences – Backward Differences – Central differences – symbolic relations and separation of symbols – Newton's formula for interpolation – central difference interpolation formula – Gauss's Central difference Formula – Stirling's formula – Bessel's formula – Everett's formula (Problem only).

Chapters 3: Section 3.3 (3.3.1 – 3.3.4), 3.6, 3.7 (3.7.1 – 3.7.4)

UNIT III: Interpolation with unequal intervals

Lagrange interpolation formula – Divided differences – Divided difference table – Newton's divided difference formula – Inverse interpolation (Problem only).

Chapter 3: Sections 3.9.1, 3.11.1, 3.12

UNIT IV: Numerical differentiation & Integration

Numerical differentiation – Maximum and minimum values of a tabulated function – Numerical Integration – Trapezoidal rule – Simpson's 1/3 and 3/8 rule – Boole's and Weddle's rule (Problem only).

Chapter 5: Sections 5.2, 5.3, 5.4 (5.4.1 – 5.4.4)

UNIT V: Solution of Simultaneous Linear Algebraic equations

Direct method - Gauss Elimination – Gauss Jordan Method – Modification of the Gauss method to compute the inverse – Method of Factorization – iterative methods – Gauss Jacobin method – Gauss Seidel method.

Chapter 6: Sections 6.3 (6.3.2 – 6.3.4), 6.4

TEXTBOOK:

1. S.S. Sastry – Introductory methods of numerical Analysis 3rd edition, Prentice Hall of India, Private Ltd, New Delhi.

REFERENCE BOOKS:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathy, Numerical Methods, Third revised Edition, S. Chand & Company LTD, Ram Nagar, New Delhi.
2. T. Veerarajan, T. Ramachandran, Numerical Methods with programs in C and C++,

TataMcGraw –HillPublishingCompanyLtd.,NewDelhi.

3. E.Balagurusamy, Numerical methods, Tata Mecgraw Hill

PublishingCompanyLimited,NewDelhi-2002.

COURSEOUTCOME

Studentswhosuccessfullycompletethecoursewillprovidethefollowingoutcomes

:

- Usenumericalmethodstosolvealgebraicandtranscendentalequationsbyusing Bisection,Newton’s methodandsomeiterativemethods.
- Have a sufficient exposure in constructing difference tables and to useNewton’sforwardandbackwardformulaforinterpolationinequalintervals.
- Have learnt to construct divided difference table and to use Stirling’s,Bessel’sandLagrange’sinterpolationformulaforunequalintervals.
- Haveunderstoodthenumericaldifferentiationandnumericaldifferentiation and numerical integration by using Newton’s methods andTrapezoidal,Simpson’srule.
- Have learnt the methods like matrix inversion, Gaussian, Gauss seidelmethodsetc.,forsolvinglinearsystemofalgebraicequations.

SEMESTER V
CORE IX: MODERN ALGEBRA

Paper Code: 21UMA09 / 21UMACA09

Max. Marks: 75

COURSE OBJECTIVE

1. Acquire knowledge about various groups.
2. Gain knowledge about Rings, Euclidean Rings and some special classes of Rings

UNIT-I

Group theory-Subgroups-A counting principle-Normal subgroups and Quotient groups.

Chapter 2 (sections 2.4, 2.5, and 2.6)

UNIT-II

Group theory-Homomorphisms-Automorphisms-Cayley's theorem and Permutation groups.

Chapter 2 (sections 2.7, 2.8, 2.9 and 2.10)

UNIT-III

Ring theory-Definition and examples of Rings-Some special classes of Rings-Homomorphisms-Ideals and Quotient Rings-More ideals and Quotient Rings.

Chapter 3 (sections 3.1, 3.2, 3.3, 3.4 and 3.5)

UNIT-IV

Ring theory-The field of Quotients of an Integral Domain-Euclidean Rings-A particular Euclidean Ring.

Chapter 3 (sections 3.6, 3.7 & 3.8)

UNIT-V

Ring theory - Polynomial Rings - Polynomials over the Rational field - Polynomial Rings over commutative Rings.

Chapter 3 (sections 3.9 to 3.11)

TEXTBOOK:

1. I.N. Herstein, Topics in Algebra, 2nd Edition, John Wiley, New York, 1975.

REFERENCE BOOKS:

1. Dr. U.S. Rana, Mathematics for Degree students (B.Sc 3rd years), S. Chand 2012.
2. A.R. Vasishta, A first course in Modern Algebra, Krishna Prakasan Mandhir, 9 Shivaji road, Meerut (UP), 1983.
3. K. Viswanatha Naik, Emerald Publishers, 135 Annasalai, Chennai- 2, 1988 & 2001.

COURSE OUTCOME

On completion of the course, students should be able to

CO1	Understand the concepts of various Subgroups and its applications
CO2	Acquire Knowledge about the concepts of homomorphisms, isomorphisms and automorphisms
CO3	Gain knowledge about the concepts of Rings and Quotient Rings
CO4	Analyse the concept of Field and Euclidean Ring
CO5	Analyse and demonstrate the properties of Polynomial Rings

SEMESTER V
COREX: REAL ANALYSIS-I

Paper Code: 21UMA10/21UMACA10

Max. Marks: 75

COURSE OBJECTIVE

Upon Completion of this course, the students will be able to know

- The concepts of Countability, least upper bound axiom.
- The concept of Convergence of Sequence.
- Basic concepts of series and tests for absolute convergence of the series.
- The concept of metric spaces and examples.
- Basic principles of continuous functions on a metric space.

UNIT-I

Real valued function – Equivalence – Countability – Real numbers –
Least upper bounds. Definitions of Sequence and Subsequence – Limit of a Sequence – Convergent
Sequences – Divergent Sequences.

Section (1.4-1.7, 2.1-2.4)

UNIT-II

Bounded Sequence – Monotone Sequences – Operations on Convergent Sequences –
Limit Superior and Limit inferior – Cauchy Sequences.

Section (2.5-2.10)

UNIT-III

Convergence and Divergence – Series with nonnegative terms – Alternating Series –
Conditional Convergence and absolute Convergence – Tests for absolute Convergence.

Section (3.1-3.4, 3.6)

UNIT-IV

Series whose terms form a non-increasing sequence – Summation by Parts – The class l^2
– Limit of a function on a real line – Metric

Spaces. Section (3.7-3.10, 4.1, 4.2)

UNIT-V

Limits in Metric Spaces – Functions continuous at a point on the real line – Reformulation –
Functions Continuous on a Metric Spaces – Open sets.

Section (4.3, 5.1-5.4)

TEXT BOOK:

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	Methods of Real Analysis	Richard R. Goldberg	IBM Publishing New Delhi.	1970

ReferenceBooks:

S.No	Titleof the Book	Author	PublishingCompany	Yearof Publication
1.	AFirstCourseinReal Analysis	SterlingK.B arberian	Springer(India)Private Limited,New Delhi.	2004
2.	Mathematical Analysis	Tom.M.Apostel	Narosa Publications,NewDelhi	2002
3.	RealAnalysis	M.S.Rangachari	NewCenturyBook House,Chennai.	1996

COURSEOUTCOME

Aftercompletingthecourse, the studentsareexpectedto know

- Understandbasicconceptsofsequence andseries.
- Understandand provevarious theorems.
- Understandthethod tosolvesimpleproblems byapplyingconceptsofAnalysis.

SEMESTER V
CORE XI: OPERATIONS RESEARCH

Paper Code: 21UMA11/21UMACA11

Max. Marks: 75

COURSE OBJECTIVE

The main objective of the course is to enable the students to apply Mathematics in very days situations and develop model of decision making problems that involve constraints and linear programs.

UNIT I: LINEAR PROGRAMMING PROBLEM

Origin and development of O.R. – Characteristic features of O.R. - uses and limitations of O.R – Linear Programming problem – Mathematical Formulation - Graphical solution - General LPP- canonical and standard forms of LPP – Simplex procedure – computational procedure.

Chapter 1: Sections 1.1 to 1.2, 1.9, Chapter 2: Sections 2.1 to 2.3, 2.5, 2.6 &

Chapter 3: Sections 3.1, 3.3

UNIT II: LINEAR PROGRAMMING PROBLEM

Artificial variable Techniques-surplus variables and artificial variable–Big 'M' method – Two phase method–Problems–concept of Duality–Formulation of primal–Dual pairs–Duality and simplex method– Dual simplex method–Dual simplex algorithm.

Chapter 3: Section 3.5 & Chapter 4: Sections 4.1 to 4.2, 4.5 to 4.7

UNIT III: TRANSPORTATION AND ASSIGNMENT PROBLEM

Transportation Problem-Introduction – Mathematical formulation of the transportation problem–Finding initial basic feasible solutions–Moving towards optimality– Degeneracy in a Transportation Problems – Unbalanced T.P. Assignment problem– Balanced and unbalanced

A.P.–Hungarian method– Degeneracy in A.P.

Chapter 6: Sections 6.1 to 6.9 & Chapter 7: Sections 7.1 to 7.3

UNIT IV: GAMES AND STRATEGIES

Introduction - Two person zero sum games-The Maximin-Minimax Principle - Games without saddle points- mixed strategies-Graphical solution of $2 \times n$ and $m \times 2$ games- Dominance property

Chapter 9: Sections 9.1 to 9.7

UNIT V: SEQUENCING PROBLEMS

Sequencing problems – Introduction – Basic assumptions – problem with n jobs and 2 machines – problems with n jobs with 3 machines – n jobs to be operated on m machines – problems with two jobs on m machines (graphical method)

Chapter 10: Sections 10.1 to 10.5

TEXTBOOK:

1. Kanti Swarup, P.K. Gupta and

Man Mohan, OPERATIONS RESEARCH, Eig

th edition, Reprint 2000– Sultan Chand & sons, New Delhi.

REFERENCEBOOKS:

1. S.Kalavathy–OPERATIONSRESEARCH–
Secondedition,yearofpublication2002,Vikaspublishinghouse,NewDelhi,
2. P.K.GuptaandD.S.Hira-
OPERATIONSRESEARCHyearofpublication2004secondedition,S
.ChandandCo,NewDelhi
3. HamdyTaha-
OPERATIONSRESEARCHyearofpublication1996.PrenticeHallpublic
ations, New Delhi.

COURSEOUTCOME

Onsuccessfulcompletionofthiscoursestudentswillbe ableto

- Formulate simple reasoning and learning optimization problems.
- Analyze a problem and can select a suitable strategy.
- Apply an appropriate method to obtain the solution to a problem.
- Manipulate the basic mathematical structures underlying these methods.
- Evaluate analytically the limitations of these methods.

SEMESTER
VCOREXII-MECHANICS

Paper Code: 21UMA12/21UMACA12

Max. Marks: 75

COURSE OBJECTIVE

To enable the student to know about the concepts of types of forces, moments, friction, projectiles, impulsive forces and collision of elastic bodies and simple harmonic motion.

UNIT I

Forces at a Point: Parallelogram law of forces – Triangular law of forces – Perpendicular triangular forces – Converse of the triangular law of forces – The polygon of forces – Lami's theorem Parallel Forces & Moments: Like and unlike parallel forces – Problems – Moments – Definition – Varignon's theorem – Problems.

Chapter II: sections 1 to 9, Chapter III: sections 1 to 12.

UNIT II

Friction: Introduction – Experimental Results – Static and Dynamic limiting friction – coefficient of friction – angle of friction – Cone of friction – Equilibrium of a particle on a rough inclined plane – Equilibrium of a particle on a rough inclined plane under a force parallel to the plane – Equilibrium of a particle on a rough inclined plane under any force – Problems.

Chapter VII: section 1 to 12.

UNIT III

Projectiles: Definitions – Two fundamental principles – The path of a projectile is a parabola – Characteristics of the motion of a projectile – Range on an inclined plane.

Chapter VI: Sections 6.1 to 6.8, 6.12 to 6.16

UNIT IV

Impulsive Forces: Impulse – Impulsive Force – Impact of two bodies – motion of a shot and Gun – Loss of Kinetic energy.

Collision of elastic bodies: Definitions – Fundamental Laws of Impact – Impact of a smooth sphere on a fixed smooth plane – Direct impact of two smooth spheres – Oblique impact of two smooth spheres.

Chapter – VII Sections 7.1 to 7.6, Chapter – VIII Sections 8.1 to 8.9

UNIT V

Simple Harmonic Motion: Simple Harmonic motion in a straight line – General solution of the S.H.M. equation – Geometrical representation – Change of origin – S.H.M. on a curve – simple pendulum – period of oscillation of a simple pendulum – equivalence simple pendulum – second pendulum – loss or gain in the number of oscillation made by a pendulum.

Chapter – X Sections 10.1 to 10.5, 10.11 – 10.16

TEXTBOOK:

1. Venkatraman.M.K., Statics, (Tenth Edition), Agasthiar Publication, Trichy 2002.
2. Venkatraman.M.K., 2009, Dynamics (Tenth Edition), Agasthiar Publications, Trichy.

REFERENCEBOOK:

1. Duraipandian.P.,1988,Mechanics,EmeraldPublishers,Chennai.

COURSEOUTCOME

CO1	To collect the basic concept of forces and understand the Varignon's theorem.
CO2	To understand the laws of friction and equilibrium of a particle on a rough inclined plane under a force
CO3	To understand the path of a projectile is a parabola and to apply the concept of projectile.
CO4	To understand the impulse and impulsive force and to gain knowledge about collision of elastic bodies.
CO5	To understand the geometrical representation of simple harmonic motion and solve the problems on the second pendulum.

SEMESTER V
SBECIII–C–Programming(Theory)

Paper Code: 21UMAS02

Max.Marks:75

COURSE OBJECTIVE

C is a versatile language suitable for virtually any programming task and it has replaced FORTRAN for solving problems. 'C' is the primary programming language, used when writing software for OS/2 and IOS and also its higher version C++ provides object oriented capabilities. The main objective of this course is to learn how to write programs in C language for solving mathematical problems.

UNIT I

Basic structure of C Program – Character set, constants – Keywords and identifiers – variables – data type – declaration of variables – assigning values to variables – Defining symbolic constants.
Chapter 2: (Sections 2.1 to 2.11)

UNIT II

Arithmetic operators – relational operators – logical operators – assignment operators' increment and decrement operators – conditional operators – special operators – arithmetic expressions – type conversions in expressions.
Chapter 3: (Sections 3.2 to 3.14)

UNIT III

Reading a character – writing a character – formatted input and output – decision making with IF statement – Simple IF statement – IF ELSE statements - Nesting of IF ELSE statement – Switch statement – The GOTO statement – the WHILE statement – The DO statement – The FOR statement – Jumps in loops.
Chapter 4, 5 & 6: (Sections 4.2 to 4.5, 5.2 to 5.7, 5.9, 6.2 to 6.5)

UNIT IV

One dimensional array – Two dimensional arrays – initializing two dimensional arrays – multidimensional arrays – declaring and initializing string variables – reading strings from terminal – writing strings to screen – Arithmetic operations on characters.
Chapter 7 & 8: (Sections 7.2 to 7.7, 8.2 to 8.5)

UNIT V

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.
Chapter 9: (Sections 9.2 to 9.10)

TEXTBOOK:

1. E. Balagurusamy, Programming in ANSI C Tata McGraw – Hill publishing company Limited, New Delhi.

REFERENCE BOOKS:

1. C. Xavier C. Language and Numerical Methods, Year of publication 1999- Newage international limited, New Delhi.
2. Kernighan B.W. and Ritchie D.M. THE C PROGRAMMING LANGUAGE, prentice hall India, New Delhi 1997.

COURSE OUTCOME

On successful completion of this course students will be able to

- Understand the structure of C program, its keywords, declaration of variables and defining symbolic commands.
- Use arithmetic operators, logical operators, relational operators, increment and decrement operator and conditional operators while writing a C program.
- Know the decision making using IF statement, IF ELSE statement, and to have jumps in loops using GOTO, WHILE, DO, FOR and SWITCH statement.
- Define one dimensional array, two dimensional arrays, and to declare string variables.
- Understand the need for user defined functions, return values and their types, calling function, and category of functions.

SEMESTER VI
COREXIII: LINEAR ALGEBRA

Paper Code: 21UMA13/21UMACA13

Max. Marks: 75

COURSE OBJECTIVE

- To learn about Linear dependence, Bases and Dimension.
- To provide basic knowledge of Linear Transformations and Matrix representation.
- To introduce Inner product Spaces.

UNIT-I

Vector Spaces: Introduction - Vector spaces – Subspaces - Linear Combinations and Systems of Linear Equations - Linear Dependence and Linear Independence - Bases and Dimension.
(Chapter 1: Sections 1.1-1.6)

UNIT-II

Linear Transformations and Matrices: Linear Transformations, Null spaces and Ranges – The Matrix representation of a Linear Transformation – Composition of Linear Transformations and Matrix Multiplication – Invertibility and Isomorphisms
(Chapter 2: Sections 2.1-2.4)

UNIT-III

Elementary Matrix Operations and System of Linear Equations: Elementary Matrix Operations and Elementary Matrices – The Rank of a Matrix and Matrix Inverses - System of Linear Equations - Theoretical Aspects (excluding Application).
(Chapter 3: Sections 3.1-3.3)

UNIT-IV

Inner Product Spaces: Inner Products and Norms - The Gram-Schmidt Orthogonalization Process and Orthogonal Complements – The Adjoint of a Linear Operator.
(Chapter 6: Sections 6.1-6.3)

UNIT-V

Normal and Self-adjoint operators – Unitary and Orthogonal operators and their Matrices (Excluding orthogonal operators on \mathbb{R}^2) - Orthogonal Projections and The Spectral theorem.
(Chapter 6: Sections 6.4 -6.6)

TEXTBOOK:

Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, *Linear Algebra*, Prentice-Hall India, Fifth edition.

REFERENCE BOOKS:

1. Arumugam, S. and Issac, A. 2014. *Modern Algebra*. Scitech Publications (India) Pvt. Ltd. Chennai.
2. Sharma J.N. and Vashistha, A.R., 1981. *Abstract Algebra*. Krishna Prakasam Mandir, Meerut.

COURSE OUTCOME

After completion of the course, the students will be able to

C01	Find the linear dependence and independence, dimension of spaces.
C02	Know the concepts of null spaces, range and Matrix representation of a linear transformation.
C03	Solve System of Linear equations by using Rank.
C04	Understand about Inner Product Spaces.
C05	Compute the orthogonal projection of a vector.

SEMESTER VI
COREXIV: REAL ANALYSIS– II

Paper Code: 21UMA14/21UMACA14

Max. Marks: 75

COURSE OBJECTIVE

On Successful Completion of the course, the students will be able to

- Understand closed sets, Connected sets totally bounded sets.
- Understand the concepts of Complete, Compact metric spaces and uniform continuity.
- Understand the classical theory of Riemann Integration.
- To know how to apply Rolle's Theorem, Fundamental theorem of calculus.
- Understand the basic concepts of Uniform convergence and its applications.

UNIT–I

Closed Sets - Discontinuous functions on \mathbb{R}^1 -More about Open sets-Connected sets-Bounded sets & Totally bounded sets.

Section (5.5, 5.6, 6.1-6.3)

UNIT–II

Complete Metric spaces - Compact Metric spaces- Continuous functions on Compact Metric spaces -Continuity of the inverse functions-Uniform Continuity.

Section (6.4-6.8).

UNIT–III

Sets of Measure Zero - Definition of the Riemann Integral-Existence of the Riemann Integral-Properties of the Riemann Integral-Derivatives.

Section (7.1-7.5)

UNIT–IV

Rolle's theorem- The law of the mean-Fundamental theorems of calculus-Improper integral- Improper integral (continued).

Section (7.6-7.10)

UNIT–V

Point wise convergence of sequences of functions-Uniform convergence of sequences of functions- Consequences of Uniform convergence- Convergence and Uniform convergence of Series of functions-Integration and differentiation of series of functions

Section (9.1-9.5)

TEXT BOOK:

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	Methods of Real Analysis	Richard R. Goldberg	IBM Publishing New Delhi.	1970

REFERENCE BOOKS:

S.No	Title of the Book	Author	Publishing Company	Year of Publication
1.	A First Course	Sterling	Springer (India) Private	2004

	inReal Analysis	K.Barberian	Limited,NewDelhi.	
2.	Mathematical Analysis	Tom.M.Apostel	Narosa Publications,NewDelhi	2002
3.	RealAnalysis	M.S.Rangachari	NewCenturyBook House,Chennai.	1996

COURSEOUTCOME

Aftercompletingthecoursethe students will beableto

- Understandconceptsofconnectedness, completenessandcompactnessof metricspaces.
- UnderstandbasicconceptsofRiemannIntegrationandsolvingsimple problems.
- Solvingproblems byusingtheorems on derivatives.

SEMESTER VI
CORE XV: COMPLEX ANALYSIS

Paper Code: 21UMA15/21UMACA15

Max. Marks: 75

COURSE OBJECTIVE

- To enable the student to identify Analytic functions
- To enrich the knowledge on Cauchy Integral formula and Fundamental theorems.
- To introduce the concepts of Singularities and Residues.

UNIT-I

Analytic Functions: Functions of a Complex variable - Limits - Theorem on Limits - Limits involving the Point at Infinity – Continuity – Derivatives - Cauchy - Riemann Equations - Sufficient Conditions for Differentiability - Polar Coordinates - Analytic Functions – Examples - Harmonic Functions.

(Chapter 1: Sections 12, 15 to 19, 21 to 26).

UNIT-II

Integrals: Contours - Contour Integrals - Some examples - Cauchy - Goursat Theorem - Proof of the Theorem - Simply Connected Domains - Multiply Connected Domains - Cauchy Integral Formula - An Extension of the Cauchy Integral Formula - Liouville's Theorem and the Fundamental Theorem of Algebra.

(Chapter 4: Sections 39 to 41, 46 to 51, 53).

UNIT-III

Series: Convergence of Sequences - Convergence of Series - Taylor Series - Proof of Taylor's Theorem - Examples - Laurent Series - Proof of Laurent's Theorem - Examples.

(Chapter 5: Sections 55 to 62)

UNIT-IV

Residues and Poles: Isolated Singular Points - Residues - Cauchy Residue Theorem - Residue at Infinity - The Three Types of Isolated Singular Points - Residues at Poles - Examples - Zeros of Analytic Functions - Zeros and poles.

(Chapter 6: Sections 68 to 76).

UNIT-V

Mapping by Elementary Functions: Linear Transformations - The Transformation $w=1/z$ - Mappings by $1/z$ – Linear Fractional Transformations – An Implicit Form. **Conformal Mapping:** Preservation of Angles - Scale Factors - Local Inverse.

(Chapter 8: Sections 90 to 94, Chapter 9: Sections 101 to 103).

TEXTBOOK

1. James Ward Brown and Ruel V. Churchill, *Complex Variables and Applications*, McGraw Hill, Inc., Eighth Edition.

REFERENCE BOOKS

1. T.K. Manickavachagam Pillai, *Complex Analysis*, S. Viswanathan Publishers Pvt. Ltd.
2. Duraipandian, P. and Laxmi Duraipandian. 2001. *Complex Analysis*, Emerald Publishers, Chennai.

COURSE OUTCOME

After completion of the course, the students will be able to

CO1	Know the concepts of Limits, Continuity and Analytic functions.
CO2	Solve Complex Integrals.
CO3	Discuss Convergence of Sequences and Series, Taylor series and Laurent series.
CO4	Find different Singularities and Residues
CO5	Understand various Linear Transformations and Conformal Mappings

SEMESTER VI
COREXVI: GRAPH THEORY

Paper Code: 21UMA16/21UMACA16

Max. Marks: 75

COURSE OBJECTIVE

- To understand the basic concepts of graph theory, vertex connectivity and edge connectivity in graph.
- To understand the concept of Euler Graphs and Hamilton Graphs.
- To understand the concept of trees and matrices in Graphs like incidence matrix, adjacency matrix etc.,
- To understand the concept of directed graphs, directed paths and Euler Digraphs

UNIT– I

Introduction-Definition- Application of Graphs- Finite and Infinite Graphs- Incidence and Degree- Isolated Vertex- Pendant vertex- Null Graph. Paths and circuits- Isomorphism- Sub graphs- A puzzle with multicolored Cubes -Walks, Paths and Circuits.
Chapter 1: Sections: 1-2, 1-3, 1-4 and 1-5.
Chapter 2: Sections: 2-1, 2-2, 2-3.

UNIT–II

Connected Graphs- Disconnected Graphs and Components- Euler Graphs- Operation on Graphs - More on Euler Graphs- Hamiltonian paths and circuits- The Travelling Salesman Problem.

Chapter 2: Sections: 2-4, 2-5, 2-6, 2-7, 2-8, 2-9 and 2-10.

UNIT–III

Trees: Properties of Trees- Pendant Vertices in trees- Distance and centers in a Tree- Rooted and Binary Trees- On Counting Trees- Spanning Trees- Fundamental Circuits.

Chapter 3: Sections: 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7 and 3-8.

UNIT– IV

Matrix representation of graph: Incidence Matrix- Sub matrix of $A(G)$ - Circuit matrix- Fundamental circuit matrix and rank of B - Path matrix- Adjacency Matrix.

Chapter 7: Sections: 7-1, 7-2, 7-3 and 7-4, 7-8, 7-9.

UNIT– V

Directed Graphs: Definitions- Types of Digraphs- Digraph and Binary Relations- Directed Paths and Connectedness- Euler Digraphs- Trees with Directed Edges.

Chapter 9: Sections: 9-1, 9-2, 9-3, 9-4, 9-5 and 9-6.

TEXT BOOK:

1. Narasingh Deo, Graph Theory with application to Engineering and Computer Science, Prentice-Hall of India Private Limited, New Delhi.

REFERENCEBOOK:

1. Harary, Graph Theory, Narosa Publications, New Delhi.
2. S. Arumugam, S. Ramachandran, Invitation to Graph Theory, Scitech Publications, Chennai-2001.
3. John Clark, A First Look at Graph Theory, Allied Publication Ltd, Madras

COURSE OUTCOME

After completing the course, Students will be able to

- Formally understand and prove theorems and lemmas.
- Apply theoretical knowledge acquired to solve realistic problems in real life.
- Apply principles and concepts of graph theory in practical situations and to improve the proof writing skills.

SEMESTER VI
SBECIV:OFFICEAUTOMATION(PRACTICAL)

PaperCode:21UMASP03

Max.Marks:75

COURSEOBJECTIVE

- To learn about basic commands of MS Word, MS Excel and MS Access.

LIST OF PRACTICALS

MS Word

1. Preparation of word document (Typing, aligning, Font Style, Font Size, Text editing, colouring, Spacing, Margins)
2. Creating and Editing a table (Select no of rows, Select no of columns, row heading, column heading, column width, row width, row height, spacing text editing)
3. Formatting a table (insert rows/columns, delete rows/columns, cell merging /splitting, Cell alignment)
4. Preparation of letters using mail merge.
5. Demonstration of Find, Replace, Cut, Copy and paste text in a word document.

MS Excel

6. Creation of Charts, Graphs and Diagrams.
7. Calculation of Measures of central Tendency
8. Calculation of Standard Deviation.

MS PowerPoint

9. Preparation of slides in powerpoint.
10. Creation of Animation Pictures.

MS Access

11. Creation of simple reports using MS Access.

General

12. Exporting a given graph from Excel to word.
13. Sending an Email.
14. Downloading a document from internet.
15. Importing a picture from internet to word document.

TEXT BOOK:

1. Andy Channelle, *Beginning Open Office 3: From Novice to Professional*, A Press series,

Springer-Verlog, 2009.

REFERENCE BOOK:

1. Perry M. Greg, *Sams Teach Yourself Open Office.org All In One*, Sams Publications, 2007.

COURSE OUTCOME

Acquire practical knowledge about MS-Word, MS-Excel, MS-PowerPoint and MS-Access.

**ELECTIVE COURSE –
IGROUP A
ELECTIVE–DISCRETE MATHEMATICS**

Paper Code: 21UMAE01

Max. Marks: 75

COURSE OBJECTIVE

The course aims to

1. gain knowledge about the concepts of Mathematical logic and algebraic structures.
2. know about the relations, functions and axioms related to natural numbers.
3. understand the concepts of Lattices and Boolean Algebra.

Syllabus

UNIT–I

Mathematical logic–Statements and Notations–Connectives–Negation–Conjunction–Disjunction–Statement formulas and truth table–Conditional and Bi-conditional–Well formed formulas– Tautologies.

Chapter 1 (sections 1.1, 1.2.1 to 1.2.4, 1.2.6 to 1.2.8)

UNIT–II

Normal forms – Disjunctive Normal forms – Conjunctive Normal forms – Principal Disjunctive Normal forms – Principal conjunctive Normal forms - Ordering and uniqueness of normal forms – Validity using truth tables– Rules of inference.

Chapter 1 (sections 1.3.1 to 1.3.5, 1.4.1, 1.4.2)

UNIT–III

Relations and Ordering – Relations – Properties of Binary binary relations in a set – Partial Ordering–Partially ordered set: Representation and Associated terminology– Functions: Definition and Introduction – Composition of functions – Inverse functions – Natural numbers: Peano axioms and Mathematical induction.

Chapter 2 (sections 2.3.1, 2.3.2, 2.3.8, 2.3.9, 2.4.1 to 2.4.3, 2.5.1)

UNIT–IV

Algebraic systems: Definition and examples - Semigroups and Monoids: Definition and examples–Homomorphism of Semigroups and Monoids–Subsemigroups and Submonoids.

Chapter 3 (sections 3.1.1, 3.2.1, 3.2.2 and 3.2.3)

UNIT–V

Lattices as partially ordered sets: Definition and examples–Some properties of Lattices – Sublattices, Direct product and Homomorphism–Boolean algebra: Definition and examples – Sub Algebra, Direct product and

Homomorphism. Chapter 4 (sections 4.1.1, 4.1.2, 4.1.4, 4.2.1, 4.2.2)

TEXTBOOK:

1. J.P. Tremblay, R. Manohar, Discrete Mathematical structure with Applications to computer science, Tata McGraw hill, 2001.

REFERENCE BOOKS:

1. Dr. M.K. Sen and Dr. B.C. Charraborthy, Introduction to Discrete Mathematics, Arunabha Sen Books & allied Pvt. Ltd, 8/1, Chintamani Das Lane, Kolkata–700009.

COURSE OUTCOME

On completion of the course, students should be able to

CO1	Recall the various concepts of Mathematical Logic
CO2	Understand the concepts of different types of normal forms
CO3	Classify the various types of functions and make them to use in practical applications related to computer science
CO4	Gain knowledge about the Algebraic systems
CO5	Understand the concepts of Boolean Algebra and its applications

GROUP A
ELECTIVE–ASTRONOMY

Paper Code: 21UMAE02

Max. Marks: 75

COURSE OBJECTIVE

This paper focuses on enabling the students to learn about the solar system, its components and interesting facts about the solar system.

UNIT–I

The Solar System: Introduction - The Sun - Mercury - Venus - Mars - Asteroids - Jupiter - Saturn - Uranus - Neptune.

Chapter 16 Sections: 316-326. Pg.No : 455 -467

UNIT-II

The Solar System: Comets - Meteors - Zodiacal light.

Chapter 16 Sections: 327-329. Pg.No : 467 -472

UNIT–III

Double and Multiple Stars: Introduction - Variable stars - Eclipsing Variables - Cepheid variables - Long period variables - Irregular variables - Novae - Star clusters - Nebulae - Constellations - Zodiacal Constellations.

Chapter 17 Sections: 339-345. Pg.No: 481-489

UNIT–IV

The Milky Way: Introduction - Seasonal changes in the night sky - The winter Constellations - The spring Constellations.

Chapter 17 Sections: 346-347. Pg.No : 489 -497

UNIT–V

Constellations: Introduction - The summer Constellations - The autumn Constellations.

Chapter 17 Sections: 347. Pg.No : 497-504

TEXTBOOK:

1. Kumaravelu S and Susheela Kumaravelu, "Astronomy for degree classes", 7th edition 1986.

REFERENCE BOOK:

1. V.B. Bhatia, Text book for Astronomy and Astrophysics with elements of Cosmology. 2nd Edition Narosa Publishing House, New Delhi, 2001.

COURSE OUTCOME

- Gain knowledge about solar system.
- Gain knowledge about double & multiple stars.

GROUP A
ELECTIVE–JAVAPROGRAMMING

Paper Code: 21UMAE03

Max. Marks: 75

COURSE OBJECTIVE

- Programming in the JAVA Programming language.
- Knowledge of object-oriented paradigm in the JAVA Programming language.
- The use of JAVA in a variety of technologies and on different platforms.

UNIT– I

Basic concepts of object-oriented programming – objects and classes – Data Abstraction and Encapsulation – Inheritance – polymorphism – Dynamic Binding – Message communication – Java features – Java Environment – Java Program structure – Java Virtual Machine.

UNIT– II

Introduction – Constants – Variables – Data types – Declaration of variables – scope of variables – type casting – operators and expressions – Decision making and branching – Decision making and looping.

UNIT– III

Classes – Objects and Methods – Arrays – Strings – Interfaces – Multiple inheritance.

UNIT– IV

Packages – Multi-threaded Programming – Managing Errors and Exceptions.

UNIT– V

Applet Programming – Introduction – Building Applet code – applet lifecycle – Creating an executable applet – Designing a webpage – Applet tag – adding applet to HTML file – Running the Applet – Managing I/O files in Java.

TEXT BOOK

1.

E. Balagurusamy, Programming with Java a Printer, Tata McGraw Hill Publication Co., Ltd., New Delhi, 1998.

REFERENCE BOOKS

1. Pootrick Naughton and Hebert Schedelt, The Complete Reference Java – 2, Tata McGraw Hill Publications Co., Ltd., New Delhi, 3rd Edition, 2006.
2. Hebert Schedelt, Java – 4th Edition.

COURSE OUTCOME

- Understand fundamentals of programming such as Variables, Conditional and iterative execution, methods etc.
- Understand fundamentals of object – oriented Programming in JAVA, including defining classes, invoking methods, using class libraries, utilities in applets etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the JAVA SDK environment to create, debug and run simple JAVA programs.

NOTE:

- This paper should be handled and valued by the faculty of Mathematics only.
- Both Internal and External Examiners for University Practical Examination should be appointed from faculty of Mathematics only.

ELECTIVE COURSE – IIGROUP B

ELECTIVE–FUZZYSETSANDFUZZYLOGIC

PaperCode:21UMAE04

Max.Marks:75

COURSEOBJECTIVE

- To understand uncertainty
- Fuzzy logic attempts to emulate reasoning and decision making in an uncertain environment
- Knowledge in set theory

UNIT– I

From Classical (Crisp) Sets to Fuzzy Sets: Introduction – *Crisp sets: An Overview*. Fuzzy Sets: Basic Types – Fuzzy Sets: Basic Concepts – Characteristics and Significance of the Paradigm Shift – **Fuzzy Sets versus Crisp sets:** Additional Properties of α -Cuts – Representations of Fuzzy Sets. Extension Principle for Fuzzy Sets.

Chapter 1: 1.1 – 1.5 & Chapter 2: 2.1 –

2.3 UNIT–II

Operations on Fuzzy Sets: Types of Operations – Fuzzy Complements – Fuzzy Intersections: t -Norms – Fuzzy Unions: t -Conorms – Combinations of Operations – Aggregation

Operations Chapter 3:

3.1– 3.6

UNIT– III

Fuzzy Arithmetic: Fuzzy Numbers – Linguistic Variables – Arithmetic Operations on Intervals, Fuzzy Numbers – Lattice of Fuzzy Numbers. Fuzzy Equations.

Chapter 4: 4.1– 4.6

UNIT– IV

Fuzzy Relation: Crisp Versus Fuzzy Relations – Projections and Cylindric Extensions – Binary Fuzzy Relations – Binary Relations on a Single Set – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Ordering Relations – Fuzzy Morphisms – \sup - i Compositions at Fuzzy Relations – \inf - ω ; Compositions of Fuzzy Relations.

Chapter 5: 5.1– 5.10

UNIT– V

Fuzzy Logic: Classical logic: An Overview – Multivalued Logics – Fuzzy Propositions – Fuzzy Quantifiers – Linguistic Hedges – Inference from Conditional Fuzzy Propositions – Inference from Conditional and Qualified Propositions – Inference from Quantified Propositions.

Chapter 8: 8.1– 8.8

TEXTBOOK

S.No.	Author Name	Title of the Book	Publisher	Year and Edition
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1.	George Klir J. and Bo Yuan	Fuzzy Sets and Fuzzy Logic: Theory and Applications	Prentice Hall of India Private Limited, New Delhi	2008, 1 st Edition
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REFERENCEBOOKS

S.No.	AuthorName	Titleof theBook	Publisher	Year andEdition
1.	GeorgeJ.Klir,Tina A.Folger	Fuzzysets, uncertainty andinformatio n	PrenticeHallof IndiaLtd,New Delhi	2006,1 st edition
2.	ZimmermannH.J.	FuzzysetTheoryandits Applications	Springer PrivateLimited, New Delhi	2006,4 th edition
3.	ZimmermannH.J	Fuzzysets,Decision Making,andExpert Systems	Kluwer,Boston	1993,4 th edition

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar andCaseStudy

WebResources

1. <https://www.journals.elsevier.com/fuzzy-sets-and-systems>
2. <https://www.ifi.uzh.ch/fuzzylogicscrip>
3. http://www.tutorialspoint.com/fuzzy_logic/fuzzy_logic_control_systemhttps://www.cse.iitb.ac.in/~cs621-2011/lectures_2009/cs621-lect38-fuzzy-logic

COURSEOUTCOME

Onthesuccessfulcompletionofthecourse,studentswillbeableto

CO Number	COStatement
CO1	Calculatesupport,height,normalalphacutsandstrongalphacutsfromtheM embershipFunctions
CO2	Manipulate standard fuzzy operations such as complements, t – normsand t – conorms
CO3	Analyzetheconceptsoffuzzynumbersandlinguistic variables
CO4	Computefuzzyrelationsforequivalenceand compatibility
CO5	Applytheconceptsoffuzzylogic,fuzzypropositionsandquantifiedprop ositionstomathematicalmodelingin uncertainituation

GROUP B

ELECTIVE – Formal Languages and Automata Theory

Paper Code: 21UMAE05

Max. Marks: 75

COURSE OBJECTIVE

- This course will give an introduction to formal languages and automata theory. Automata and formal languages appear (possibly in various disguises) in almost every branch of computer science.
- The purpose of this course is to acquaint the student with an overview of the theoretical foundations of computer science from the perspective of formal languages.

UNIT – I

Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: NFA with $\hat{\Gamma}$ transitions -

Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without $\hat{\Gamma}$ transitions, NFA to DFA conversion, minimisation of FSM, equivalence between two FSM's, Finite Automata without output - Moore and Mealy machines.

UNIT – II

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expression, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

Grammar Formalism: Regular grammars - right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Rightmost and leftmost derivation of strings.

UNIT – III

Context Free Grammars : Ambiguity in context free grammars. Minimisation of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).

Push Down Automata : Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA.

UNIT – IV

Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required).

UNIT – V

Computability Theory: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0) grammar, decidability of problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

TEXTBOOKS

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory Languages and Computation", 3rd Edition, 2006, Pearson Education (Addison Wesley).
2. Michael Sipser, "Introduction to the Theory of Computation", 2nd Edition, 2006, Thomson

REFERENCES

1. Daniel I.A. Cohen, Introduction to Computer Theory, 1986, John Wiley & Sons, Inc. (<https://pakistandasti.files.wordpress.com/2013/11/introduction-to-computer-theory-by-cohen-copy.pdf>)
 2. John C Martin, Introduction to languages and the Theory of Computation, 4th Edition, 2003, McGraw Hill (<https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.3774&rep=rep1&type=pdf>)
 3. Harry R. Lewis, Christos H. Papadimitriou, Elements of Theory of Computation, 2nd Edition, 1998, Prentice-Hall, Upper Saddle River, New Jersey. (https://www.ucursos.cl/ingenieria/2010/2/CC3102/1/material_docente/bajar?id_material=3222)
- 14)

COURSE OUTCOME

- Gain knowledge about the Grammars, Languages and Automata Theory.
- Understanding the features of Turing Machine and Computability Theory

GROUP B
ELECTIVE–C++PROGRAMMING

Paper Code: 21UMAE06

Max. Mark: 75

COURSE OBJECTIVE

The Course aims are to

1. Understanding about object-oriented programming
2. Create and process data in files using I/O functions
3. Understand about constructors which are special type of functions.

UNIT-I

Basic Concepts of Object-Oriented Programming – Tokens – Expressions –
Control Structures – Functions in C++.

Chapter 1: Sec. 1.5, Chapter 3: Sec 3.1– 3.24

Chapter 4: Sec 4.1-4.11

UNIT-II

Classes &

Objects. Chapter 5: Sec. 5.1

UNIT-III

– 5.16

Constructors &

UNIT-IV

Destructors. Chapter 6:

Sec 6.1– 6.11

UNIT-V

Operator Overloading – Type

Conversions. Chapter 7: Sec. 7.1– 7.8

Inheritance & Extending classes – Pointers, Virtual Functions and

Polymorphism.

Chapter 8: Sec. 8.1– 8.12, Chapter 9: Sec. 9.1– 9.3, 9.5 – 9.7

TEXT BOOK:

1. Object Oriented Programming with C++, E. Balagurusamy, Tata McGraw, Hill, 2006. Fourth Edition.

COURSE OUTCOME

- Understand the Basic concepts of object oriented programme, Expressions, control structures, Classes and objects.
- Understand dynamic memory management techniques using constructors, destructors, etc.
- Understand the concept of function overloading, operator overloading, virtual functions and polymorphism.
- Demonstrate the use of various OOPs concepts with the help of programs.

ALLIED MATHEMATICS

(For B.Sc. PHYSICS / B.Sc. COMPUTER SCIENCE / B.Sc. CHEMISTRY)

SEMESTER- I/III ALLIED MATHEMATICS – I ALGEBRA AND CALCULUS

Paper Code: 21UMAA01

Max. Marks: 75

COURSE OBJECTIVE

- To learn the basic concepts and problem solving in Theory of equations.
- Develop the ability of solving the Integrals.

UNIT – I: Theory of Equations:

Imaginary roots - Irrational roots - Formation of equations - Solution of equations - Diminishing the roots of an equation & solutions - Removal of the second term of an equation & solutions - Descartes' rule of signs - Problem only.

UNIT – II: Matrices:

Definition of Characteristic equation of a matrix - Characteristic roots of a matrix - Eigenvalues and the corresponding Eigenvectors of matrix — Cayley Hamilton theorem (Statement only) — Verification of Cayley Hamilton Theorem — Problem only.

UNIT – III: Radius of Curvature:

Formula of Radius of Curvature in Cartesian coordinates, Parametric coordinates and Polar coordinates (no proof for formulae) - Problem only.

UNIT – IV: Partial Differential Equations:

Formation of Partial Differential Equations by eliminating the arbitrary constant and arbitrary functions - Lagrange's Linear Partial Differential Equations - Problem only.

UNIT – V: Integration:

Definite Integral: Simple properties of definite Integrals - Bernoulli's Formula - Integration by parts - Simple problems; Reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$, $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$, $\int_0^{\infty} e^{-x} \int x^n e^{ax} dx$ simple problems

TEXTBOOK:

1. Dr P R .Vittal ,Allied Mathematics, Margham publication, Chennai-17,

Reprint2012

REFERENCEBOOK:

1.S G Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17, Reprint 2011.

COURSE OUTCOME

On completion of the course, students should be able to

CO1	Know the application of relations between the roots and coefficients of a quadratic equation and diminishing the roots of a quadratic equation
CO2	Ability to solve the consistency of linear equations and application of Cayley-Hamilton theorem
CO3	Understanding the concepts of Cartesian co-ordinates, parametric co-ordinates and polar co-ordinates.
CO4	Understand the basic properties of PDE.
CO5	Gain the skill to solve problems.

SEMESTER II /
IV ALLIED MATHEMATICS – II
DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

Paper Code: 21UMAA02

Max. Marks: 75

COURSE OBJECTIVE

- Develop the basic concepts of Maxima and Minima of two variables and Numerical methods problems.
- To learn the second order differential equation with constant coefficients.
- To learn the basic concepts of Laplace Transforms, Inverse Laplace Transforms & Applications

UNIT – I

Jacobian and Maxima & Minima: Jacobian of two variables and three variables - Maxima and Minima of functions of two variables - Problems only.

UNIT – II

Finite Differences: First difference - Higher differences - Construction of difference table - Interpolation of missing value - Newton's Forward and Newton's Backward difference formula (no proof) - Lagrange's Interpolation formula (no proof) - simple problems only.

UNIT – III

Second Order Differential Equations: Second Order Differential Equations with constant coefficients - Complementary function - particular Integral and Solution of the type: e^{ax} , x^n , $\cos ax$ (or) $\sin ax$, $e^{as}x^{bs}$, $e^{as}\sin bx$, $e^{as}\cos bx$ - only

UNIT – IV

Laplace Transforms: Definition of Laplace Transforms - standard formula - Linearity property - Shifting property - Change of scale property - Laplace Transforms of derivatives - Problems.

UNIT – V

Inverse Laplace Transforms: Standard formula - Elementary theorems (no proof) - Application to solution of second order differential equations with constant coefficients - Simple problems.

TEXTBOOK:

1. Dr. P.R. Vittal, Allied Mathematics, Margham publication, Chennai-17, Reprint 2012

REFERENCE BOOK:

1. S.G. Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17, Reprint 2011.

COURSE OUTCOME

On completion of the course, students should be able to

CO1	Understanding the concepts of Maxima and Minima.
CO2	Developing the knowledge in Numerical Methods problems solving.
CO3	Understanding these second order differential equations with constant coefficients.
CO4	Understand the basic properties of Laplace Transforms.
CO5	Solving the simple problems in inverse Laplace and its applications.

SEMESTER-II/ IV

ALLIED MATHEMATICS-III-PRACTICALS

Paper Code: 21UMAAP01

Max. Marks: 75

COURSE OBJECTIVE

- Acquire knowledge about Matrices and Cayley-Hamilton Theorem.
- Understand the concepts of differentiation and Vector point functions.

UNIT I: Matrices:

Rank of Matrix – Problems upto (3x3) Matrix - Characteristic equation of a Matrix - Cayley Hamilton Theorem (statement only) - Problems to verify Cayley Hamilton Theorem.

UNIT II: Leibnitz formula for n^{th} derivative:

Leibnitz formula (without proof) for n^{th} derivative - Problems (Page no. 8.23 to 8.39 of the Text Book).

UNIT III: Partial Differentiation:

Euler's theorem on homogeneous function (without proof) - Problems to verify Euler's Theorem - Partial derivative - problems (Page no. 9.1 to 9.13 and 9.18 to 9.27 of the Text Book).

UNIT IV: Scalar and Vector point functions:

Scalar point functions - Gradient of scalar point functions - Vector point functions - Problem only.

UNIT V: Divergence and Curl of Vector point functions:

Divergence of vector point functions - Curl of vector point functions - Solenoidal of vector - Irrotational of vector - Problem only.

TEXTBOOK:

1. Dr. P.R. Vittal, Allied Mathematics, Margham publication, Chennai-17, Reprint 2012

REFERENCE BOOK:

1. S.G. Venkatachalapathi, Allied Mathematics, Margham publication, Chennai-17, Reprint 2011.

COURSE OUTCOME

- Gain the skill to solve the problems in Matrices.
- Gain knowledge to solve the problems in partial differentiation.
- Gain knowledge on the concept of divergence, curl and integration of vector point functions

NOTE:

- 1) University Examination will be conducted at the end of Second Semester/Fourth Semester,
- 2) **Two Teaching Hours** for Unit –
I, II and III in the First Semester/Third Semester and **two Hours** for Unit
– IV and V in the Second Semester/Fourth Semester.

B.Sc.
MATHEMATICS SEMESTER III
NON MAJOR ELECTIVE
COURSE QUANTITATIVE APTITUDE-I-
21UMAN01

COURSE OBJECTIVE

- To enhance the problem-solving skills.
- To improve the basic mathematical skills to help students who are preparing for any type of competitive examinations.
- To develop knowledge in practicing quantitative aptitude objective type question and answer in individual for competitive exams, entrance exams and interviews.

UNIT-I

Numbers, H.C.F. and L.C.M. of Numbers.

UNIT-II

Decimal Fractions, Square Roots and Cube Roots.

UNIT- III

Averages and Problems on Ages.

UNIT-IV

Surds and Indices,

Percentages UNIT-V

Ratio and proportion, Chain Rule.

TEXTBOOK:

1. Dr. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Ltd., New Delhi, Reprint 2013.

REFERENCE BOOK:

1. Abhijit Guha, Quantitative Aptitude Tata McGraw Hill Publishing Company Limited., New Delhi. Reprint 2005

COURSE OUTCOME

After completion of this course, Students will be able to

- Make sense of problems, develop strategies to find solutions and persevere in solving them.
- Use appropriate technology in a given context.
- Critique and evaluate quantitative arguments that utilize mathematics, statistical and quantitative information.
- Solve problems in numbers, decimal fractions, square root and cube roots.

**B.Sc.
MATHEMATICS SEM
ESTER– III**

NON - MAJOR ELECTIVE

UNIT-I

**COURSE LINEAR PROGRAMMING–
21UMAN02**

Definition of O.R. - Graphical Method .

UNIT-II

Simplex Method using Slack and Surplus Variables.

UNIT-III

Transportation Problem-Definition-Finding initial basic feasible solution only by using North-West corner Rule-Vogel's Approximation Method-Lowest cost entry Method.(Minimization with balanced problems only).

UNIT-IV

Assignment Problem-Definition -Finding optimal solution by using Hungarian Method

UNIT-V

Sequencing Problem-Definition-N job to be operated on Two Machines-Problems.

TEXTBOOK:

1. G. V. Shenoy, Linear Programming Methods and Applications, New Age International Publishers, Second Edition.

REFERENCE BOOK:

1. Gauss S. I., Linear Programming, McGraw-Hill Book Company.
2. Gupta P. K. and Hira D. S., Problems in Operation Research, S. Chand & Co.,
3. Kanti Swaroop, Gupta P. K. and Manmohan, Problems in Operation Research, Sultan Chand & Sons.

B.Sc.

MATHEMATICS

SEMESTER-IV

NON MAJOR ELECTIVE

COURSE OBJECTIVE COURSE QUANTITATIVE APTITUDE – II – 21UMAN03

1. To enhance the problem-solving skills.
2. To improve the basic mathematical skills to help students who are preparing for any type of competitive examinations.
3. To develop knowledge in practicing quantitative aptitude objective type questions and answers in individual form for competitive exams, entrance exams and interviews.

UNIT-I

Time and Work, Time and Distance.

UNIT-II

Problems on trains, Boat and streams.

UNIT-III

Alligation or mixture, Logarithms

UNIT-IV

Volume and Surface Areas, Calendar, Clocks.

UNIT-V

Height and Distances, Odd Man Out and Series.

TEXTBOOK:

1. Dr. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Ltd., New Delhi, Reprint 2013.

REFERENCE BOOK:

1. Abhijit Guha, Quantitative Aptitude Tata McGraw Hill Publishing Company Limited, New Delhi. Reprint 2005.

COURSE OUTCOME

After completion of this course, Students will be able to,

- Make sense of problems, develop strategies to find solutions and persevere in solving them.
- Use appropriate technology in a given context.
- Solving the problem on time and work, time and distance, boat and stream.
- Solving the problem on logarithms, volume and surface area, height and distance, odd man out.

B.Sc.
MATHEMATICSSEM
ESTER-IV
NON MAJOR ELECTIVE
COURSE NUMERICAL METHODS–
21UMAN04

UNIT-I

SolutionstoAlgebraicequationsonly:By(i)BisectionMethod(noproof)and(ii)
NewtonRaphson'sMethod(noproof)-SimpleProblemsonly.

UNIT-II

Finite Differences: Definition- First difference -Higher differences-
Constructionof difference TableOperator Δ , and E only- Interpolation of missing value-
Expression of anyvalue of yin terms ofthe initial valuey -Simple problems.

UNIT-III

Newton'sForwarddifferenceFormula(withoutproof)-
ConstructionofdifferenceTable -Simple problems only.

UNIT-IV

Newton'sBackwarddifferenceFormula(withoutproof)-
ConstructionofdifferenceTable—Simple problems only.

UNIT-V

CentraldifferenceFormula:Gauss'sForwardandGauss'sBackwarddifferenceformul
a(withoutproof)-Stirlingformula(withoutproof) -Simple problemsonly.

TEXTBOOK:

1P.KandasamyK.Thilagavathi,CalculusofFiniteDifferencesandNumericalAnalysis,S.Cha
nd&. CompanyPVT.LTD, New Delhi-55,2003.

REFERENCEBOOK:

1. M.K.Jain,S.R.K.IyengarandR.K.Jain,NumericalMethodsforScientificandEngineering
Computation,New AgeInternationalPrivateLimited,1999.
2. C.E.Froberg,IntroductiontoNumericalAnalysis, IIEdn.,AddisonWesley,1979.