COURSE PLAN 2014-15
B.Sc. MATHEMATICS SEM 1
15U1CRMAT01-FOUNDATIONS OF MATHEMATICS

COURSE OBJECTIVES

- To explain the fundamental ideas of sets and functions
- To introduce basic logic
- To introduce basic number theory

Basic Reference

1. K.H. Rosen: Discrete Mathematics and its application, Tata McGraw Hill Publishing Company, New Delhi
2. **S. Bernard and J.M Child: Higher Algebra, AITBS Publishers, India,2009**

Faculty: Jeet Kurian Mattam, Didimos K.V.

Learning Outcomes

On completion of this course, successful students will be able to:

- prove statements about sets and functions;
- analyze statements using truth tables;
- construct simple proofs;
- Familiarize mathematical Symbols and standard methods of proofs.

Sessions	**Topic**	**Method**	**Remarks/Reference**
1	Introductory Session		
2	Introduction of sets-definition examples	Interactive session	
3	Properties of sets1	Lecturing	
4	Properties of sets2		
5	Problems		
6	Set operations	Lecturing and interaction with students	
7	Problems		
8	Functions introduction examples	Group discussion	
9	Functions Operations	Group discussion	
10	Problems		
11	Tutorial		
12	Sequence & Summation Definition examples	Lecturing	
13	Problems		

14	Revision		
15	Relations Introduction	Interactive session	
16	Examples of relation		
17	Properties of relations	Lecturing	
18	Problems		
19	Tutorial		
20	n-array relations	Group discussion	
21	Examples		
22	Applications		
23	Problems		
24	Tutorial		
25	Representation of Relations	Group discussion	
26	Examples and problems		
27	Equivalence relation	Lecturing and interaction	
28	Examples		
29	Problems		
30	Partial ordering Inroduction		
31	Examples		
32	Tutorial and revision		
33	Propositional logic	Interactive session	
34	Logical Operators	Lecturing	
35	Conditional Statements	Lecturing	
36	Truth tables	Lecturing	
37	Propositional Equivalences	Lecturing	
38	Predicates and Quantifiers	Lecturing	
39	Nested Quantifiers	Lecturing	
40	Rules of inference	Lecturing	
41	Introduction to Proofs	Lecturing	
42	Proof methods and strategy	Lecturing	
43	Exercise Problems		
44	Test Paper		
45	Divisibility theory in the integers	Lecturing	
46	The greatest common divisor	Problem solving	
47	The Euclidean algorithm(division algorithm)	Lecturing	
48	The Euclidean algorithm(division algorithm	Lecturing	
49	Tutorial		
50	Primes and famous numbers	Lecturing	
51	The fundamental theorem of arithmetic	Lecturing	
52	The theory of congruence	Lecturing	
53	Basic properties of congruence	Lecturing	
54	Theorems	Lecturing	

55	Fermat's little theorem	Lecturing	
56	Wilson's theorem	Lecturing	
57	Euler's phi function	Lecturing	
58	Euler's generalization of Fermat's theorem	Lecturing	
59	Revision		
60	Test Paper		

ASSIGNMENTS

	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	**Weighttage**
1	n-array relations and applications	
2	Introduction to functions and function operations	

References :

1, Lipschutz: Set Theory and related topics (Second Edition), Schaum Outline Series, Tata

McGraw-Hill Publishing Company, New Delhi. (Reprint 2009).

2. P.R. Halmos : Naive Set Theory, Springer.

3. Richard Johnsonbaugh – Discrete Mathematics (Pearsons)

COURSE PLAN 2014-15

BSc MATHEMATICS- SEMESTER 2

CORE COURSE

15U1CRMAT02-ANALYTIC GEOMETRY, TRIGONOMETRY AND MATRICES

Textbooks:

1.Manicavachagom Pillay , Natarajan–Analytic Geometry (Part I, Two Dimensions)
2.S.L.Loney–Plane TrigonometryPart –II, S. Chand and Company Ltd.
3.Frank Ayres Jr-Matrices , Schaum's Outline Series, TMH Edition.

COURSE OBJECTIVES:
1. To find the equation to tangent and normal at a point on a conic.
2. To find the polar equation of a line, circle, tangent and normal to conics.
3. To familiarize with real and imaginary parts of a circular and hyperbolic functions of a complex variable.
4. To solve a system of linear equations using the inverse of a matrix.
5. To familiarize with the characteristic roots and characteristic vectors.
6. To find the inverse of a matrix by Cayley- Hamilton theorem.

Faculty: Sanil Jose, Jeenu Kurian

Sessions	Topic	Method
1	Analytic geometry-preliminaries	Lecture, Group discussion, Problem solving
2	Analytic geometry-preliminaries	Lecture, Group Discussion, Problem solving
3	Analytic geometry-preliminaries	Lecture, Group Discussion, Problem solving
4	**Module 1** Tangents in terms of their slope	Lecture, Group Discussion, Problem solving
5	Number of tangents from a point	Lecture, Group Discussion, Problem solving
6	Orthoptic Locus	Lecture, Group Discussion, Problem solving
7	Tangent at a point	Lecture, Group Discussion, Problem solving
8	Chord joining two points, tangent , intersection of tangents and normal of a	Lecture, Group Discussion, Problem solving

	parabola	
9	Problems	Group Discussion, Problem solving
10	Chord joining two points, tangent , intersection of tangents and normal of an ellipse	Lecture, Group Discussion, Problem solving
11	Chord joining two points, tangent , intersection of tangents and normal of a hyperbola	Lecture, Group Discussion, Problem solving
12	Problems	Group Discussion, Problem solving
13	Chord of contact	Lecture, Group Discussion, Problem solving
14	Chord with a given mid point	Lecture, Group Discussion, Problem solving
15	Problems	Group Discussion, Problem solving
16	Equation of the polar of a given point and pole of a given line	Lecture, Group Discussion, Problem solving
17	Conjugate lines and problems	Lecture, Group Discussion, Problem solving
18	Conjugate diameters of ellipse	Lecture, Group Discussion, Problem solving
19	Properties and problems	Lecture, Group Discussion, Problem solving
20	Conjugate diameters of hyperbola	Lecture, Group Discussion, Problem solving
21	Problems	Group Discussion, Problem solving
22	Asymptotes	Lecture, Group Discussion, Problem solving
23	Conjugate hyperbola	Lecture, Group Discussion, Problem solving
24	Properties and problems	Lecture, Group Discussion, Problem solving
25	Rectangular hyperbola, Parametric coordinates	Lecture, Group Discussion, Problem solving
26	Problems	Group Discussion, Problem solving
27	Problems	Group Discussion, Problem solving
28	**Module 2** Polar coordinates, distance	Lecture, Group Discussion, Problem solving

	between the points, area of a triangle	
29	Equation of a straight line, Parallel lines, perpendicular straight lines	Lecture, Group Discussion, Problem solving
30	Test	1 hour
31	Equation of a circle	Lecture, Group Discussion, Problem solving
32	Problems	Group Discussion, Problem solving
33	Polar equation of a conic	Lecture, Group Discussion, Problem solving
34	Chord of a conic	Lecture, Group Discussion, Problem solving
35	Tangent and normal of a conic	Lecture, Group Discussion, Problem solving
36	Polar of a point with respect to a conic	Lecture, Group Discussion, Problem solving
37	Asymptotes of conic	Lecture, Group Discussion, Problem solving
38	Problems	Group Discussion, Problem solving
39	Problems	Group Discussion, Problem solving
40	CIA-1	1 hour
41	**Module 3** Trigonometry-Introduction	Lecture, Group Discussion, Problem solving
42	Expansion of sine and cosine functions	Lecture, Group Discussion, Problem solving
43	Hyperbolic functions and relation connecting hyperbolic and circular functions	Lecture, Group Discussion, Problem solving
44	Problems	Group Discussion, Problem solving
45	Problems	Group Discussion, Problem solving
46	Separation into real and imaginary parts -problems	Lecture, Group Discussion, Problem solving
47	Problems	Group Discussion, Problem solving
48	Problems	Group Discussion, Problem solving
49	Factorisation of x^n -1	Lecture, Group Discussion, Problem solving
50	Problems	Group Discussion,

		Problem solving
51	Factorisation of $x^n + 1$	Lecture, Group Discussion, Problem solving
52	Problems	Group Discussion, Problem solving
53	Factorisation of $x^{2n} - 2x^n a^n \cos nx + a^{2n}$	Lecture, Group Discussion, Problem solving
54	Problems	Group Discussion, Problem solving
55	Summation based on geometric series - problems	Lecture, Group Discussion, Problem solving
56	Summation based on binomial series - problems	Lecture, Group Discussion, Problem solving
57	Summation based on exponential series-problems	Lecture, Group Discussion, Problem solving
58	Summation based on logarithmic series-problems	Lecture, Group Discussion, Problem solving
59	Summation based on hyperbolic series - problems	Lecture, Group Discussion, Problem solving
60	**Module 4** Rank of a matrix and problems	Lecture, Group Discussion, Problem solving
61	Elementary transformations and inverse of Elementary transformations	Lecture, Group Discussion, Problem solving
62	Equivalent matrices	Lecture, Group Discussion, Problem solving
63	Normal form of a matrix to find the rank and problems	Lecture, Group Discussion, Problem solving
64	Row equivalent canonical form to find the rank and problems	Lecture, Group Discussion, Problem solving
65	System of non homogenous linear equations and matrix method to solve	Lecture, Group Discussion, Problem solving
66	Problems	Group Discussion, Problem solving
67	Cramer's rule and problems	Lecture, Group Discussion, Problem solving
68	System of homogenous linear equations and problems	Lecture, Group Discussion, Problem solving
69	Characteristic equation of a matrix and roots	Lecture, Group Discussion, Problem solving
70	Characteristic vectors and problems	Lecture, Group Discussion, Problem solving

71	Cayley-Hamilton theorem and problems	Lecture, Group Discussion, Problem solving
72	Problems	Group Discussion, Problem solving
73	CIA-2	2 hours

COURSE PLAN
COURSE: 15U1CRMAT03: CALCULUS

Course Teacher: Didimos K. V.

Brief Description of the Course

This course introduces higher order derivatives, Leibnitz theorem, for higher derivatives of the product of two functions. Series expansions of functions using Maclaurin's theorem and Taylor's theorem are discussed. Some applications of derivatives in finding maxima, minima, point of inflection, curvature etc are introduced. The concept of partial derivatives and its properties are also introduced.

In integral calculus, certain reduction formulae are discussed. Application of integrals in finding plane area, surface area, arc length, and volume of solids of Revolution are introduced and double and triple integrals and some applications are also introduced.

Objectives

After completing this course the learner should be able to

- Find the higher order derivative of the product of two functions.
- Expand a function using Taylor's and Maclaurin's series.
- Conceive the concept of asymptotes and obtain their equations.
- Learn about partial derivatives and its applications.
- Find the area under a given curve, length of an arc of a curve when the equations are given in parametric and polar form.
- Find the area and volume by applying the techniques of double and triple integrals

Text Book

1. George B. Thomas Jr. (Eleventh Edition) – Thomas' Calculus, Pearson, 2008.
2. Shanti Narayan and P. K. Mittal– Differential Calculus (S. Chand & Co.) 2008.

Total Hours : 75

No of Hours	Topic	Method	Remarks/ Reference
4	Successive Differentiation	Lecture, Group Discussion, Problem SolvingLecture	Module-1 (30 Hours)
4	Expansion of functions using Maclaurin's theorem and Taylor's theorem	Lecture, Group Discussion, Problem Solving	
4	Concavity and points of inflexion	Lecture, Group Discussion, Problem Solving	
4	Curvature and Evolutes. Length of arc as a function derivatives of arc, radius of curvature – Cartesian equations	Lecture, Group Discussion, Problem Solving	
4	Centre of curvature	Lecture, Group Discussion, Problem Solving	
4	Evolutes and Involutes	Lecture, Group Discussion, Problem Solving	
3	properties of evolutes	Lecture, Group Discussion, Problem Solving	
3	Asymptotes and Envelopes.(Pedal equation and Newtonian Method excluded)	Lecture, Group Discussion, Problem Solving	

5	Partial derivatives	Lecture, Group Discussion, Problem Solving	Module-II (20 Hours)
5	The chain rule	Lecture, Group Discussion, Problem Solving	
4	Extreme values and saddle points	Lecture, Group Discussion, Problem Solving	
3	Lagrange multipliers	Lecture, Group Discussion, Problem Solving	
3	Partial derivatives with constrained variables	Lecture, Group Discussion, Problem Solving	
3	Substitution and area between curves	Lecture, Group Discussion, Problem Solving	Module-III (20 Hours)
5	volumes by Slicing and rotation about an axis	Lecture, Group Discussion, Problem Solving	
3	Volumes by cylindrical shells	Lecture, Group Discussion, Problem Solving	
5	Lengths of Plane Curves	Lecture, Group Discussion, Problem Solving	
4	Areas of surfaces of Revolution and the theorems of Pappus..	Lecture, Group Discussion, Problem Solving	
3	Double integrals	Lecture, Group Discussion, Problem Solving	Module-IV (20 Hours)
3	Areas	Lecture, Group Discussion, Problem Solving	
4	Double integrals in polar form	Lecture, Group Discussion, Problem Solving	
4	Triple integrals in rectangular coordinates	Lecture, Group Discussion, Problem Solving	
3	Triple integrals in cylindrical and spherical coordinates	Lecture, Group Discussion, Problem Solving	
3	Substitutions in multiple integrals	Lecture, Group Discussion, Problem Solving	

1. ASSIGNMENTS/EXERCISES – Details & Guidelines

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Weightage**
1.	12 September 2018	Problems on applications of derivatives and integrals.	5 Marks

2. Additional Reading List

1. T. M. Apostol – Calculus Volume I & II (Wiley India)
2. Widder – Advanced Calculus ,2nd edition
3. K. C. Maity & R. K. Ghosh – Differential Calculus (New Central Books Agency)
4. K. C. Maity & R. K. Ghosh – Integral Calculus (New Central Books Agency)
5. Shanti Narayan, P.K. Mittal - Integral Calculus – (S. Chand & Co.)
6. Anton: Calculus, Wiley.

B.Sc Mathematics SEM 4 - CORE COURSE

15U4CRCMAT04 - VECTOR CALCULUS, THEORY OF EQUATIONS AND NUMERICAL METHODS

Faculty : Anisha AnilKumar

COURSE OBJECTIVES

- To comprehend vector functions, vector field and applications
- To understand the applications of Stokes, Greens and Divergence theorem
- To introduce theory of equations
- Introduce numerical methods

Sessions	Topic	Method
1	Introductory Session	Interactive session
2	Lines and planes in space	Lecturing and Interactive session
3	Examples	
4	Cylinders and quadric surfaces	Lecture
5	Examples	Interactive session
6	Vector Functions	Lecturing ,Group discussion
7	Examples	Interactive session
8	Arc Length	Lecture
9	Problems	Interactive session
10	Unit Tangent Vector	Lecture
11	Tutorial	
12	Curvature	Lecturing
13	Problems	Interactive session
14	Revision	Interactive session and problem solving
15	Unit Normal Vector	Lecture and Interactive Session
16	Examples	Interactive session
17	Torsion	Lecturing
18	Unit Normal Vector	Lecture
19	Problems	Interactive session
20	Directional Derivatives and Gradient Vectors	Lecture
21	Tangent Planes and Differentials	Lecturing and Interactive session
22	Introduction to Module 2	Interactive session
23	Line Integrals	Lecturing ,Group discussion
24	Vector Fields	Lecture
25	Examples and problems	Lecturing ,Group discussion and problem solving

26	Work Circulation and Flux	Lecturing ,Group discussion
27	Problems	Interactive session
28	Path independence	Lecturing ,Group discussion and problem solving
29	Potential functions	Lecturing ,Group discussion and problem solving
30	Conservative Fields	Lecturing ,Group discussion and problem solving
31	Examples	Interactive session
32	Tutorial and revision	
33	Greens theorem in the plane	Lecturing ,Group discussion and problem solving
34	Problems related to Greens theorem	Lecturing
35	Continuation	Lecturing
36	Surface Area and Surface Integrals	Lecturing
37	Problems	Lecturing
38	Parametrized surfaces	Lecturing
39	Stokes theorem	Lecturing
40	Problems	Lecturing
41	Continuation	Lecturing
42	Divergence Theorem	Lecturing
43	Problems	Interactive session
44	Continuation	Interactive session
45	Unified theory	Lecturing
46	Problems	Interactive session
47	Revision	Lecturing
48	Tutorial	Lecturing
49	Test paper	
50	Discussion	Lecturing
51	Fundamental Theorem of Algebra	Lecturing
52	Deduction that every polynomial has n and only n roots	Lecturing
53	Problems	Lecturing
54	Problems	Lecturing
55	Relation between roots and coefficients	Lecturing
56	Problems	Lecturing
57	Transformation of Equations	Lecturing
58	Problems	Interactive session
59	Problems	Interactive session
60	Reciprocal Equations	Lecturing ,Group discussion and problem solving
61	Cardans method	Lecturing ,Group discussion and problem solving
62	Problems	Interactive session
63	Ferrari’s Method	Lecturing ,Group discussion and

		problem solving
64	Problems	
65	Symmetric Functions of roots	Lecturing ,Group discussion and problem solving
66	Problems	Interactive session
67	Revision	Interactive session
68	Test Paper	
69	Introduction to module 4	Interactive session
70	Bisection Method	Lecturing ,Group discussion and problem solving
71	Problems	Interactive session
72	Problems	Interactive session
73	Problems	Interactive session
74	Method of False Position	Lecturing ,Group discussion and problem solving
75	Problems	Interactive session
76	Problems	Interactive session
77	Problems	Interactive session
78	Iteration Method	Lecturing ,Group discussion and problem solving
79	Problems	Interactive session
80	Problems	Interactive session
81	Problems	Interactive session
82	Newton-Raphson Method	Lecturing ,Group discussion and problem solving
83	Problems	Interactive session
84	Problems	Interactive session
85	Problems	Interactive session
86	Revision	Interactive session
87	Test Paper	

Fifth Semester B.Sc Mathematics

Core Course

15U5CRMATO5 : Mathematical Analysis

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Name of the faculty : M.P Sebastian and Anju Wilson

COURSE OBJECTIVE

*To study elementary concepts of real analysis

* To equip the students for analysing a problem and solving it.

*To understand both algebraic and geometrical implications of the results in real analysis.

Text Books:

1. S.C.Malik, Savitha Arora _ Mathematical analysis. RevisedSecond edition.

2. J.W. Brown and Ruel.V.Churchill _ Complex variables and applications, 8^{th} edition. Mc.Graw Hill.

Sessions	Topic	Method	Remarks/Reference
1	Introductory Session, Bridge course	Lecture	
2	Introductory Session, Bridge course	Lecture	
3	Intervals, Bounded and unbounded sets-examples	Lecture,group discussion and problem solving	
4	Problem solving		
5	Supremum and infimum-	Lecture,group discussion and problem solving	
6	examples to find supremum and infimum		
7	Order completeness in R, Archimedian property of real numbers	Lecture,group discussion	
8	Dedekinds form of completeness property	Lecture	
9	Dedekinds form of completeness property	Lecture	
10	Revision		
11	Test Paper - 1		
12	Introduction to module 2		
13	Neighbourhood of a point	Lecture,group discussion and problem solving	
14	examples		
15	Interior point of a set-examples		
16	Interior point of a set-examples	Lecture,group discussion and problem solving	
17	Open set-examples	Lecture,group discussion and problem solving	
18	Theorems on open sets - Problems		
19	Limit Point-Derived set-examples	Lecture,group discussion and problem solving	
20	Limit Point-Derived set-examples	Lecture,group discussion and problem solving	
21	Bolzano Weierstras Theorem	Lecture	
22	Closed sets-	Lecture,group	

BSc. MATHEMATICS SEMESTER 5

CORE COURSE 15U5CRMAT05 DIFFERENTIAL EQUATIONS

Faculty : Maria Sebastian , Dr. Jeenu Kurian , Toby

COURSE OBJECTIVES

Since the time of Isaac Newton differential equation have been of fundamental importance in the application of Mathematics to the Physical Science. Lately differential equation gained increasing importance in the Biological and Social Science. In this course we are studying the ordinary differential equation involving one independent and one or more dependent variables. The integrals of ordinary differential equation are plane curves. Also we should study the differential equation involving one dependent and more than one independent variables, that is, partial differential equation. Such integrals are space curves and surfaces. Partial differential equation can arise in a variety of ways in Geometry, Physics, etc.

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Basic Reference

1. Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).
2. Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)

COURSE OUTCOMES:

After completing this course the learner should be able to

- Find power series and Frobenius series solutions of second order linear homogeneous equations.
- Comprehend Bessel's functions and their properties.
- Method of solution of the differential equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$
- Describe the origin of partial differential equation and distinguish the integrals of first order linear partial differential equation into complete, general and singular integrals.
- Use Lagrange's method for solving the first order linear partial differential equation

Sessions	Topic	Method
1.	Bridge course – Introduction to differential equations and partial	Lecture, Group Discussion, Interactions

	differential equations	
2.	Module 1 - Exact differential equations	Lecture, Group Discussion, Interactions
3.	Exact differential equations and integrating factors	Lecture, Group Discussion, Interactions
4.	Problems solving	Discussion
5.	Problems	Discussion
6.	Separable equations	Lecture, Group Discussion, Interactions
7.	Separable equations and problems	Lecture, Group Discussion, Interactions
8.	equations reducible to separable equations	Lecture, Group Discussion, Interactions
9.	Problems solving	Lecture, Group Discussion, Interactions
10.	Problems	Lecture, Group Discussion, Interactions
11.	linear equations and its solutions	Lecture, Group Discussion, Interactions
12.	Problems on linear equations	Lecture, Group Discussion, Interactions
13.	Bernoulli equations and its solution	Lecture, Group Discussion, Interactions
14.	Problems on Bernoulli equations	Lecture, Group Discussion, Interactions
15.	special integrating factors and transformations : case 1	Lecture, Group Discussion, Interactions
16.	special integrating factors and transformations : case 2	Lecture, Group Discussion, Interactions
17.	Problems	Lecture, Group Discussion, Interactions
18.	Problems	Lecture, Group Discussion, Interactions
19.	Orthogonal trajectories and its solution	Lecture, Group Discussion, Interactions
20.	Oblique trajectories and its solutions	Lecture, Group Discussion, Interactions
21.	Problems	Lecture, Group Discussion, Interactions
22.	Revision of module 1	Lecture, Group Discussion, Interactions
23.	Test on module 1	
24.	Module 2 – Introduction- Basic theory of linear differential equations	Lecture, Group Discussion, Interactions
25.	Basic Definitions	Lecture, Group Discussion, Interactions

26.	Basic existence theorem	Lecture, Group Discussion, Interactions
27.	Objective type problems based on definitions and theorem	Lecture, Group Discussion, Interactions
28.	Basic theorems on linear homogeneous differential equations	Lecture, Group Discussion, Interactions
29.	Elementary problems on basic theorem	Lecture, Group Discussion, Interactions
30.	Method of reduction of order	Lecture, Group Discussion, Interactions
31.	Problems on reduction of order	Lecture, Group Discussion, Interactions
32.	Non homogeneous equations and theorems	Lecture, Group Discussion, Interactions
33.	Problems on non homogeneous equations	Lecture, Group Discussion, Interactions
34.	Homogeneous linear equations with constant coefficient - Introduction	Lecture, Group Discussion, Interactions
35.	Case I and Case II	Lecture, Group Discussion, Interactions
36.	Case III and Case IV Problems	Lecture, Group Discussion, Interactions
37.	Method of undetermined coefficients - Introduction and method A	Lecture, Group Discussion, Interactions
38.	Method B, definitions of UC functions and sets	Lecture, Group Discussion, Interactions
39.	Examples	Lecture, Group Discussion, Interactions
40.	Problems	Lecture, Group Discussion, Interactions
41.	Variation of Parameters, method	Lecture, Group Discussion, Interactions
42.	Variation of parameters problem	Lecture, Group Discussion, Interactions
43.	Cauchy Euler Equation and the method of solution	Lecture, Group Discussion, Interactions
44.	Problems on CR equations	Lecture, Group Discussion, Interactions
45.	Problems	Lecture, Group Discussion, Interactions
46.	Revision	Lecture, Group Discussion, Interactions

47.	Revision	Lecture, Group Discussion, Interactions
48.	Test on module 2	
49.	Test Paper review	
50.	Introduction to second order linear homogeneous differential equations and examples.	Lecture, Group Discussion, Interactions
51.	Ordinary points of second order linear homogeneous equations and examples.Concept of power series and convergence of power series.	Lecture, Group Discussion, Interactions
52.	Theorem concerning power series solutions& The method of finding power series solutions.	Lecture, Group Discussion, Interactions
53.	Problems related to power series solutions.	Lecture, Group Discussion, Interactions
54.	Problems related to power series solutions.	Seminar by students
55.	Problems related to power series solutions.	Seminar by students
56.	Problems related to power series solutions.	Seminar by students
57.	Singular points of second order linear homogeneous equations. Classification into regular and irregular singular points.	Lecture, Group Discussion, Interactions
58.	Problems related to classification of singular points.	Lecture, Group Discussion, Interactions
59.	Theorems related to existence of Frobenius series solutions about regular singular points of second order linear	Lecture, Group Discussion, Interactions

	homogeneous equations.	
60.	Method of finding Frobenius series solutions about regular singular points.	Seminar by students
61.	Problems related to Frobenius series solutions	Lecture, Group Discussion, Interactions
62.	Problems related to Frobenius series solutions	Lecture, Group Discussion, Interactions
63.	Problems related to Frobenius series solutions	Lecture, Group Discussion, Interactions
64.	Problems related to Frobenius series solutions	Seminar by students
65.	Introducing the Bessel's equation of order zero and order p.	Lecture, Group Discussion, Interactions
66.	Solution of the Bessel's equation of order zero	Lecture, Group Discussion, Interactions
67.	Solution of the Bessel's equation of order zero(Contd.)	Lecture, Group Discussion, Interactions
68.	Solution of the Bessel's equation of order p	Lecture, Group Discussion, Interactions
69.	Solution of the Bessel's equation of order p(Contd.)	Lecture, Group Discussion, Interactions
70.	Bessel Fuctions and properties.	Lecture, Group Discussion, Interactions
71.	CIA – I	1 hr; descriptive answers only
72.	Introduction to systems of first order linear equations.	Lecture, Group Discussion, Interactions
73.	Solving systems of first order linear equations-Elimination Method	Lecture, Group Discussion, Interactions
74.	Solving systems of first order linear equations-Elimination Method(Contd.)	Seminar by students

75.	Solving systems of first order linear equations-Operator Method	Lecture, Group Discussion, Interactions
76.	Solving systems of first order linear equations-Operator Method(Contd.)	Seminar by students
77.	Review of the 3rd Module	
78.	Introduction to Partial Differential equations	Lecture, Group Discussion, Interactions
79.	Origin of Partial Differential Equations	Lecture, Group Discussion, Interactions
80.	. Forming Partial Differential equations by elimination of arbitrary constants	Lecture, Group Discussion, Interactions
81.	Forming Partial Differential equations by elimination of arbitrary constants(Contd.)	Seminar by students
82.	Forming Partial Differential equations by elimination of arbitrary functions.	Lecture, Group Discussion, Interactions
83.	Forming Partial Differential equations by elimination of arbitrary functions. (Contd.)	Seminar by students
84.	Surfaces and Curves in three dimensions.	Lecture, Group Discussion, Interactions
85.	Surfaces and Curves in three dimensions.(Contd.)	Lecture, Group Discussion, Interactions
86.	Method of solution of the differential equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ (Contd.	Seminar by students

87.	Second CIA	2 hrs Descriptive Test
88.	Lagrange's linear first order p.d.e. and solution.	Lecture, Group Discussion, Interactions
89.	Problems related to Lagranges equation	Lecture, Group Discussion, Interactions
90.	Problems related to Lagranges equation(Contd.)	Seminar by students
91.	Problems related to Lagranges equation(Contd.)	Seminar by students
92.	Review of 4^{th} module	
93.	REVISION.	

ASSIGNMENTS

No.	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	Problems on each methods discussed
2	Power series solution problems.
3	Frobenius series solution problems

Additional Reading List

1.Differential Equations - by G.F.Simmons.

ABSTRACT ALGEBRA

Course Teacher- JEET KURIAN MATTAM

Instructional Hours – 90 Hours

COURSE OBJECTIVES

This course aims to introduce the students to abstract algebraic structures such as groups, rings, integral domains, division rings and fields. It also aims to familiarise the students with the concept of isomorphism of algebraic structures, various types and examples of groups, the concept of subgroups and normal subgroups and the concept of characteristic and ideal of a ring.

Text Book

1.A First Course in Abstract Algebra by John B Fraleigh 3rd Edition

Additional references

1) Contemporary Abstract Algebra by Joseph Gallian

2) Topics in Algebra by I.N.Herstein

3) Algebra by Michael Artin

4) Abstract Algebra by David S Dummit and Richard M Foote

COURSE OUTCOMES:

After completing this course the learner should be able to

- Explain what a group is and provide examples for the same
- Explain what a subgroup is and provide examples for the same
- Distinguish between abelian and non abelian groups.
- Understand the concept of cyclic groups and appreciate the fact that cyclic groups can be classified upto isomorphism.
- Understand the general Linear group, the symmetric groups and the dihedral groups as examples of non abelian groups
- Distinguish whether two given groups are isomorphic or not.
- Understand Lagrange's theorem and its consequences
- Understand what a normal subgroup is and how it leads to the concept of a factor group.
- Explain what a ring is and consequently understand the special types of rings such as rings with unity, commutative and non commutative rings, integral domains, division rings, and fields.
- Understand the concepts of ideal of a ring, maximal ideal, prime ideal and the notion of a factor ring.

Sessions	**Topic**	**Method**	**Remarks/Reference**
1	Bridge Course: Concept of Set and its	Group Discussion followed by a	In the Group Discussion, the

	importance in Mathematics and particularly in algebra	Lecture session.	students are to be encouraged to discuss all that they know about sets.
2	Bridge Course : The importance of definitions in mathematics	Interactive session including GD	
3	Bridge Course:Equivalence Relations and Partitions	Lecture session with Examples	
4	Bridge Course:Equivalence Relations and Partitions	Lecture session with Examples	
5 **MODULE 1 BEGINS**	Binary Operations: Introduction of the concept	Lecture session	
6	Examples of operations which are binary operations and counterexamples	Interactive session with the students in which the students are given different operations and are supposed to identify whether they are binary operations or nor.	
7	Representation of Binary Operations using a table	Lecture	Explanation and introducing the salient features of the

			table such as how to identify whether the binary operation is commutative et al.
8	Binary operations (Conclusion)	Lecture	Finding the number of binary operations on a given finite set, the number of commutativebinary operations on a finite set, binary operations which are commutative but not associative and vice versa.
9	Group: Motivating the definition using an example (For example the set of Integers under addition	Lecture	Various examples of groups will be given. Also examples which are not groups will also be given.
10	Group (Introduction of the concept continued)	Lecture	The concept of group table of a finite group is given.Group

			tables of groups of orders 1,2and 3 are determined
11	Group table of order 4.	Interactive session	The students are asked to fill out a group table of order 4.They find out three ways of filling the table, out of which two are alike. Thus the concept of isomorphism is introduced for the first time to the students even without formally defining isomorphism.
12,13 &14	Selected Exercises on pages 26, 27 and 28 of the text	Assignment and seminar for the students.	
15	Subgroups. The concept of subgroup is explained and examples are given.	Lecture	The subgroups of Z_4 and V are determined
16	The subgroups of Z_4 and V are determined.	Lecture	The subgroups of Z_4 and V are determined

17	Cyclic Subgroups -Concept is introduced	Lecture	
18,19 &20	Exercises on Page 35,36 and 37 of the text	**Assignment , Seminar and for the students**	
21	Permutations and permutation groups- Introduction of the concept.	Lecture	
22	Permutations continued. The group S_A	Lecture	
23	Group Tables of S_3 and D_4 and their subgroups and subgroup lattice diagrams	Lecture	
24	Cycles and cyclic Notation. Theorem 5.1 of the text and its proof.	Lecture	
25	Transpositions-definition. Corollary on page 52. Theorem 5.2-idea of proof explained	Lecture	
26	Theorem 5.2- Proof Completed.	Lecture	
27	The alternating Group	Lecture	
28	Selected Exercises on page 55,56 and 57	**Seminars and assignments by students**	
29	**FIRST CIA**	Written Test; Descriptive.	
30 **MODULE 2 BEGINS**	Cyclic Groups- Definition , Theorem 6.1, Lemma 6.1 and examples	Lecture	
31	Theorem 6.2 and its Corollary	Lecture	
32	The Classification of Cyclic groups- Infinite	Lecture	

	Case		
33	The Classification of Cyclic groups- Finite Case	Lecture	
34	Subgroups of Finite Cyclic groups. Theorem 6.4	Lecture	
35	Corollary of theorem 6.4 and applications.	Lecture	
36	Selected Exercises on pages 63 64 and 65	**Seminar and assignments for the students**	
37	Isomorphism- Definition , Explanation of the concept and Theorem 7.1	Lecture	
38	How to show that to groups are isomorphic and Theorem 7.2 and Example 7.2	Lecture	
39	How to show that two groups are not isomorphic. Examples 7.5- 7.9 0f the text	Lecture	
40	Cayley's Theorem	Lecture	
41	Cayley's Theorem and proof continued.	Lecture	
42,43 and 44	Exercises on pages 74,75 and 76 of the text	**Seminar Assignment and for the students.**	
45	Groups of Cosets- Introduction to the concept and Theorem 11.1.Definition of left and right	Lecture	

	cosets.Motivation using example 11.2 and example 11.3.		
46	Theorem 11.2 example 11.1 and Theorem 11.3	Lecture	
47	Lagrange's Theorem, its corollary , theorem 11.5, Definition of index and Theorem 11.6.	Lecture	
48	Counterexample for the falsity of the theorem of Lagrange.	Lecture	
49	Selected Exercises on page 111, 112 and 113	**Seminar and assignments for students.**	
50	Lemma 12.1 and Theorem 12.1	Lecture	
51	Definition of automorphism, theorem 12.2 , definition of a normal subgroup ,theorem 12.3,Example 12.1 and definition of conjugate subgroups.	Lecture	
52	Definition of Factor Group, example 12.2, Example 12.3 and example 12.4	Lecture	
53	Examples 12.5, 12.6 and 12.7	Lecture	
54	Definition of simple group, Statement of theorem 12.4 and Theorem 12.5	Lecture	

55	Theorem 12.6	Lecture	
56	Selected Exercises on pages 123, 124,125 and 126	**Seminar and assignments for the students.**	
57 **MODULE 3 BEGINS**	Definition of Homomorphism and Elementary Properties.Example 13.1,Theorem 13.1and Example 13.2	Lecture	
58	Theorem 13.2	Lecture	
59	Theorem 13.3	Lecture	
60	Example 13.3, definition of maximal normal subgroup theorem 13.4 and theorem 13.5.	Lecture	
61,62 and 63	Selected Exercises on pages 133,134 and 135	Lecture	
62	Motivation of the definition of a ring, The Definition and Examples.	Lecture	
63	Examples 23.1 and 23.2	Lecture	
64	Theorem 23.1, Definition of isomorphism and example 23.3	Lecture	
65	Definitions of commutative rings and examples . Definition of Ring with unity and examples, Theorem 23.2, Direct product of rings.	Lecture	
66	Definition of unit, division ring and field and	Lecture	

	examples.Examplw 23.4		
67,68 and 69	Selected Exercises on pages 211,212 and 213.	Lecture	
70	Divisors of Zero, Theorem 24.1 and its corollary	Lecture	
71	Theorem 24.2 and definition of an integral domain and its examples	Lecture	
72	Theorems 24.3 and Theorem 24.4 and its corollary.	Lecture	
73	Selected Exercises on pages 220,221 and 222.	Lecture	
74 **MODULE 4 BEGINS**	Definition of characteristic of a ring and example 24.2 and theorem 24.5	Lecture	
75	Fermat's Theorem (Theorem 24.6,corollary, Example 24.3)	Lecture	
76	Theorem 24.7 and Theorem 24.8(Euler)	Lecture	
77	**SECOND CIA**		
78	**SECOND CIA**		
79	**SECOND CIA**		
80	Theorem 28.2 and lemma 28.1	Lecture	
81	Theorem 28.3	Lecture	
82	Definition of Ideal,proper ideal,improper ideal,trivial ideal et al and examples 28.1-	Lecture	

	28.4		
83	Theorem 28.4 and its corollary	Lecture	
84,85&86	Selected Exercises on Pages 252-253	Lecture	
87	**REVISION**		
88	**REVISION**		
89	**REVISION**		
90	**REVISION**		

Fuzzy Mathematics
(Semester 5– B.Sc Mathematics)

COURSE OBJECTIVES

The course aims

- to introduce and explain the ideas relevant Fuzzy sets and fuzzy logic Theory in detail;

Basic Reference

Fuzzy Sets and Fuzzy Logic Theory and Applications by George J. Klir and BoYuan

COURSE OUTCOMES: The students will be able

- find intersection and union of two fuzzy sets
- to add, subtract, multiply and divide fuzzy numbers
- to understand the difference between logics in fuzzy sets and claasical sets

Sessions	**Topic**	**Method**
1	Module 1 - Preliminaries - Introduction	Lecturing
2	Crisp set an overview	Lecturing
3	Fuzzy sets	Lecturing
4	Basic types of fuzzy sets	Lecturing
5	Basic concepts of fuzzy sets	Lecturing
6	Properties of alpha cuts	Lecturing
7	Theorems on alpha cuts	Lecturing
8	Problems	Lecturing
9	Representation of fuzzy sets	Lecturing
10	first decomposition theorem	Lecturing
11	second decomposition theorem	Lecturing
12	third decomposition theorem	Lecturing
13	Problems	Lecturing
14	Problems	Lecturing

15	Problems	Lecturing
16	Theorems on alpha plus cut of a set	Lecturing
17	Problems	Lecturing
18	Additional theorems on fuzzy sets	Lecturing
19	Problems	Lecturing
20	Problems	Lecturing
21	Revision	Group discussion
22	CIA – I (Module -1)	1 hr; descriptive answers only
23	Module II – Operations on fuzzy sets	Lecturing
24	Types of fuzzy operations	Lecturing
25	Union	Lecturing
26	Intersection	Lecturing
27	Complements	Lecturing
28	Fuzzy complements	Lecturing
29	Problems	Lecturing
30	Theorems	Lecturing
31	Fuzzy t norms	Lecturing
32	Problems	Lecturing
	Problems	Lecturing
33	Theorems	Lecturing
34	Fuzzy t-conorms	Lecturing
35	Problems	Lecturing
36	Problems	Lecturing
37	Theorems	Lecturing
38	De –morgans law	Lecturing
39	Dual triple	Lecturing
40	Theorems on dual triple	Lecturing
41	Theorems on combination of operations	Lecturing
42	Theorems	Lecturing

43	Problems	Lecturing
44	Problems	Group work
45	Problems	Group work
46	Problems	Group work
47	Problems	Group work
48	Problems	Group work
49	Problems	Group work
50	Problems	Group work
51	Revision and test	
52	Module III -Introduction	Lecturing
53	Fuzzy Numbers	Lecturing
54	Arithmetic operations on intervals	Lecturing
55	Addition	Lecturing
56	Subtraction	Lecturing
57	Multiplication	Lecturing
58	Division	Lecturing
59	Arithmetic operations on fuzzy numbers	Lecturing
60	Addition	Lecturing
61	Subtraction	Lecturing
62	Multiplication	Lecturing
63	Division	Lecturing
64	Problems	Lecturing
65	MAX and MIN of fuzzy numbers	Lecturing
66	Max and min of fuzzy numbers	Lecturing
67	Problems	Lecturing
68	Module IV-Fuzzy logic	Lecturing
	Classical logic an overview	Lecturing
	Multivalued logics	Lecturing
	Fuzzy propositions	Lecturing
	Fuzzy Quantifiers	Lecturing

	Linguistic hedges	Lecturing
	Inference from conditional fuzzy propositions	Lecturing
77	Problems	
78		
79		
80		

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Weighttage**
1		Exercise Problems from the prescribed text – Individual submission	
2		Seminar on topics assigned	
3			
4			

Course teacher : Jeenu Kurian

SEMESTER 5

Open Course: 15U5OCMAT1: APPLICABLE MATHEMATICS

Faculty:Sanil Jose , Minnumol P K

Objectives : prepare students of all streams, particularly those with arts and commerce back ground for their higher studies.

prepare students of all streams, particularly those with arts and commerce back ground to approach competitive examinations.

Text Books:

1 M. Tyra, & K. Kundan- CONCEPTS OF ARITHMETIC.

Sessions	Topic	Method	Remarks/Reference
1	Introduction about the course	Lecture + Interaction	
2	Types of numbers	Lecture + Interaction	
3	Solution of quadratic equations with real roots only	Lecture + Interaction	
4	Different methods of solution	Lecture + Interaction	
5	Logarithms	Lecture + Interaction	
6	Properties + problems	Group work	
7	Problems	Group work	
8	Evaluations of exponents	Lecture + Interaction	

9	Exponents laws	Lecture + Interaction	
10	Permuations	Lecture + Interaction	
11	Rules and explanations	Lecture + Interaction	
12	Problems	Lecture + Interaction	
13	Combinations	Lecture + Interaction	
14	Problems	Lecture + Interaction	
15	Trigonometry	Lecture + Interaction	
16	Simple equations	Group work	
17	- T - Values	Lecture + Interaction	
18	Heights and Distance - problems	Group work	
19	Two dimensional geometry	Lecture + Interaction	
20	Plotting of points	Lecture + Interaction	
21	Drawing graph of a straight line	Lecture + Interaction	
22	Probability	Lecture + Interaction	
23	Sample space	Lecture + Interaction	
24	Examples – events	Lecture + Interaction	
25	Differential calculus	Lecture + Interaction	
26	Formulas	Group work	
27	Simple problems	Group work	
28	Problems	Lecture	
29	Integral calculus	Lecture	
30	Simple problems	Group work	
31	Problems	Group work	
32	Hcf of nos	Lecture	
33	Lcm of nos	Lecture	
34	Fractions	Lecture	
35	Square and roots	Lecture	
36	Test		

37	Cube and cube roots	Lecture	
38	Problems	Lecture	
39	Ratio and proportion	Lecture	
40	Percentage	Lecture	
41	Profit and loss	Lecture	
42	problems	Group work	
43	Problems	Group work	
44	Simple interest	Lecture	
45	Compound interest	Lecture	
46	Time and work	Lecture	
47	Time and work	Lecture	
48	Work and wage	Lecture	
49	Work and wage	Lecture	
50	Time and distance	Lecture	
51	Elementary menstruation	Lecture	
52	Area and Perimeter	Lecture	
53	Problems on polygons	Lecture	
54	Problems on polygons	Lecture	
55	Test		
56	Problems	Group work	
57	Revision	Group work	
58	Revision	Group work	
59	Revision	Group work	
60	Problems	Group work	

Sixth Semester B.Sc Mathematics

Core Course

15U5CRMATO9 : REAL ANALYSIS

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Name of the faculty : M.P Sebastian and Anju Wilson

COURSE OBJECTIVE

*To study elementary concepts of real analysis

* To equip the students for analysing a problem and solving it.

*To understand both algebraic and geometrical implications of the results in real analysis.

TEXT BOOK

*S.C.MALIK SAVITHA ARORA … MATHEMATICAL ANALYSIS , SECOND EDITION

Sessions	Topic	Method	Remarks/Reference
1	Introductory Session		
2	A necessary condition for convergence	Lecture,Group Discussion, Problem Solving	
3	Cauchy`s general principle of convergence for a series.	Lecture,Group Discussion, Problem Solving	
4	Positive term series.	Lecture,Group Discussion, Problem Solving	
5	A necessary condition for convergence of positive term series.	Lecture,Group Discussion, Problem Solving	
6	Geometric series.	Lecture,Group Discussion, Problem Solving	
7	The comparison series$\sum 1/n^p$ Comparison test for positive term series without proof.	Lecture,Group Discussion, Problem Solving	
8	Cauchy`s root test	Lecture,Group Discussion, Problem Solving	
9	DALEMBERTE'S Ratio test	Lecture,Group Discussion, Problem Solving	
10	Raabe's test.	Lecture,Group Discussion, Problem Solving	
11	Gauss`s test.	Lecture,Group Discussion, Problem Solving	

12	Series with arbitrary terms. Alternating series.	Lecture,Group Discussion, Problem Solving	
13	Absolute convergence	Lecture,Group Discussion, Problem Solving	
14	Solving Exercise Problems		
15	Test paper 1		
16	Introduction to continuous function	Lecture, Group Discussion	
17	Continuity at a point	Lecture, Group Discussion	
18	Continuity in an interval	Lecture,Group Discussion, Problem Solving	
19	Discontinuous functions	Lecture,Group Discussion, Problem Solving	
20	Theorems on continuity	Lecture	
21	More Theorems	Lecture	
22	Theorems on continuity	Lecture	
23	Functions continuous on closed intervals	Lecture,Group Discussion, Problem Solving	
24	Functions continuous on closed intervals	Lecture,Group Discussion, Problem Solving	
25	Functions continuous on closed intervals	Lecture,Group Discussion, Problem Solving	
26	Uniform continuity	Lecture,Group Discussion, Problem Solving	
27	Uniform continuity	Lecture,Group Discussion, Problem Solving	
28	Doubt Clearing		
29	Revision on module 2		
30	Test Paper 2		
31	Introduction of module 3	Lecture and Group Discussion	
32	Definiton and existence of the integral	Lecture,Group Discussion, Problem Solving	
33	Definiton and existence of the integral	Lecture,Group Discussion, Problem Solving	
34	Inequalities of integrals	Lecture,Group Discussion,	

		Problem Solving	
35	Refinement of partitions of integrability	Lecture,Group Discussion, Problem Solving	
36	Darboux's theorem	Lecture	
37	Condition of integrability	Lecture	
38	Integrability of the sum of integrable functions	Lecture, Problem Solving	
39	Integrability of the sum of integrable functions	Lecture, Problem Solving	
40	Integrability of the sum of integrable functions	Lecture,Problem Solving	
41	Integrability of the sum of integrable functions	Lecture, Problem Solving	
42	Integrability of the sum of integrable functions	Lecture,Problem Solving	
43	Group Discussion and doubt clearing		
44	The integrals as the limit of a sum	Lecture,Group Discussion, Problem Solving	
45	The integrals as the limit of a sum	Lecture,Group Discussion, Problem Solving	
46	Some applications	Lecture,Group Discussion, Problem Solving	
47	Some integrable functions	Lecture,Group Discussion, Problem Solving	
48	Some integrable functions	Lecture,Group Discussion, Problem Solving	
49	Integration and Differentiation	Lecture,Group Discussion, Problem Solving	
50	The fundamental theorem of calculus	Lecture,Group Discussion, Problem Solving	
52	Revision of module 3		
52	Test Paper 3		
53	Introduction to module 4		
54	Point wise convergence.	Lecture, Group Discussion	
55	Examples for Point wise convergence	Group Discussion	
56	Uniform convergence on an	Lecture,Group Discussion,Problem	

	interval	Solving	
57	Uniform convergence on an interval	Problem Solving	
58	Cauchy`s criterion for uniform convergence	Lecture,Group Discussion,Problem Solving	
59	Solved examples		
60	Examples	Group Discussion	
61	A test for uniform convergence of sequences	Lecture,Group Discussion, Problem Solving	
62	A test for uniform convergence of sequences	Lecture, Group Discussion	
63	Problems on test for Uniform convergence of sequences	Group Discussion	
64	Test for uniform convergence of series	Lecture, Group Discussion	
65	Test for uniform convergence of series	Lecture, Group Discussion	
66	Problems on test for Uniform convergence of series	Group Discussion	
67	Weierstrass M test	Lecture, Group Discussion	
68	Examples	Lecture,Group Discussion, Problem Solving	
69	Abel`s test	Lecture,Group Discussion, Problem Solving	
70	Examples	Lecture,Group Discussion, Problem Solving	
71	Statement of Dirichelet`s test without proof.	Lecture,Group Discussion, Problem Solving	
72	Solving Problems		
73	Doubt Clearing		
74	Revision	Lecture, Group Discussion, Problem Solving	
75	Test Paper 4		

COURSE PLAN – COMPLEX ANALYSIS – SIXTH SEMESTER B.Sc Mathematics

Course Objectives:
The objectives of the course include familiarising the student with the theory of functions of one complex variable, differentiability and analyticity of such functions, complex integration and related topics

Course Outcomes:
As course outcomes the student must master the following:
1) Understand theorems on limit and continuity of functions of one complex variable.
2) Understand the significance of the Cauchy Riemann equations.
3) Learn the sufficient conditions for differentiability.
4) Study the relationship between analytic and harmonic functions.
5) Study complex integration and related theorems such as Cauchy Goursat Theorem
6) Study infinite complex series and sequences.
7) Study residue calculus and its applications.

Bridge Course **(4 hours.)**
A quick review on Complex numbers and its properties, vectors and moduli, complex conjugates, exponential forms, arguments and its properties, roots of complex numbers, and regions in complex plane.

Day	Topic	Method
	MODULE I BEGINS	
1	Functions of a complex variable	Lecture
2	Selected Exercises on Pages 37-38	Seminar
3	Limits	Lecture
4	Theorems on Limits	Lecture
5	Continuity	Lecture
6	Selected Exercises on Pages 55-56	Seminar
7	Derivatives	Lecture
8	Differentiation Formulas	Lecture
9	Selected Exercises on Pages 62-63	Seminar
10	Cauchy- Riemann Equations	Lecture
11	Cauchy- Riemann Equations (Continued)	Lecture
12	Sufficient Conditions for Differentiability	Lecture
13	Selected exercises on Pages 71,72 and 73	Assignment
14	Analytic Functions	Lecture
15	Examples of Analytic FunctionsLecture	Lecture
16	Selected Exercises on Pages 77-78	Exercise
17	Harmonic Functions	Lecture
18	Harmonic Functions (Continued)	Lecture
19	Selected Exercises on pages 81-82	Seminar
20	The Exponential Function	Lecture

COURSE PLAN – COMPLEX ANALYSIS – SIXTH SEMESTER B.Sc Mathematics

21	Selected Exercises on pages 92-93	Seminar
22	The Logarithm Function	Lecture
23	Selected Exercises on pages 97- 98	Seminar
24	Complex Exponents	Lecture
25	Complex Exponents (Continued)	Lecture
26	Selected Exercises on Page 104	Seminar
27	Trigonometric Functions	Lecture
28	Selected Exercises on Pages 108-109	Seminar
29	Hyperbolic Functions	Lecture
30	Selected Exercises on Pages 111-112	Seminar
31	Inverse Trigonometric and Hyperbolic Functions	Lecture
32	Selected Exercises on Pages 114-115	Seminar
33	**FIRST CIA**	
	(MODULE II BEGINS)	
34	Derivatives of Functions	Lecture
35	Definite Integrals of Functions	Lecture
36	Selected Exercises on Pages 121	Assignment
37	Contours	Lecture
38	Contours (Continued)	Lecture
39	Selected Exercises on pages 125- 126	Seminar
40	Contour Integrals	Lecture
41	Some Examples of Contour Integrals	Lecture
42	Upper Bounds for Moduli of Contour integrals	Lecture
43	Examples and Selected Exercises on pages 141	Seminar
44	Antiderivatives	Lecture
45	Cauchy Goursat Theorem	Lecture
46	Simply Connected Domains	Lecture
48	Multiply Connected Domains	Lecture
49	Selected Exercises on Pages 160,161 & 162	Assignment
50	Cauchy’s Integral Formula	Lecture
51	An extension of Cauchy’s Integral Formula	Lecture
52	Some Consequences of the Extension	Lecture
53	Selected Exercises on pages 171-172	Seminar
54	Liouville’s Theorem and the Fundamental	Lecture

COURSE PLAN – COMPLEX ANALYSIS – SIXTH SEMESTER B.Sc Mathematics

	theorem of Algebra	
55	Maximum Modulus Principle	Lecture
	(MODULE III BEGINS)	
56	Convergence of Sequences	Lecture
56	Convergence of Series	Lecture
57	Convergence of Series (Continued)	Lecture
58	Selected Exercises on Pages 188-189	Assignment
59	Taylor Series	Lecture
60	Proof of Taylor's theorem	Lecture
61	Examples of Taylor's series	Lecture
62	Selected Exercises on pages 196-197	Seminar
63	Laurent Series	Lecture
64	Examples of Laurent Series	Lecture
65	Selected Exercises on pages 205-207	Assignment
66	SECOND CIA	Lecture
	MODULE IV BEGINS	Lecture
67	Isolated Singular Points	Lecture
68	Residues	Lecture
69	Examples	Lecture
70	Cauchy's Residue Theorem	Lecture
71	Selected Exercises on pages 239-240	Seminar
72	The three types of isolated singular points	Lecture
73	Examples	Lecture
74	Selected Exercises on pages 243-244	Assignment
75	Residues at Poles	Lecture
76	Examples	Lecture
77	Selected Exercises on pages 248-249	Seminar
78	Evaluation of improper integrals	Lecture
79	Evaluation of improper integrals (Continued)	Lecture
80	Examples	Lecture
81	Selected Exercises on pages 267-268	Seminar
82	Improper integrals from Fourier Analysis	Lecture
83	Improper integrals from Fourier Analysis (Continued)	Lecture

COURSE PLAN – COMPLEX ANALYSIS – SIXTH SEMESTER B.Sc Mathematics

84	Jordan's Lemma	Lecture
85	Selected Exercises on Pages 275-276	Seminar
86	Definite Integrals involving Sines and Cosines	Lecture
87	Selected Exercises on Pages 290-291	Assignment
88	REVISION	Lecture
89	REVISION	Lecture
90	REVISION	Lecture

BSc. MATHEMATICS
Core Course Semester 5
15U5CRMAT11:DISCRETE MATHEMATICS
Course Plan

Faculty: Sanil Jose Minnumol P K,

Course Objectives: * To introduce graph theory and its applications
To understand cryptography
*To study lattices.

Text Book

1. John Clark Derek Allen Holton - A first look at graph theory, Allied Publishers
2. David M Burton - Elementary Number Theory 6th Edition TMH
3. Vijay K. Khanna - Lattices and Boolean Algebras- First Concepts, Vikas Publishing House Pvt Ltd.

Sessions	Topic	Remarks/Reference
1	Introduction to Graph	
2	History	
3	Definition and examples	
4	Graph as models	
5	More Definitions	
6	Examples	
7	Vertex degree	
8	Examples and problems	
9	Sub Graphs	
10	Problems	
11	Seminar	
12	Seminar	
13	Paths and cycles	
14	Matrix representation	
15	Problems	
16	Seminar	
17	Seminar	
18	Trees.	
19	connectivity.	
20	Connectivity Problems	
21	Connectivity Problems	
22	Properties of connected graphs	
23	Properties of connected graphs	
24	Bridges.	
25	Bridges,	

26	Spanning trees	
27	Cut vertices	
28	Cut vertices problems	
29	Cut vertices problems	
30	Revision	
31	Problems	
32	Class test	
33	Euler Tour	
34	Problems	
35	Problems	
36	Hamiltonian Cycle	
37	Problems	
38	Euler's tour	
39	Chinese postman problem	
40	Hamiltonian Graphs	
41	Examples and problems	
42	Examples and problems	
43	Examples and problems	
44	Matching	
45	Matching	
46	Matching	
47	Hall's marriage problem	
48	Personal assignment problem	
49	Optimal assignment Prroblem	
50	Problems	
51	Revision	
52	Introduction	
53	Caesar Cipher	
54	Problems	
55	Problems	
56	Hill's Ciper	
57	Problems	
58	Problems	
59	Public key Cryptography	
60	Public key Cryptography	
61	RSA Cryptosystem	
62	Problems	
63	Problems	
64	the Knapsack problem	
65	the Knapsack problem	
66	test	

67	Introduction	
68	Diagramatical Representation of a Poset, Diagramatical Representation of a Poset,	
69	Isomorphisms,	
70	Isomorphisms,	
71	Duality,	
72	Duality,	
73	Product of two Posets,	
74	Lattices,	
75	Lattices	
76	Semilattices,	
77	Complete Lattices,	
78	Sublattices.	
79	Revision	
80	Revision	

Sixth Semester B.Sc Mathematics

Core Course

15U5CRMAT12 : LINEAR ALGEBRA AND METRIC SPACES

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Name of the faculty : Anju Wilson

Course Objectives: * To introduce vector spaces ,basis and linear transformation.
To understand linear dependence and independence
*To study metric spaces and its properties.

TEXT BOOK

* Richard Bronson,Gabriel B Costa – Linear Algebra An Introduction(Second Edition)
* G.F.Simmons – Introduction to topology and modern analysis(Tata Mc Graw Hill)

Sessions	Topic	Method
1	Introductory Session	Interactive session
2	Definition of vector space	Lecture and interaction
3	Examples	Group discussion and problem solving
4	Solving exercise 2.1	
5	Theorems	Lecture
6	Subspaces-Definition	Lecture,Group Discussion
7	Examples	Group discussion and problem solving
8	Solving exercise 2.2	
9	Theorems	Lecture
10	Linear dependence and independence	Lecture,Group Discussion
11	Problems	Group discussion and problem solving
12	Theorems	Lecture
13	Basis	Lecture
14	Examples	Group discussion and problem solving
15	Theorems	Lecture
16	Theorems	Lecture
17	Dimension of Vector space	Lecture

18	Coordinate representation	Lecture
19	Problems	Group discussion and problem solving
20	Row space of a matrix	Lecture
21	Examples and theorems	Lecture
22	Theorems	Lecture
23	Revision of module 1	
24	Test paper 1	
25	Introduction to module 2	Interaction session
26	Functions	Interaction session
27	Linear Transformation	Lecture,Group Discussion
28	Examples	Group discussion and problem solving
29	Solving exercise 3.2	Group discussion and problem solving
30	Matrix representations	Lecture
31	Problems	Group discussion and problem solving
32	Exercise problem	
33	Change of basis	Lecture,Group Discussion
34	Theorems	Lecture
35	Problems	Group discussion and problem solving
36	Theorems	Lecture
37	Properties of linear transformation	Lecture
38	Kernel of a matrix	Lecture
39	Problems	Group discussion and problem solving
40	Image of a linear transformation	Lecture
41	Problems	Group discussion and problem solving
42	Theorems	Lecture
43	Rank-Nullity Theorem	Lecture
44	Theorems	Lecture
45	One–one and onto linear transformation	Lecture,Group Discussion
46	Problems	, Group discussion and problem solving

47	Exercise problems 3.5	
48	Revision of module 2	
49	Test Paper 2	
50	Introduction to module 3	Interaction session
52	Metric-Definition	Lecture,Group Discussion
52	Examples	Lecture,Group Discussion
53	Metric Space-Definition	Lecture,Group Discussion
54	Examples	Lecture,Group Discussion
55	More examples on metric spaces	Lecture,Group Discussion
56	Open set-Definition	Lecture,Group Discussion
57	Examples	Lecture,Group Discussion
58	Theorems	Lecture
59	Theorems	Lecture
60	Theorems	Lecture
61	Theorems	Lecture
62	Interior of a set and its properties	Lecture, Group Discussion
63	Closed set-Definition	Lecture and interaction
64	Examples	Lecture,Group Discussion
65	Theorems	Lecture
66	Theorems	Lecture
67	Cantor set	Lecture
68	Properties of cantor set	Lecture,Group Discussion
69	Boundary of a set and its properties	Lecture
70	Revision	
71	Test Paper 3	
72	Introduction to module 4	Interaction session
73	Convergence of a sequence	Lecture

74	Examples	Group discussion and problem solving
75	Theorems	Lecture
76	Cantor's Intersection Theorem	Lecture
77	Theorems	Lecture
78	Complete metric space	Lecture
79	Continuous mapping	Lecture
80	Theorems	Lecture
81	Theorems	Lecture
82	Theorems	Lecture
83	Theorems	Lecture
84	Revision	
85	Test Paper 4	

Course Plan
Sixth Semester – B.Sc Mathematics
15U5CRMAT13 - Operations Research

COURSE OBJECTIVES

The course aims

- to introduce and explain the ideas relevant to Mathematical programming in detail;
- to explain methods to solve Linear Programming Problem

Basic Reference

1. Optimization methods in Operations Research and System Analysis - K.V.Mital and C.Mohan
2. Operations Research – J.K.Sharma

Sessions	Topic	Method
1	Mathematical Preliminaries - Introduction	Lecturing
2	Euclidean space	Lecturing
3	Convex sets	Lecturing
4	Convex sets	Lecturing
5	Convex sets	Lecturing
6	Introduction to LPP	Lecturing
7	LP in 2 dimensional space	Lecturing
8	Optimal solution	Lecturing
9	Simple Problems	Lecturing
10	Problems	Group work
11	Simplex method	Lecturing
12	Problems	Group work
13	Problems	Group work
14	2 Phase simplex method	Lecturing

15	Big M method	Lecturing
16	Problems	Lecturing
17	Problems	Group work
18	Problems	Lecturing
19	Duality in LPP	Lecturing
20	Problems	Group work
21	CIA – I (Module -1)	
22	Problems	Lecturing
23	Dual simplex method	Lecturing
24	Applications	Lecturing
25	Problems	Group work
26	Problems	Lecturing
27	Introduction Transportation Problem	Lecturing
28	Problems	Lecturing
29	Finding basic feasible solution	Lecturing
30	Testing of optimality	Lecturing
31	Loop in transportation	Lecturing
32	degeneracy	Lecturing
	Problems	Lecturing
33	Unbalance Problem	Lecturing
34	Problems	Lecturing
35	Assignment Problems	Lecturing
36	Problems	Lecturing
37	Queueing theory introduction	Lecturing
38	Essential features of queuing system	Lecturing
39	Calling Population	Lecturing
40	Characteristics queuing process	Lecturing
41	Queue discipline	Lecturing
42	Service Process	Lecturing

43	Perfomance measure of system	Lecturing
44	Transient state , steady state	Lecturing
45	Relation amoung performance measure	Lecturing
46	Probability distribution in queuing system	Lecturing
47	Problems	Lecturing
48	Problrms	Lecturing
49	Problems	Lecturing
50	Problems	Lecturing
51	Distribution of arrival	Lecturing
52	Distribution of interarrival times	Lecturing
53	Distribution of departure	Lecturing
54	Distribution of service time	Lecturing
55	Convex hull	Lecturing
56	Vertices of a convex set	Lecturing
57	Convex polyhedron	Lecturing
58	Hyperplanes , half space and polytopes	Lecturing
59	Separating and supporting hyperplanes	Lecturing
60	Numerical examples	Lecturing
61	CIA II	2 HOURS
62	Revision	
63	Revision	
64	Revision	
65	Revision	
66	Discussion on the CIA	
67		
68		

ASSIGNMENTS

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**	**Weighttage**
1		Exercise Problems from the prescribed text – Individual submission	
2		Seminar on topics assigned	
3			
4			

ASSIGNMENTS/EXERCISES – Details & Guidelines

Additional Reading List

First Semester B.Sc. Phy/Chem

Complementary Course

15U1CPMATO1: DIFFERENTIAL CALCULUS AND TRIGONOMETRY

Faculty: SANIL JOSE, DIDIMOS

COURSE OBJECTIVES

To understand limits, derivatives of a functions and its applications.

To introduce partial derivatives of a several valued function.

To familiarize with real and imaginary parts of circular and hyperbolic functions of a complex variable

Text Book

1. George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.
2. S.L. Loney – Plane Trigonometry Part – II, AITBS Publishers India, 2009.

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Sessions	Topic	Method	Remarks/Reference
1	Introductory Session		
2	Rates of change and limits	Lecture	
3	calculating limits using the limit laws	Lecture, Problem Solving	
4	calculating limits using the limit laws	Lecture, Problem Solving	
5	the precise definition of a limit	Lecture,	
6	the precise definition of a limit	Lecture Problem Solving	
7	one sided limits and limits at infinity	Lecture, Problem Solving	
8	derivative of a function	Lecture, Problem Solving	
9	derivative of a function	Lecture, Problem Solving	
10	differentiation rules	Lecture, Problem Solving	
11	differentiation rules	Lecture, Problem Solving	
12	the derivative as a rate of change	Lecture	
13	the derivative as a rate of change	Lecture, Problem Solving	
14	derivatives of trigonometric functions	Lecture, Problem Solving	
15	the chain rule and parametric	Lecture, Problem Solving	

	equations		
16	the chain rule and parametric equations	Lecture, Problem Solving	
17	implicit differentiation.	Lecture, Problem Solving	
18	implicit differentiation.	Lecture, Problem Solving	
19	Test		
20	Extreme values of functions	Lecture, Problem Solving	
21	Extreme values of functions	Lecture, Problem Solving	
22	The Mean Value Theorem	Lecture, Problem Solving	
23	The Mean Value Theorem	Lecture, Problem Solving	
24	Monotonic functions	Lecture, Problem Solving	
25	Monotonic functions	Lecture, Problem Solving	
26	first derivative test.	Lecture, Problem Solving	
27	first derivative test.	Lecture, Problem Solving	
28	first derivative test.	Lecture, Problem Solving	
29	Test		
30	Functions of several variables	Lecture, Problem Solving	
31	Partial derivatives	Lecture, Problem Solving	
32	Partial derivatives	Lecture, Problem Solving	
33	Partial derivatives	Lecture, Problem Solving	
34	Partial derivatives	Introduction	
35	The Chain Rule	Lecture, Problem Solving	
36	The Chain Rule	Lecture, Problem Solving	
37	The Chain Rule	Lecture, Problem Solving	
38	The Chain Rule	Lecture, Problem Solving	
39	test		
40	Expansions of $\sin n\theta$	Lecture, Problem Solving	
41	Expansions of $\cos n\theta$,	Lecture, Problem Solving	
42	Expansions of $\tan n\theta$	Lecture, Problem Solving	
43	Expansions of $\sin^n \theta$	Lecture, Problem Solving	
44	Expansions of $\cos^n \theta$,	Lecture, Problem Solving	
45	Expansions of $\sin^n \theta \cos^m \theta$	Lecture, Problem Solving	
46	Circular and hyperbolic functions	Lecture, Problem Solving	
47	Circular and hyperbolic functions	Lecture, Problem Solving	
48	inverse circular and hyperbolic	Lecture, Problem Solving	

	function		
49	inverse circular and hyperbolic function	Lecture, Problem Solving	
50	inverse circular and hyperbolic function	Lecture, Problem Solving	
51	Separation into real and imaginary parts	Lecture, Problem Solving	
52	Separation into real and imaginary parts	Lecture, Problem Solving	
53	Separation into real and imaginary parts	Lecture, Problem Solving	
54	Summation of infinite series based on C + iS method	Lecture, Problem Solving	
55	Summation of infinite series based on C + iS method	Lecture, Problem Solving	
56	Summation of infinite series based on C + iS method	Lecture, Problem Solving	
57	Summation of infinite series based on C + iS method	Lecture, Problem Solving	
58	Summation of infinite series based on C + iS method	Lecture, Problem Solving	
59	Revision		
60	Revision		

Second Semester B.Sc. Phy/Chem

Complementary Course

15U1CPMATO2: INTEGRAL CALCULUS AND MATRICES

Faculty: Minnumol P K, Aparna V, Anju Wilson

COURSE OBJECTIVES

To understand Fundamental theorem of calculus, and applications of definite integral.

To solve a system of linear equations using inverse of a matrix.

To find the inverse of a matrix by Cayley-Hamilton theorem.

Text Book

1. George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.
2. Frank Ayres Jr : Matrices, Schaum's Outline Series, TMH Edition.

COURSE OUTCOMES:

At the end of the course, the student Would know how to use the integration for finding Surface area, Volume etc.

Sessions	Topic	Method	Remarks/Reference
1	Introductory Session		
2	A quick review of indefinite integral as anti derivative.	Lecture, Group Discussion, Problem Solving	
3	A quick review of indefinite integral as anti derivative.	Lecture, Group Discussion, Problem Solving	
4	The Definite integral.	Lecture, Group Discussion, Problem Solving	
5	The Definite integral.	Lecture, Group Discussion, Problem Solving	
6	The Definite integral.	Lecture, Group Discussion, Problem Solving	
7	The Definite integral.	Lecture, Group Discussion, Problem Solving	
8	The fundamental theorem of Calculus	Lecture, Group Discussion, Problem Solving	
9	The fundamental theorem of	Lecture, Group Discussion,	

	Calculus	Problem Solving	
10	The fundamental theorem of Calculus	Lecture, Group Discussion, Problem Solving	
11	The fundamental theorem of Calculus	Lecture, Group Discussion, Problem Solving	
12	The fundamental theorem of Calculus	Lecture, Group Discussion, Problem Solving	
13	Substitution and area between curves	Lecture, Group Discussion, Problem Solving	
14	Substitution and area between curves	Lecture, Group Discussion, Problem Solving	
15	Substitution and area between curves	Lecture, Group Discussion, Problem Solving	
16	Substitution and area between curves	Lecture, Group Discussion, Problem Solving	
17	Volumes by slicing and rotation about an axis (disc method only)	Lecture, Group Discussion, Problem Solving	
18	Volumes by slicing and rotation about an axis (disc method only)	Lecture, Group Discussion, Problem Solving	
19	Volumes by slicing and rotation about an axis (disc method only)	Lecture, Group Discussion, Problem Solving	
20	Volumes by slicing and rotation about an axis (disc method only)	Lecture, Group Discussion, Problem Solving	
21	Volumes by slicing and rotation about an axis (disc method only)	Lecture, Group Discussion, Problem Solving	
22	Areas of surfaces of revolution and the theorem of Pappus (excluding theorem of Pappus)	Lecture, Group Discussion, Problem Solving	
23	Areas of surfaces of revolution and the theorem of Pappus (excluding theorem of Pappus)	Lecture, Group Discussion, Problem Solving	
24	Areas of surfaces of revolution and the theorem of Pappus (excluding theorem of Pappus)	Lecture, Group Discussion, Problem Solving	
25	Areas of surfaces of revolution	Lecture, Group Discussion,	

	and the theorem of Pappus (excluding theorem of Pappus)	Problem Solving	
26	Double Integrals	Lecture, Group Discussion, Problem Solving	
27	Double Integrals	Lecture, Group Discussion, Problem Solving	
28	area of bounded region in plane only	Lecture, Group Discussion, Problem Solving	
29	area of bounded region in plane only	Lecture, Group Discussion, Problem Solving	
30	area of bounded region in plane only	Lecture, Group Discussion, Problem Solving	
31	area of bounded region in plane only	Lecture, Group Discussion, Problem Solving	
32	Double Integrals in Polar form,	Lecture, Group Discussion, Problem Solving	
33	Double Integrals in Polar form,	Lecture, Group Discussion, Problem Solving	
34	Double Integrals in Polar form,	Introduction	
35	Triple integrals in rectangular co-ordinates	Lecture, Group Discussion, Problem Solving	
36	Triple integrals in rectangular co-ordinates	Lecture, Group Discussion, Problem Solving	
37	Volume of a region in space	Lecture, Group Discussion, Problem Solving	
38	Volume of a region in space	Lecture, Group Discussion, Problem Solving	
39	Volume of a region in space	Lecture, Group Discussion, Problem Solving	
40	Rank of a Matrix	Lecture, Group Discussion, Problem Solving	
41	Non-Singular and Singular matrices	Lecture, Group Discussion, Problem Solving	
42	Elementary Transformations	Lecture, Group Discussion, Problem Solving	
43	Elementary Transformations	Lecture, Group Discussion,	

		Problem Solving	
44	Inverse of an elementary Transformations	Lecture, Group Discussion, Problem Solving	
45	Equivalent matrices,	Lecture, Group Discussion, Problem Solving	
46	Row Canonical form	Lecture, Group Discussion, Problem Solving	
47	Row Canonical form	Lecture, Group Discussion, Problem Solving	
48	Normal form	Lecture, Group Discussion, Problem Solving	
49	Normal form	Lecture, Group Discussion, Problem Solving	
50	System of non homogeneous	Lecture, Group Discussion, Problem Solving	
51	solution using matrices	Lecture, Group Discussion, Problem Solving	
52	solution using matrices	Lecture, Group Discussion, Problem Solving	
53	Cramer's rule	Lecture, Group Discussion, Problem Solving	
54	Cramer's rule	Lecture, Group Discussion, Problem Solving	
55	system of homogeneous equations	Lecture, Group Discussion, Problem Solving	
56	Characteristic equation of a matrix; Characteristic roots and characteristic vectors	Lecture, Group Discussion, Problem Solving	
57	Cayley-Hamilton theorem and simple applications	Lecture, Group Discussion, Problem Solving	
58	Cayley-Hamilton theorem and simple applications	Lecture, Group Discussion, Problem Solving	
59	Revision		
60	Revision		

Third Semester B.Sc. Phy/Chem

Complementary Course

15U1CPMATO3: VECTOR CAlCULUS , DIFFERENTAIL EQUATIONS AND ANALYTIC GEOMETRY

Faculty: Minnumol P K,Aparna V,Anju Wilson

COURSE OBJECTIVES

To understand Vector functions, vector fields and its applications.

To understand the applications of stokes, Greens and Divergence theorem

To study different methods to solve differential equations.

To understand conic sections and polar equations.

Text Book

1. A. H Siddiqi , P Manchanada : A first Course in Differential Equations with Applications (Macmillan India Ltd 2006)
2. George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.

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Sessions	Topic	Method	Remarks/Reference
1	Introductory Session		
2	Vector Functions	Lecture	
3	Arc length	Lecture, Problem Solving	
4	unit Tangent vector **T**	Lecture, Problem Solving	
5	Curvature	Lecture, Problem Solving	
6	unit Normal Vector **N**	Lecture Problem Solving	
7	Torsion	Lecture, Problem Solving	
8	unit Binormal vector **B**	Lecture, Problem Solving	
9	Directional Derivatives	Lecture, Problem Solving	
10	Gradient Vectors	Lecture, Problem Solving	
11	Test		
12	Line Integrals	Lecture	
13	Line Integrals	Lecture, Problem Solving	
14	Vector fields and Work	Lecture, Problem Solving	
15	Vector fields and Work	Lecture, Problem Solving	

16	Circulation and Flux	Lecture, Problem Solving	
17	Circulation and Flux	Lecture, Problem Solving	
18	Path independence	Lecture, Problem Solving	
19	Potential Function	Lecture, Problem Solving	
20	Conservation Fields	Lecture, Problem Solving	
21	Green's theorem in Plane	Lecture	
22	Green's theorem in Plane	Lecture, Problem Solving	
23	Green's theorem in Plane	Lecture, Problem Solving	
24	Surface area and Surface integral	Lecture, Problem Solving	
25	Surface area and Surface integral	Lecture, Problem Solving	
26	Parameterised Surface	Lecture, Problem Solving	
27	Stoke's theorem	Lecture,	
28	Stoke's theorem	Lecture, Problem Solving	
29	Stoke's theorem	Lecture, Problem Solving	
30	Divergence theorem and a Unified theory	Lecture	
31	Divergence theorem and a Unified theory	Lecture, Problem Solving	
32	Divergence theorem and a Unified theory	Lecture, Problem Solving	
33	Test		
34	Exact Differential Equation	Lecture	
35	Exact Differential Equation	Problem Solving	
36	Linear Equations	Lecture, Problem Solving	
37	Linear Equations	Lecture, Problem Solving	
38	Solutions by Substitutions,	Lecture, Problem Solving	
39	Solutions by Substitutions,	Lecture, Problem Solving	
40	Equations of first order and not of first degree	Lecture, Problem Solving	
41	First order equations of higher Degree solvable for *p*	Lecture, Problem Solving	
42	Equations solvable for *y*	Lecture, Problem Solving	
43	Equations solvable for *x*	Lecture, Problem Solving	
44	Equations of first degree in *x* and *y* - Lagrange's and Clairaut's Equation	Lecture, Problem Solving	
45	Test		
46	Conic sections and Quadratic equations	Lecture, Problem Solving	

47	Conic sections and Quadratic equations	Lecture, Problem Solving	
48	Classifying Conic Sections by Eccentricity	Lecture, Problem Solving	
49	Classifying Conic Sections by Eccentricity	Lecture, Problem Solving	
50	Conics and Parametric equations	Lecture, Problem Solving	
51	Conics and Parametric equations	Lecture, Problem Solving	
52	The Cycloid	Lecture, Problem Solving	
53	polar co-ordinates	Lecture, Problem Solving	
54	polar co-ordinates	Lecture, Problem Solving	
55	Conic Sections in Polar coordinates	Lecture, Problem Solving	
56	Conic Sections in Polar coordinates	Lecture, Problem Solving	
57	Conic Sections in Polar coordinates	Lecture, Problem Solving	
58	Test		
59	Revision		
60	Revision		

COURSE PLAN

Fourth Semester B.ScPhy/Chem

Complementary Course

U4CPMAT04: Fourier Series, Partial Differential Equations, Numerical Analysis and Abstract Algebra

Faculty: Minnumol P K,Aparna V,Anju Wilson

COURSE OBJECTIVES

To introduce Fourier series and power series solutions and power series solutions'

To understand Partial Differential Equations and how to solve partial differential equations.

To understand groups, rings and vector spaces.

Text Book

1. Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.
2. Ian Sneddon – Elements of Partial Differential Equation (Tata McGraw Hill)
3. S.S .Sastry : Introductory methods of Numerical Analysis ,4th edition (Prentice Hall)

4.John B Fraleigh- A first course in Abstract Algebra(7th Edition)Pearson Education

COURSE OUTCOMES:

At the end of the course, the student Would know what is Fourier series how to solve partial differential equations and what is groups, rings, and vector spaces.

Sessions	Date	Topic	Method	Remarks/Reference
1		Introductory Session		
2		Fourier Series	Lecture	
3		Periodic Functions, Trigonometric Series	Lecture, Group Discussion, Problem Solving	
4		Functions of any period p = 2L Fourier Series	Lecture, Group Discussion, Problem Solving	
5		Functions of any period p = 2L Fourier Series	Group Discussion, Problem Solving	
6		Functions of any period p = 2L Fourier Series	Group Discussion, Problem Solving	
7		Even and Odd functions	Lecture, Group Discussion,	
8		Even and Odd functions	Problem Solving	
9		Half-range Expansions	Lecture, Group Discussion, Problem	

			Solving	
10		Half-range Expansions	Problem Solving	
11		A brief introduction to power series	Lecture	
12		power series method	Problem Solving	
13		Legendre equation and Legendre Polynomials ,	Lecture, Group Discussion, Problem Solving	
14		Rodrigues' Formula,	Lecture, Group Discussion, Problem Solving	
15		Bessel's Equation .Bessel's Functions	Lecture, Group Discussion, Problem Solving	
16		Surfaces in three dimensions	Lecture, Group Discussion, Problem Solving	
17		Curves in three dimensions	Lecture, Group Discussion, Problem Solving	
18		Solution of equation of the form dx/P=dy/Q=dz/R	Lecture, Group Discussion, Problem Solving	
19		Solution of equation of the form dx/P=dy/Q=dz/R	Lecture, Group Discussion, Problem Solving	
20		Solution of equation of the form dx/P=dy/Q=dz/R	Lecture, Group Discussion, Problem Solving	
21		Origin of first and second order partial differential equations.	Lecture, Group Discussion, Problem Solving	
22		Origin of first and second order partial differential equations	Lecture, Group Discussion, Problem Solving	
23		Linear Equation of the first order	Lecture, Group Discussion, Problem Solving	
24		Linear Equation of the first order	Lecture, Group Discussion, Problem Solving	

25		Lagrange's method	Lecture, Group Discussion, Problem Solving	
26		Lagrange's method	Lecture, Group Discussion, Problem Solving	
27		Absolute , relative and percentage errors.	Lecture, Group Discussion, Problem Solving	
28		A general error formula .	Lecture, Group Discussion, Problem Solving	
29		Error in a series Approximation..	Lecture, Group Discussion, Problem Solving	
30		Bisection Method ,	Lecture, Group Discussion, Problem Solving	
31		Bisection Method	Problem Solving	
32		Methods of false position ,	Lecture, Group Discussion, Problem Solving	
33		Methods of false position	Problem Solving	
34		Iteration Method ,	Lecture, Group Discussion, Problem Solving	
35		Iteration Method	Problem Solving	
36		Acceleration of convergence: Aitken's Δ^2 Process	Lecture, Group Discussion, Problem Solving	
37		Newton Raphson Method,	Lecture, Group Discussion, Problem Solving	
38		Newton Raphson Method	Problem Solving	
39		the quotient – Difference method	Lecture, Group Discussion, Problem Solving	
40		the quotient – Difference method	Problem Solving	
41		Groups	Lecture, Group Discussion, Problem	

			Solving	
42		Groups	Lecture, Group Discussion, Problem Solving	
43		Groups	Lecture, Group Discussion, Problem Solving	
44		Groups	Lecture, Group Discussion, Problem Solving	
45		Sub Groups	Lecture, Group Discussion, Problem Solving	
46		Cyclic Groups	Lecture, Group Discussion, Problem Solving	
47		Cyclic Groups	Lecture, Group Discussion, Problem Solving	
48		Groups of Permutations	Lecture, Group Discussion, Problem Solving	
49		Groups of Permutations	Lecture, Group Discussion, Problem Solving	
50		Homomorphisms	Lecture, Group Discussion, Problem Solving	
51		Homomorphisms	Lecture, Group Discussion, Problem Solving	
52		Rings	Lecture, Group Discussion, Problem Solving	
53		Rings	Lecture, Group Discussion, Problem Solving	
54		Field	Lecture, Group Discussion, Problem Solving	
55		Vector Spaces	Lecture, Group Discussion, Problem	

			Solving	
56		Vector Spaces	Lecture, Group Discussion, Problem Solving	
57		Vector Spaces	Lecture, Group Discussion, Problem Solving	
58		Revision		
59		Revision		
60		Revision		