SACRED HEART COLLEGE (AUTONOMOUS)

Department of Mathematics

M.Sc. Mathematics

Course plan

Academic Year 2016 – 17

Semester 1

COURSE PLAN

PROGRAMME	**M.Sc. MATEMATICS**	**SEMESTER**	**1**
COURSE CODE AND TITLE	**16P1MATT01: LINEAR ALGEBRA**	**CREDIT**	**4**
HOURS/WEEK	**4**	**HOURS/SEM**	**72**
FACULTY NAME	**Dr. DIDIMOS K. V.**		

COURSE OBJECTIVES
To know vector spaces, subspaces, basis and dimension and understanding coordinates and summary of row equivalence.
To understand linear transformations their algebra and representation of transformations by matrices.
To assimilate ideas of canonical forms, characteristic values and annihilating polynomials.
To develop ideas of simultaneous triangulation and diagonalisation and direct sum decomposition.

Sessions	Topic	Method	REMARKS
1	Vector spaces	Lecture, Group Discussion, Problem Solving	
2	Vector spaces	Lecture, Group Discussion, Problem Solving	
3	Subspaces	Lecture, Problem Solving	
4	Subspaces	Lecture, Group Discussion, Problem Solving	
5	Basis	Lecture, Group Discussion, Problem Solving	
6	Dimension	Lecture	
7	Co-ordinates	Lecture, Group Discussion, Problem Solving	
8	Co-ordinates	Lecture, Group Discussion, Problem Solving	
9	Summary of row-equivalence	Lecture, Group Discussion, Problem Solving	

10	Summary of row-equivalence	Lecture, Group Discussion, Problem Solving	
11	Summary of row-equivalence	Lecture, Group Discussion, Problem Solving	
12	Summary of row-equivalence	Lecture, Group Discussion, Problem Solving	
13	Linear transformations	Lecture, Group Discussion, Problem Solving	
14	Linear transformations	Lecture, Group Discussion, Problem Solving	
15	The algebra of linear transformations	Lecture, Group Discussion, Problem Solving	
16	The algebra of linear transformations	Lecture, Group Discussion, Problem Solving	
17	The algebra of linear transformations	Lecture, Group Discussion, Problem Solving	
18	The algebra of linear transformations	Lecture, Group Discussion, Problem Solving	
19	Isomorphism	Lecture, Group Discussion, Problem Solving	
20	Isomorphism	Lecture, Group Discussion, Problem Solving	
21	Representation of transformations by matrices	Lecture, Group Discussion, Problem Solving	
22	Representation of transformations by matrices	Lecture, Group Discussion, Problem Solving	
23	Representation of transformations by matrices	Lecture, Group Discussion, Problem Solving	
24	Representation of transformations by matrices	Lecture, Group Discussion, Problem Solving	
25	Representation of transformations by matrices	Lecture, Group Discussion, Problem Solving	

26	Linear functionals	Lecture, Group Discussion, Problem Solving	
27	Linear functionals	Lecture, Group Discussion, Problem Solving	
28	Linear functionals	Lecture, Group Discussion, Problem Solving	
29	Linear functionals	Lecture, Group Discussion, Problem Solving	
30	Linear functionals	Lecture, Group Discussion, Problem Solving	
31	Double dual	Lecture, Group Discussion, Problem Solving	
32	Double dual	Lecture, Group Discussion, Problem Solving	
33	Double dual	Lecture, Group Discussion, Problem Solving	
34	Double dual	Lecture, Group Discussion, Problem Solving	
35	Transpose of a linear transformation.	Lecture, Group Discussion, Problem Solving	
36	Transpose of a linear transformation.	Lecture, Group Discussion, Problem Solving	
37	Transpose of a linear transformation.	Lecture, Group Discussion, Problem Solving	
38	Commutative Rings	Lecture, Group Discussion, Problem Solving	
39	Commutative Rings	Lecture, Group Discussion, Problem Solving	
40	Determinant functions	Lecture, Group Discussion, Problem Solving	
41	Permutation	Lecture, Group Discussion, Problem Solving	
42	Permutation	Lecture, Group Discussion, Problem Solving	
43	Permutation	Lecture, Group Discussion, Problem Solving	

44	Permutation	Lecture, Group Discussion, Problem Solving	
45	Uniqueness of determinants	Lecture, Group Discussion, Problem Solving	
46	Uniqueness of determinants	Lecture, Group Discussion, Problem Solving	
47	Uniqueness of determinants	Lecture, Group Discussion, Problem Solving	
48	Uniqueness of determinants	Lecture, Group Discussion, Problem Solving	
49	Uniqueness of determinants	Lecture, Group Discussion, Problem Solving	
50	Additional properties of determinants	Lecture, Group Discussion, Problem Solving	
51	Additional properties of determinants	Lecture, Group Discussion, Problem Solving	
52	Additional properties of determinants	Lecture, Group Discussion, Problem Solving	
53	Introduction to elementary canonical forms	Lecture, Group Discussion, Problem Solving	
54	Characteristic values	Lecture, Group Discussion, Problem Solving	
55	Characteristic values	Lecture, Group Discussion, Problem Solving	
56	Characteristic values	Lecture, Group Discussion, Problem Solving	
57	Annihilating polynomials	Lecture, Group Discussion, Problem Solving	
58	Annihilating polynomials	Lecture, Group Discussion, Problem Solving	
59	Annihilating polynomials	Lecture, Group Discussion, Problem Solving	
60	Annihilating polynomials	Lecture, Group Discussion, Problem Solving	

61	Invariant subspaces	Lecture, Group Discussion, Problem Solving	
62	Invariant subspaces	Lecture, Group Discussion, Problem Solving	
63	Simultaneous triangulations	Lecture, Group Discussion, Problem Solving	
64	Simultaneous triangulations	Lecture, Group Discussion, Problem Solving	
65	Simultaneous diagonalization	Lecture, Group Discussion, Problem Solving	
66	Simultaneous diagonalization	Lecture, Group Discussion, Problem Solving	
67	Simultaneous diagonalization	Lecture, Group Discussion, Problem Solving	
68	Direct sum decompositions	Lecture, Group Discussion, Problem Solving	
69	Direct sum decompositions	Lecture, Group Discussion, Problem Solving	
70	Direct sum decompositions	Lecture, Group Discussion, Problem Solving	
71	Invariant direct sums	Lecture, Group Discussion, Problem Solving	
72	Invariant direct sums	Lecture, Group Discussion, Problem Solving	
73	Revision	Group Discussion, Problem Solving	
74	Revision	Group Discussion, Problem Solving	
75	Revision	Group Discussion, Problem Solving	

ASSIGNMENTS/EXERCISES – DETAILS & GUIDELINES

	Date of submission/completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc.)**
1.	12 September 2016	oblems on the applications of linear transformation

REFERENCES

- Klaus Jonich. Linear Algebra, Springer Verlag.
- Paul R. Halmos, Linear Algebra Problem Book, The Mathematical Association of America.
- Kenneth Hoffman / Ray Kunze (Second Edition), Linear Algebra, Prentice-Hall of India Pvt. Ltd., New Delhi, 1992.

COURSE PLAN

PROGRAMME	**MSC MATHEMATICS**	**SEMESTER**	**1**
COURSE CODE AND TITLE	**16P1MATT02: BASIC TOPOLOGY**	**CREDIT**	**4**
HOURS/WEEK	**5**	**HOURS/SEM**	**75**
FACULTY NAME	**JEENU KURIAN**		

COURSE OBJECTIVES
Analyse the concept of Topological spaces, base and subbase.
Apply the concept of continuity and quotient spaces on different topology.
Understand the concept of local connectedness and path connected.
Differentiate levels of spaces based on axioms.

SESSIONS	TOPIC	METHOD	REMARKS
1.	Introductory Session – sets, functions and logics.	Lecture	
2.	Introductory session - metric spaces and open balls.	Lecture	
MODULE 1			
3	Examples of topological spaces	Lecture	
4.	Examples of topological spaces	Lecture	
5.	Different types of topological spaces.	Lecturing	
6.	Convergence of sequence in spaces	Lecturing	
7.	Convergence of sequence in spaces	Lecture,	
8.	Problems on convergence and countability	Lecturing	
9.	Introducing base of a topological spaces	Lecturing	
10.	Theorems and properties on base	Lecture	
11.	Axiom of second countability and theorems	Lecturing	
12.	Subbase and their properties	Lecture	
13.	Sub spaces	Lecturing	
14.	theorems on subspaces	Lecture,	
15.	Problems on base and subbase	Lecture, Group Discussion, Problem Solving	
16.	Open, closed and clopen sets	Lecture, Group Discussion, Problem Solving	
17.	Neighbourhood, interior points, accumulation points and closure axiom.	Lecture, Group Discussion, Problem Solving	
18.	Prepositions on Neighbourhood, interior points, accumulation points and closure axiom.	Lecture, Group Discussion, Problem Solving	
19.	Theorems on Neighbourhood, interior points, accumulation points and closure axiom.	Lecture	
20.	Problems on topological spaces	Lecture, Group Discussion, Problem Solving	

21.	Problems on open and closed sets	Lecture, Group Discussion, Problem Solving	
MODULE 2			
23.	Continuity and related concepts	Lecture, Group Discussion, Problem Solving	
24.	Continuity and related concepts	Lecture, Group Discussion, Problem Solving	
24.	Propositions on continuity	Lecture	
25.	Theorems on continuity	Lecture	
26.	Projection maps	Lecture, Group Discussion, Problem Solving	
27.	Theorems on projection map	Lecture,	
28.	Homeomorphism introduction	Lecture, Group Discussion, Problem Solving	
29.	Embedding introduction	Lecture	
30.	Making functions continuous	Lecture, Group Discussion, Problem Solving	
31.	Quotient space	Lecturing	
32.	prepositions	Lecturing	
33.	Spaces with special properties	Lecturing	
34.	Lebesgue covering Lemma	Lecture	
35.	Concepts of Separable, first countable, hereditary	Lecturing	
36.	Theorems on second countable space	Lecture	
37.	Theorems on first countable space	Lecture	
38.	Hereditary property of space	Lecture	
39.	Problems	Lecture, Group Discussion, Problem Solving	
40.	Problems	Problem Solving	
41.	Module3 – Introduction	Lecture,	
42.	Concept of connectedness	Lecture	

43.	Examples of connectedness	Lecture, Group Discussion, Problem Solving	
44.	Theorems on connectedness	Lecture	
45.	Propositions	Lecture	
46.	Theorems and Propositions	Lecture,	
47.	Components and maximally connected sets	Lecture,	
48.	Theorems	Lecture,	
49.	Local connectedness - introduction	Lecture,	
50.	Examples of local connectedness	Lecture, Group Discussion, Problem Solving	
51.	Theorems of local connected space	Lecture,	
52.	Path connectedness - introduction	Lecture,	
53.	Examples of path connectedness	Lecture, Group Discussion, Problem Solving	
54.	Theorems of path connected space	Lecture,	
55.	Comparative study between spaces	Lecture,	
56.	Comparative study between spaces	Lecture,	
57.	Problems solving	Lecture, Group Discussion, Problem Solving	
58.	Problems solving	Lecture, Group Discussion, Problem Solving	
59.	Problems solving	Lecture, Group Discussion, Problem Solving	
MODULE 4 - INTRODUCTION			
61.	Basic definitions examples on separation axioms	Lecture	
62.	Basic definitions examples on separation axioms	Lecture	
62.	Theorems and proposition	Lecture	
63.	Theorems and proposition	Lecture	
64.	Theorems and proposition	Lecture	
65.	Theorems and proposition	Lecture	
66.	Compactness and separation axioms	Lecture	

67.	Theorems and proposition	Lecture	
68.	Theorems and proposition	Lecture	
69.	Problem solving session	Lecture, Group Discussion, Problem Solving	
70.	Problem solving session	Lecture, Group Discussion, Problem Solving	
71.	Problem solving session	Lecture, Group Discussion, Problem Solving	
72.	Problem solving session	Lecture, Group Discussion, Problem Solving	
73.	Problem solving session	Lecture, Group Discussion, Problem Solving	
74.	Problem solving session	Lecture, Group Discussion, Problem Solving	
75.	Problem solving session	Lecture, Group Discussion, Problem Solving	

INDIVIDUAL ASSIGNMENTS/SEMINAR – DETAILS & GUIDELINES

	DATE OF COMPLETION	**TOPIC OF ASSIGNMENT & NATURE OF ASSIGNMENT (INDIVIDUAL/GROUP – WRITTEN/PRESENTATION – GRADED OR NON-GRADED ETC)**
1	31-07-2016	Assisgnment on basic concepts of topology and continuity
2	25^{th} to 29^{th} Sep	Seminar on theorems and problems in Separation Axioms

REFERENCES:

- Munkers J.R, Topology – A first course, Prentice Hall of India Pvt.Ltd., New Delhi, 2000.
- J.L.Kelly, General Topology.Van Nostrand, Reinhold Co.,NewYork, 1995.
- Stephen Willard, General Topology,Addison – Wesley.
- Dugundji, Topology, Universal Book Stall, New Delhi.
- George F Simmons, introduction to Topology and Modern Analysis, Mc Graw-Hill Book Company, 1963.

COURSE PLAN

PROGRAMME	MSC MATHEMATICS	SEMESTER	1
COURSE CODE AND TITLE	16P1MATT03: MEASURE THEORY AND INTEGRATION	CREDITS	4
HOURS/WEEK	4	HOURS/SEM	75
FACULTY NAME	PROF. M P SEBASTIAN		

COURSE OBJECTIVES
To understand the basics of Measure theory.
To apply Measure theory in the other disciplines.
To apply Measure theory for Integration with respect to an arbitrary measure.
To understand the importance of Measure theory in the study of Real and Complex analysis.
To apply measure theory in probability.
To apply measure theory in the study of L^Pspaces.

SL. NO	NO. OF SESSIONS/HRS	TOPICS TO BE TAUGHT	METHOD OF TEACHING	VALUE ADDITION	REMARKS
1	2	Fundamentals of real analysis.	Lecture, assignment, seminar.	Q & A Session	
2.	2	Lebesgue Measure and its properties.	Lecture, assignment.		
3	2	Problems based on Lebesgue Measure.	Lecture.		
4	2	Leabesgue measurable sets.	Lecture.		
5	2	Lebesgue Measure and its properties.	Lecture, assignment.		
6	1	Problems based on Lebesgue Measure.	Lecture, Seminar.		
7	1	Example of a non- measurable set.	Lecture.		
8	2	Measurable Functions and its properties.	Lecture.		

9	2	Problems based on Measurable Functions.	Lecture.		
10	2	Riemann integral, Examples.	Lecture		
11	2	Riemann integral, Examples.	Lecture		
12	2	Lebesgue integral of a simple function, properties.	Lecture, assignment.		
13	2	Lebesgue integral of a bounded measurable function over a measurable set of finite measure, properties.	Lecture, assignment.		
14	2	Lebesgue integral and Riemann integral.	Lecture.		
15	1	Bounded convergence theorem.	Lecture.		
16	1	Integral of a non-negative measurable function.	Lecture.	Quiz	
First internal					
17 - 18	1	Fatous Lemma.	Lecture.	Q & A Session	
19	1	Monotone convergence theorem.	Seminar.		
20	3	Integrability of non- negative measurable function and related propositions.	Lecture, seminar.		
21	2	Problems based on integral of non-negative functions.	Lecture, seminar, assignment.		
22	2	General Lebesgue integral and its properties.	Seminar.		
23	2	Lebesgue convergence theorem and its general version.	Lecture , seminar		
24	2	Problems based on the general integral.	Lecture.		
25	1	**Test paper on module -2**			
26	2	Introduction of abstract measurable space and measure space.	Lecture		
27	1	Propositions, finite and sigma finite measure spaces	Lecture, seminar.		
28	1	Set of finite measure, a set of sigma finite measure, complete measure.	Lecture , seminar		
29	2	Measurable functions and its properties, problems.	Lecture		
30	2	Integral of a non-negative simple function with respect to a measure, properties.	Lecture, assignment.		

31	2	Integral of a non-negative measurable function with respect to a measure, properties.	Lecture, assignment.		
32	2	Fatous Lemma.	Lecture.		
33	3	Monotone convergence theorem, followed by two propositions.	Lecture, seminar.		
34	2	Lebegue convergence theorem and problems.	Lecture.		
35	2	General convergence theorem.	Lecture, seminar.		
36	1	Signed measure, positive set, negative set, null set followed by two lemmas.	Lecture.		
37	1	Hahn decomposition theorem.	Lecture, seminar assignment.		
38	1	Jordan decomposition theorem.	Lecture, assignment.		
39	2	Problems based on Hahn and Jordan decomposition theorems.	Lecture, seminar.		
40		**TEST PAPER -3**			
41	2	Cartesian product, rectangle, measurable rectangle, elementary sets, problems.	Lecture, seminar.		
42	2	**T**he class of all elementary sets is an algebra.	Lecture.		
42	1	Product space, product measure.	Lecture.		
43	1	X-section and y- section of set and their measurability.	Lecture, seminar.		
44	2	X-section and y-section of a set and their measurability.	Lecture, assignment.		
45	2	Integral of a non-negative measurable function w.r.t. product measure and related theorems.	Lecture.		
46	1	Fubinis theorem and examples	Lecture , seminar		
47	1	Model Examination			
	Total = 75 hours				

INDIVIDUAL ASSIGNMENTS/SEMINAR – DETAILS & GUIDELINES

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc.)
1	26-07-2016	Assignment - problems from module-1
2	21th to 25th Sep	Seminar on topics from module 4

COURSE PLAN

PROGRAMME	**MSC MATHEMATICS**	**SEMESTER**	**1**
COURSE CODE AND TITLE	**16P1MATT04: ORDINARY DIFFERENTIAL EQUATION**	**CREDITS**	**4**
HOURS/WEEK	**4**	**HOURS/SEM**	**75**
FACULTY NAME	**APARNA V**		

COURSE OBJECTIVES
Explain the basic theory of linear systems and its solution
Understand the concept of power series solution
Understand the Picard's existence theorem
Understanding the concept of Strum Liouville problem and methods of solving it
Introduce the concept of Laplace transforms and techniques of solving it

SESSIONS	TOPIC	METHOD	VALUE ADDITION	REMARKS
1	Introductory Session	Lecture, Group discussion	Q & A Session	
2	Basic theory of Linear systems in normal form-two equations in 2 unknown functions	Lecture, Group Discussion, Problem solving		
3	Problems	Group Discussion, Problem solving		
4	Theorems, Wronskian, Problems	Lecture, Group Discussion, Problem solving		
5	Non homogenous Linear systems and problems	Lecture, Group Discussion, Problem solving		
6	Homogenous linear system with constant coefficients - Introduction	Lecture, Group Discussion, Problem solving		
7	Case 1- when the roots of the characteristic equations are real and distinct and problems	Lecture, Group Discussion, Problem solving		
8	Case 2- when the roots of the characteristic equations are conjugate complex and problems	Lecture, Group Discussion, Problem solving		
9	Case 3- when the roots of the characteristic equations are real and equal and problems	Lecture, Group Discussion, Problem solving		
10	Basic concepts of Matrices and vectors, Inverse	Lecture, Group Discussion, Problem solving		
11	Linear dependence and independence Characteristic values and vectors, problems	Lecture, Group Discussion, Problem solving		
12	Introduction – The Matrix method for homogenous linear systems with constant coefficients	Lecture, Group Discussion, Problem solving		
13	Case of two distinct characteristic values and problems	Lecture, Group Discussion, Problem solving		
14	Case of a double characteristic values and problems	Lecture, Group Discussion, Problem solving		
15	Theorems and problems	Lecture, Group Discussion, Problem solving	Quiz	

16 - 17	Introduction and review of Power series	Lecture, Group Discussion		
18	Radius of Convergence, problems	Lecture, Group Discussion, Problem solving		
19	Sum ,Scalar product and Cauchy product of series ,problems	Lecture, Group Discussion, Problem solving		
20	Series solution of first order differential equations, problems	Lecture, Group Discussion, Problem solving		
21	Problems	Group Discussion, Problem solving		
22	Second order Linear equations: ordinary points-Introduction and problem	Lecture, Group Discussion, Problem solving		
23	Problems	Group Discussion, Problem solving		
24	Regular singular points and problems	Lecture, Group Discussion, Problem solving		
25	Method of Frobenius series and problems	Lecture, Group Discussion, Problem solving		
26	Problems	Group Discussion, Problem solving		
27	More on Regular singular points and problems	Lecture, Group Discussion, Problem solving	Q & A Session	
28	Problems	Group Discussion, Problem solving		
29	Gauss's Hypergeometric equations and problems	Lecture, Group Discussion, Problem solving		
30	Problems	Group Discussion, Problem solving		
31	Problems	Group Discussion, Problem solving		
32	Introduction to Picard's Existence and uniqueness Theorem-The form of a Differential Equation	Lecture, Group Discussion, Problem solving		
33	Picard's iteration Technique and some examples	Lecture, Group Discussion, Problem solving		
34	Estimation of the Picard's iterates and Problems	Lecture, Group Discussion, Problem solving		

35	Problems	Group Discussion, Problem solving		
36	CIA-I	1 hour		
37	Introduction to Boundary Value problems – Definition and examples	Lecture, Group Discussion, Problem solving		
38	Non trivial solutions of Strum Liouville problems	Lecture, Group Discussion, Problem solving		
39	Problems	Group Discussion, Problem solving		
40	Characteristic values and Characteristic functions	Lecture, Group Discussion, Problem solving		
41	Theorems and problems	Lecture, Group Discussion, Problem solving		
42	Problems	Group Discussion, Problem solving		
43	Orthogonality of Functions and examples	Lecture, Group Discussion, Problem solving		
44	Orthogonality of Characteristic Functions and examples	Lecture, Group Discussion, Problem solving		
45	Theorem and problems	Lecture, Group Discussion, Problem solving		
46	Problems	Group Discussion, Problem solving		
47	Orthonormal systems and examples	Lecture, Group Discussion, Problem solving		
48	The expansion of a function in a series of ortho-normal functions	Lecture, Group Discussion, Problem solving		
49	Theorem and Problems	Lecture, Group Discussion, Problem solving		
50	Problems	Group Discussion, Problem solving		
151	Introduction of Laplace transforms	Lecture, Group Discussion, Problem solving		
52	Laplace transforms of basic functions	Lecture, Group Discussion, Problem solving		

53	Problems	Group Discussion, Problem solving		
54	Applications to Differential Equations - examples	Lecture, Group Discussion, Problem solving		
55	More Examples	Lecture, Group Discussion, Problem solving		
56	Problems	Group Discussion, Problem solving		
57	Derivatives of Laplace transforms ,examples	Lecture, Group Discussion, Problem solving		
58	Problems	Group Discussion, Problem solving		
59	Integrals of Laplace transforms ,examples	Lecture, Group Discussion, Problem solving		
60	Problems	Group Discussion, Problem solving		
61	Properties of Laplace transforms and problems	Lecture, Group Discussion, Problem solving		
62	Convolutions and example	Lecture, Group Discussion, Problem solving		
63	More examples and Abel's Mechanical Problem	Lecture, Group Discussion, Problem solving		
64	Continuation of Abel's Mechanical Problem	Lecture, Group Discussion, Problem solving		
65	Analysing Abel's Mechanical Problem	Lecture, Group Discussion, Problem solving		
66	Problems	Group Discussion, Problem solving		
67	The unit step function- Introduction	Lecture, Group Discussion, Problem solving		
68	Principle of Superposition and example	Lecture, Group Discussion, Problem solving		
69	The Impulse function - Introduction	Lecture, Group Discussion, Problem solving		
70	Examples	Lecture, Group Discussion, Problem solving		

71	Problems	Group Discussion, Problem solving		
72	CIA-II	2 Hours		
73	Discussion Of CIA-II			
74	Revision			
75	Revision			

INDIVIDUAL ASSIGNMENTS/SEMINAR – DETAILS & GUIDELINES

	Date of completion	**Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)**
1	27-07-2016	Assignment on linear system of ode's
2	25th to 29th Sep	Seminar on Laplace transforms

COURSE PLAN

PROGRAMME	**MSC MATHEMATICS**	**SEMESTER**	**1**
COURSE CODE AND TITLE	**16P1MATT05: COMPLEX ANALYSIS**	**CREDITS**	**4**
HOURS/WEEK	**4**	**HOURS/SEM**	**72**
FACULTY NAME	**SANIL JOSE**		

COURSE OBJECTIVES
To understand analytic function as a mapping on the plane, Mobius transformation and branch of logarithm.
To understand Cauchy's theorems and integral formulas on open subsets of the plane.
To understand the concept of homotopy and homotopic version of Cauchy's theorem and simply connectivity.
To understand how to count the number of zeros of analytic function giving rise to open mapping theorem and Goursat theorem as a converse of Cauchy's theorem.
To know about the kind of singularities of meromorphic functions which helps in residue theory and contour integrations.
To handle integration of meromorphic function with zeros and poles leading to the argument principle and Rouche's theorem.
To understand analytic function as a mapping on the plane, Mobius transformation and branch of logarithm.

NO.	TOPIC	METHODS	VALUE ADDITIONS	REMARKS
1	INTRODUCTION	Lecture		
2	The spherical representation of complex numbers	Lecture		
3	Riemann Sphere, Stereographic projection	Lecture, Problem Solving		
4	Distance between the stereographic projections	Lecture, Problem Solving		
5	Elementary Theory of power series	Lecture,		
6	Abel's Theorem on convergence of the power series,	Lecture Problem Solving		
7	Hadamard's formula	Lecture, Problem Solving		
8	Abel's limit Theorem	Lecture, Problem Solving		
9	Arcs and closed curves	Lecture, Problem Solving		
10	Analytic functions in regions	Lecture, Problem Solving		
11	Conformal mappings	Lecture, Problem Solving		
12	Length and area	Lecture		
13	Linear transformations	Lecture, Problem Solving		
14	The cross ratio, Symmetry	Lecture, Problem Solving		
15	Oriented circles,	Lecture, Problem Solving		
16	Families of circles.	Lecture, Problem Solving		

17	Seminar	Lecture, Problem Solving		
18	Seminar	Lecture, Problem Solving		
19	Seminar	Lecture, Problem Solving		
20	Test paper	Test		
21	Answer discussion	Lecture, Problem Solving	Discussion	
22	Line integrals	Lecture, Problem Solving		
23	Rectifiable arcs	Lecture, Problem Solving		
24	Line integrals as functions of arcs	Lecture, Problem Solving		
25	Cauchy’s theorem for a rectangle	Lecture, Problem Solving		
26	Cauchy’s theorem in a disk,	Lecture, Problem Solving		
27	Cauchy’s integral formula	Lecture, Problem Solving		
28	Cauchy’s integral formula 2	Lecture, Problem Solving		
29	Cauchy’s integral formula	Lecture		
30	Tutorial	Lecture, Problem Solving	Quiz	
31	Seminar	Lecture, Problem Solving		
32	Seminar	Lecture, Problem Solving		
33	Seminar	Lecture, Problem Solving		
34	Seminar	Introduction		
35	Seminar	Lecture, Problem Solving		

36	Seminar	Lecture, Problem Solving		
37	Seminar	Lecture, Problem Solving		
38	Test paper	Lecture, Problem Solving		
39	Answer discussion			
40	Differentiation under the sign of integration	Lecture, Problem Solving		
41	Morera’s Theorem, Liouville’s Theorem,	Lecture, Problem Solving		
42	Morera’s Theorem, Liouville’s Theorem,	Lecture, Problem Solving		
43	Fundamental Theorem	Lecture, Problem Solving		
44	Cauchy’s estimate	Lecture, Problem Solving		
45	Removable singularities, Taylor’s theorem, zeroes and poles 1	Lecture, Problem Solving		
46	Removable singularities, Taylor’s theorem, zeroes and poles 2	Lecture, Problem Solving		
47	Weirstrass Theorem on essential singularity,	Lecture, Problem Solving		
48	The local mapping,	Lecture, Problem Solving		
49	The maximum principle.	Lecture, Problem Solving		
50	Schwarz lemma	Lecture, Problem Solving		
51	Seminar	Lecture, Problem Solving		
52	Seminar	Lecture, Problem Solving		
53	Seminar	Lecture, Problem Solving		

54	Seminar	Lecture, Problem Solving		
55	Test paper	Lecture, Problem Solving		
56	Answer discussion	Lecture, Problem Solving		
57	Chains and cycles,	Lecture, Problem Solving		
58	Simple connectivity, homology,	Lecture, Problem Solving		
59	General statement of Cauchy's theorem	Lecture, Problem Solving		
60	Proof of Cauchy's theorem,	Lecture, Problem Solving		
61	Locally exact differentiation	Lecture, Problem Solving		
62	Multiply connected regions	Lecture, Problem Solving		
63	The residue theorem	Lecture, Problem Solving		
64	The argument principle,	Lecture, Problem Solving		
65	Evaluation of definite integrals.	Lecture, Problem Solving		
66	Evaluation of definite integrals.	Lecture, Problem Solving		
67	Evaluation of definite integrals.	Lecture, Problem Solving		
68 - 72	Seminar	Lecture, Group Discussion		

GROUP ASSIGNMENTS/ACTIVITES – DETAILS & GUIDELINES

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc.)
1	2/8/2016	PROBLEMS IN MODULE 3

INDIVIDUAL ASSIGNMENTS/SEMINAR – DETAILS & GUIDELINES

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc.)
1	4/10/2016	Problems from module 1 and 2
2	28/9/2016	Problems from module 4

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- Chaudhary. B, The elements of Complex Analysis, Wiley Eastern.
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- E.T.Copson, Complex variables.
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