SACRED HEART COLLEGE (AUTONOMOUS)

Department of Mathematics

BACHELOR OF SCIENCE IN MATHEMATICS

Course plan

Academic Year 2018-19

Semester 6

COURSE PLAN

PROGRAMME	BACHELOR OF SCIENCE MATHEMATICS	SEMESTER	6
COURSE CODE AND TITLE	15U6CRMAT09: REAL ANALYSIS	CREDIT	4
HOURS/WEEK	5	HOURS/SEM	75
FACULTY NAME	PROF. M.P.SEBASTIAN		

COURSE OBJECTIVES
Understand the basic theorems regarding continuity, derivability, and integrability of functions
Understand the concept of Riemann
Determine the limits of functions
Understand the concepts of sequence and series of functions.

Sessions	Topic	Method	REMARKS
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 interval	Lecture,Group Discussion,Problem 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		

TEXT BOOK

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

COURSE PLAN

PROGRAMME	BACHELOR OF SCIENCE MATHEMATICS	SEMESTER	6
COURSE CODE AND TITLE	15U6CRMAT10: COMPLEX ANALYSIS	CREDIT	4
HOURS/WEEK	5	HOURS/SEM	75
FACULTY NAME	JEET KURIAN MATTAM		

COURSE OBJECTIVES
Understand theorems on limit and continuity of functions of one complex variable
Understand the significance of the Cauchy Riemann equations
Understand the sufficient conditions for differentiability
Understand the relationship between analytic and harmonic functions
Understand the concepts of convergence of complex sequences and series
Understand residue calculus and its applications

Day	Topic	Method	Remarks
	MODULE I BEGINS		
1	Functions of a complex variable	Lecture	
2	Limits	Lecture	
3	Theorems on Limits	Lecture	
4	Continuity	Lecture	
5	Derivatives	Lecture	
6	Differentiation Formulas	Lecture	
7	Cauchy- Riemann Equations	Lecture	
8	Sufficient Conditions for	Lecture	

	Differentiability		
9	Selected exercises on Pages 71,72 and 73	Assignment	
10	Analytic Functions	Lecture	
11	Examples of Analytic FunctionsLecture	Lecture	
12	Harmonic Functions	Lecture	
13	Harmonic Functions (Continued)	Lecture	
14	Selected Exercises on pages 81-82	Seminar	
15	The Exponential Function	Lecture	
16	The Logarithm Function	Lecture	
17	Selected Exercises on pages 97- 98	Seminar	
18	Complex Exponents	Lecture	
19	Selected Exercises on Page 104	Seminar	
20	Trigonometric Functions	Lecture	
21	Selected Exercises on Pages 108-109	Seminar	
22	Hyperbolic Functions	Lecture	
23	Selected Exercises on Pages 111-112	Seminar	
24	Inverse Trigonometric and Hyperbolic Functions	Lecture	
25	Selected Exercises on Pages 114-115	Seminar	
	(MODULE II BEGINS)		
26	Derivatives of Functions	Lecture	
27	Definite Integrals of Functions	Lecture	
28	Selected Exercises on Pages 121	Assignment	
29	Contours	Lecture	
30	Selected Exercises on pages 125-126	Seminar	
31	Contour Integrals	Lecture	
32	Some Examples of Contour Integrals	Lecture	
33	Upper Bounds for Moduli of Contour integrals	Lecture	
34	Examples and Selected Exercises on pages 141	Seminar	
35	Antiderivatives	Lecture	

36	Cauchy Goursat Theorem	Lecture	
37	Simply Connected Domains	Lecture	
38	Multiply Connected Domains	Lecture	
39	Selected Exercises on Pages 160,161 & 162	Assignment	
40	Cauchy's Integral Formula	Lecture	
41	An extension of Cauchy's Integral Formula	Lecture	
42	Some Consequences of the Extension	Lecture	
43	Selected Exercises on pages 171-172	Seminar	
44	Liouville's Theorem and the Fundamental theorem of Algebra	Lecture	
45	Maximum Modulus Principle	Lecture	
	(MODULE III BEGINS)		
46	Convergence of Sequences	Lecture	
47	Convergence of Series	Lecture	
48	Selected Exercises on Pages 188-189	Assignment	
49	Taylor Series	Lecture	
50	Proof of Taylor's theorem	Lecture	
51	Examples of Taylor's series	Lecture	
52	Selected Exercises on pages 196-197	Seminar	
53	Laurent Series	Lecture	
54	Examples of Laurent Series	Lecture	
55	Selected Exercises on pages 205-207	Assignment	
	MODULE IV BEGINS	Lecture	
56	Isolated Singular Points	Lecture	
57	Residues	Lecture	
58	Examples	Lecture	
59	Cauchy's Residue Theorem	Lecture	
60	Selected Exercises on pages 239-240	Seminar	
61	The three types of isolated singular points	Lecture	
62	Examples	Lecture	
63	Selected Exercises on pages 243-244	Assignment	

64	Residues at Poles	Lecture	
65	Examples	Lecture	
66	Selected Exercises on pages 248-249	Seminar	
67	Evaluation of improper integrals	Lecture	
68	Evaluation of improper integrals (Continued)	Lecture	
69	Examples	Lecture	
70	Selected Exercises on pages 267-268	Seminar	
71	Improper integrals from Fourier Analysis	Lecture	
72	Improper integrals from Fourier Analysis (Continued)	Lecture	
73	Jordan’s Lemma	Lecture	
74	Definite Integrals involving Sines and Cosines	Lecture	
75	Selected Exercises on Pages 275 - 276 and 290-291	Seminar	

COURSE PLAN

PROGRAMME	BACHELOR OF SCIENCE MATHEMATICS	SEMESTER	6
COURSE CODE AND TITLE	15U6CRMAT11: DISCRETE MATHEMATICS	CREDIT	4
HOURS/WEEK	5	HOURS/SEM	75
FACULTY NAME	SANIL JOSE		

COURSE OBJECTIVES
Understand the concept of graph
Understand the applications of graphs
Understand lattices and their applications
Understand cryptography and its applications.

Text Book

0 John Clark Derek Allen Holton - A first look at graph theory, Allied Publishers

1 David M Burton - Elementary Number Theory 6th Edition TMH

2 Vijay K. Khanna - Lattices and Boolean Algebras- First Concepts, Vikas Publishing House Pvt Ltd.

Sessions	Topic
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

Reference Books

1. Symbolic logic (Fifth edition) – Irving M. Copi, Macmillan Publishing Co., Inc New York. 2. Elements of Discrete Mathematics (Second Edition), C. L. Liu, Tata McGraw – Hill publishing Company Limited New Delhi.
3. Discrete Mathematics (Second Edition), Schaum's Outlines, Seymour Lipschutz, More Lars Lipson, Tata McGraw – Hill Publishing Company Limited, New Delhi.
4. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay, R. Manohar, Tata McGraw – Hill Publishing Company Limited (1974), New Delhi.
5. Discrete Mathematics, G. K. Ranganath and B. Sooryanarayana. S. Chand & Company Ltd. 7361, Ramnagar, New Delhi-110055.
6. Discrete Mathematical Structures (Third Edition), Bernard Kolman, Robert C. Busby, Sharon Ross, Prentice Hall of India private Limited, (2001), New Delhi110 001.

COURSE PLAN

PROGRAMME	BACHELOR OF SCIENCE MATHEMATICS	SEMESTER	6
COURSE CODE AND TITLE	15U6CRMAT12: LINEAR ALGEBRA AND METRIC SPACES	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	MARIA SEBASTIAN		

COURSE OBJECTIVES
Explain the concepts of vector space , linear independence and dependence
Apply the concepts of basis and rank
Analyze the concepts of linear transformation and compute the matrix representations
Analyze the concepts of metric spaces
Explain the convergence of sequence
Analyze complete metric spaces and continuous mapping theorem

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I				
1	Introductory Session	PPT		
2	Definition of vector space	Problem solving		
3	Examples	Lecture		
4	Solving exercise 2.1	Problem solving		
5	Theorems	Lecture		
6	Subspaces-Definition	Problem solving		
7	Examples	Lecture		
8	Solving exercise 2.2	Lecture		
9	Theorems	Lecture		
10	Linear dependence and independence	Lecture/Problem solving		
11	Problems	Lecture		
12	Theorems	Lecture/Problem solving		
13	Basis	Lecture/Problem solving		

14	Examples	Lecture		
15	Theorems	Lecture/Problem solving		
16	Theorems	Lecture		
17	Dimension of Vector space	Lecture/Problem solving		
MODULE II				
18	Coordinate representation	PPT/Lecture		
19	Problems	Lecture		
20	Row space of a matrix			
21	Examples and theorems	Lecture		
22	Theorems	Lecture		
23	Revision of module 1	Lecture/Problem solving		
24	Test paper 1	Lecture/Problem solving		
25	Introduction to module 2	Lecture/Problem solving		
26	Functions	Lecture/Problem solving		
27	Linear Transformation	Lecture/Problem solving		
28	Examples	Lecture/Problem solving		
29	problems	Lecture/Problem solving		
30	problems	Lecture/Problem solving		
	CIA-1			
31	Matrix representations	Lecture		
32	Problems	Lecture/Problem solving		
33	Exercise problem	Lecture/Problem solving		
34	Change of basis	Lecture/Problem solving		
35	Theorems	Lecture		
36	Problems	Lecture/Problem solving		
MODULE III				
37	Properties of linear transformation	Lecture/Problem solving		
38	Kernel of a matrix	Lecture/Problem solving		

39	Problems	Lecture/Problem solving		
40	Image of a linear transformation	Lecture/Problem solving		
41	Problems	Lecture/Problem solving		
42	Theorems	Lecture/Problem solving		
43	Rank-Nullity Theorem	Lecture/Problem solving		
44	Theorems	Lecture/Problem solving		
45	One–one and onto linear transformation	Lecture/Problem solving		
46	Problems	Lecture/Problem solving		
47	Exercise problems 3.5	Lecture/Problem solving		
48	Revision of module 2	Lecture/Problem solving		
49	Test Paper 2	Lecture/Problem solving		
50	Introduction to module 3	Lecture/Problem solving		
51	Metric-Definition	Lecture/Problem solving		
52	Examples	Lecture/Problem solving		
53	problems	Lecture/Problem solving		
54	problems	Lecture/Problem solving		
Module-IV				
55	More examples on metric spaces	Lecture/Problem solving		
56	Open set-Definition	Lecture/Problem solving		
57	Examples	Lecture/Problem solving		
58	Theorems	Lecture/Problem solving		
59	Theorems	Lecture/Problem solving		
60	Theorems	Lecture/Problem		

		solving		
61	Theorems	Lecture/Problem solving		
62	Interior of a set and its properties	Lecture/Problem solving		
63	Closed set-Definition	Lecture/Problem solving		
64	Examples	Lecture/Problem solving		
CIA - II				
65	Cantor set	Lecture/Problem solving		
66	Properties of cantor set	Lecture/Problem solving		
67	Boundary of a set and its properties	Lecture/Problem solving		
68	Cantor's Intersection Theorem	Problem solving		
69	Theorems	Problem solving		
70	Complete metric space	Problem solving		
71	Continuous mapping	Problem solving		
72	Theorems	Problem solving		
73	Revision			
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	12/1/2019	Vector space problems
2	15/1/2019	Metric space problems

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	31/1/2019	Complete metric space

Textbook

*Richard Bronson,Gabriel B Costa – Linear Algebra An Introduction(Second Edition)

* G.F.Simmons – Introduction to topology and modern analysis(Tata Mc Graw Hill)

References

3 Linear Algebra, Hoffmann, Kunze

Web resource references:

https://www.coursera.org/learn/introduction-to-calculus?

COURSE PLAN

PROGRAMME	BACHELOR OF SCIENCE MATHEMATICS	SEMESTER	6
COURSE CODE AND TITLE	15U6CRMAT13: OPERATIONS RESEARCH	CREDIT	4
HOURS/WEEK	5	HOURS/SEM	75
FACULTY NAME	DR JEENU KURIAN		

COURSE OBJECTIVES
Translate the real world problems into corresponding LPP
Understand the concepts of duality in LPP
Understand the concepts of transportation and assignment problem
Understand the concept of queueing theory

Basic Reference1. Optimization methods in Operations Research and System Analysis - K.V.Mital and C.Mohan

2. Operations Research – J.K.Sharma

Sessions	**Topic**	**Method**	Remarks
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	Hyperplanes , half space and polytopes	Lecturing	
60	Hyperplanes , half space and polytopes	Lecturing	
61	Hyperplanes , half space and polytopes	Lecturing	
62	Hyperplanes , half space and polytopes	Lecturing	
63	Hyperplanes , half space and polytopes	Lecturing	
64	Separating and supporting hyperplanes	Lecturing	
65	Separating and supporting hyperplanes	Lecturing	
66	CIA		
67	Discussion on CIA		
68	Revision		
69	Revision		
70	Revision		
71	Revision		

72	Revision		
73	Revision		
74	Revision		
75	Revision		