

**ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)  
CUDDALORE-1**



**PG & RESEARCH DEPARTMENT OF MATHEMATICS**

**M.Phil. MATHEMATICS**

**SYLLABUS (2020-2021)**

**PG AND RESEARCH DEPARTMENT OF MATHEMATICS**

**CURRICULUM TEMPLATE**

**M.Phil. MATHEMATICS**

**SEMESTER – I**

S.No	Part		Hours/ Week	Credit	Course Code	Course Title	Maximum Marks		
							CIA	ESE	TOTAL
1	III	Core Theory - 1	6	5	MMT101A	Algebra and Analysis	25	75	100
2	III	Core Theory - 2	6	5	MMT102A	Topology and Differential Equations	25	75	100
3	III	Core Theory - 3	6	5	GMT201	Elective Paper (Guide Paper)	25	75	100
4	III	Library	12	-		Science-6 (Library)+6(Lab)	-	-	-
<b>Semester Total</b>			<b>30</b>	<b>15</b>			<b>75</b>	<b>225</b>	<b>300</b>

**SEMESTER – II**

S.No	Part		Hours/ Week	Credit	Course Code	Course Title	Maximum Marks		
							CIA	ESE	TOTAL
5	III	Core Theory - 1		21	JMT201	Dissertation and Viva Voice	100	100	200
<b>Semester Total</b>				<b>21</b>			<b>100</b>	<b>100</b>	<b>200</b>

**Syllabus - Mathematics**

<b>YEAR – I</b>	<b>ALGEBRA AND ANALYSIS FOR THE STUDENT ADMITTED FROM 2016</b>	<b>MMT101A</b>
<b>SEMESTER –I</b>		<b>Hrs / Week: 6</b>
<b>CORE – I</b>		<b>Credit: 5</b>

**OBJECTIVES:**

The course aims to apply the concepts of Rings, Ideals, Modules of Fractions and Primary Decomposition, Abstract Integration,  $L^p$  – spaces, Fourier Transforms and Holomorphic Fourier Transforms in Research Paper.

**COURSE OUTCOME:**

- CO1: Knowing the advance concepts of rings, ideals and modules.
- CO2: Getting the knowledge of rings modules of Fractions and primary decomposition.
- CO3: Knowing the advanced concepts of measure theory and HP spaces.
- CO4: Knowing the Fourier transforms and some new types.
- CO5: Getting the basic knowledge of research methodology

SEMESTER IV	COURSE CODE: MMT101A	COURSE TITLE: ALGEBRA AND ANALYSIS	HOURS: 6	CREDIT: 5												
COURSE OUTCOME	PROGRAMME OUTCOME (PO)					PROGRAMME SPECIFIC OUTCOME(PSO)										Mean Score of CO's
	P O 1	P O 2	P O 3	P O 4	P O 5	P S O 1	P S O 2	P S O 2	P S O 4	P S O 5	P S O 6	P S O 7	P S O 8	P S O 9	PSO 10	
CO1	4	5	4	3	2	4	3	4	3	4	3	4	4	5	4	3.6
CO2	5	5	5	4	2	3	4	5	4	3	4	3	3	5	4	3.6
CO3	3	4	4	3	2	5	4	3	5	4	4	4	5	3	3	4.0
CO4	4	5	3	4	2	5	4	4	5	4	3	5	4	4	5	3.9
CO5	3	5	5	3	2	4	4	3	5	4	4	5	3	5	5	3.6
Mean Overall Score															3.7	

Result: The Score of this Course is 3.7 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	$0 \leq \text{rating} \leq 1$	$1.1 \leq \text{rating} \leq 2$	$2.1 \leq \text{rating} \leq 3$	$3.1 \leq \text{rating} \leq 4$	$4.1 \leq \text{rating} \leq 5$
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

### **UNIT I: RINGS, IDEALS AND MODULES**

Rings and ring homomorphism-Ideals, Quotient rings-Zero-divisors, Nil potent elements, units-Prime ideals and maximum ideals-Nil radical and Jacobson radical-operations on ideals-extension and contraction-exercises-Modules and module homomorphism-sub modules and quotient modules-operation on sub modules-Direct sum and product-Finitely generated modules. -Exercises.

### **UNIT-II: RINGS, MODULES OF FRACTIONS AND PRIMARY DECOMPOSITION**

Extract sequences-Tensor product of modules-Restriction and extension of scalars-Exactness properties of the tensor product-Algebra-Tensor product of algebras-Local properties-Extended and contracted ideals in rings of fractions Exercises- Primary decomposition – Exercise.

### **UNIT-III: ABSTRACT INTEGRATION AND $L^p$ – SPACES**

#### **$L^p$ – Spaces**

Convex Function and Inequalities – The  $L^p$ – Spaces – Approximation by Continuous Functions – The Inversion Theorem.

#### **$H^p$ Spaces**

The concept of  $H^p$ spaces-the role played by the  $H^p$ spaces-simple functions –inequalities-Exercises.

### **UNIT-IV:FOURIER TRANSFORMS AND HOLOMORPHIC FOURIER TRANSFORMS**

Formal properties – The Invention Theorem – thePlancheral Theorem – The Banach algebra Li- Introduction – Two Theorems of Paley and Wiener – Quasi – analytic classes – The Denjoy- Carleman theorem.

### **UNIT-V: RESEARCH METHODOLOGY**

Research – Research methods and methodology –Types of Research – Mode of approach– Art of writing a Research paper and thesis

### **TEXT BOOKS:**

1. M.F. Atiyah, I.G. Macdonald, Introduction to Commutative Algebra, Addison – Wesley Publishing Company, 1969.  
Unit-I Chapter – 1 (pg 1-10), Chapter – 2 (pg 17 – 31)  
Unit-II Chapter - 3 ( pg 36 – 43), Chapter – 4 (pg 50 – 55)
2. Walter Rudin, Real and Complex Analysis II Edition, McGraw Hill International, 1986.  
Unit – III Chapter - 3 (pg61 – 70), Chapter – 17 (pg335 – 355),  
Unit-IV Chapter – 9 (pg 178 – 193), Chapter – 19(pg 371 – 383) .
3. Unit-V Research Methodologyby S Rajasekar, P Philominathan and V Chinnathambi, e-material at <http://arxiv.org/pdf/physics/0601009.pdf>

<b>YEAR – I</b>	<b>TOPOLOGY AND DIFFERENTIAL EQUATIONS</b>	<b>MMT102A</b>
<b>SEMESTER –I</b>		<b>Hrs / Week: 6</b>
<b>CORE-2</b>		<b>Credit: 5</b>
FOR THE STUDENT ADMITTED FROM 2016		

**OBJECTIVES:**

The course aims to apply the concepts Fundamental Group, Covering Spaces, Simplified Complexes, Linear Systems, and Non Linear Systems: Local Theory, Techniques and Dynamics of Teaching- Learning in Research Paper.

**COURSE OUTCOME:**

CO1: Get Knowing the fundamental group and covering spaces

CO2: Knowing the simplicial complexes.

CO3: Knowing the linear systems

CO4: getting the knowledge of nonlinear systems: local theory

CO5: Knowing the techniques and dynamic of teaching.

SEMESTER IV	COURSE CODE: MMT102A	COURSE TITLE : TOPOLOGY AND DIFFERENTIAL EQUATIONS	HOURS: 6	CREDIT: 5												
COURSE OUTCOME	PROGRAMME OUTCOME (PO)					PROGRAMME SPECIFIC OUTCOME(PSO)										Mean Score of CO's
	P1	P2	P3	P4	P5	PSO 1	PSO 2	PSO 2	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	
CO1	4	5	4	3	2	4	3	4	3	4	3	4	4	5	4	3.6
CO2	5	5	5	4	2	3	4	5	4	3	4	3	3	5	4	3.5
CO3	3	4	4	3	2	5	4	3	5	4	4	4	5	3	3	4.0
CO4	4	5	3	4	2	5	4	4	5	4	3	5	4	4	5	3.9
CO5	3	5	5	3	2	4	4	3	5	4	4	5	3	5	5	3.6
Mean Overall Score															3.67	

Result: The Score of this Course is 3.67 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcomes and Programme Specific Outcomes.

**UNIT –I: FUNDAMENTAL GROUP AND COVERING SPACES**

Homotopy – Fundamental group – Covering spaces.

**UNIT – II: SIMPLICIAL COMPLEXES**

Geometry of Simplicial Complexes - Bary Centric subdivisions – Simplicial approximation Theorem – Fundamental Group of a simplicial Complex.

**UNIT-III: LINEAR SYSTEMS**

Uncoupled Linear System – Diagonalization – Exponentials operators – The Fundamental Theorem for linear system – Linear System in  $R^2$  – Complex Eigen Values – Multiple Eigen Values – Non Homogeneous Linear System.

**UNIT-IV: NON LINEAR SYSTEMS: LOCAL THEORY**

Some preliminary concepts & definitions – The Fundamental Existence – Uniqueness Theorem – Dependence on Initial Conditions and Parameters – The Maximum Interval of Existence- The Flow Defined by a Differential Equation.

**UNIT-V: TECHNIQUES AND DYNAMICS OF TEACHING- LEARNING**

- a. Emerging trends in Educational Psychology– Meaning, Scope and Methods
- b. Learning–Different Theories of learning, Approaches to learning(Classical Conditioning- Ivan Pavlov; Operant conditioning-B.F.Skinner); kinds of learning, factors affecting learning
- c. Motivation: Intrinsic and extrinsic motivation, Development of memory and intelligence.

**TEXT BOOKS:**

1. I.M.Singer, J.A.Thorpe, Lecture notes on Elementary Topology and Geometry, Springer- Verlag, Newyork,1967.  
Unit-I -Chapter -3 ,pg(49-77)Unit-II-Chapter -4 ,pg (78-108)
2. L. Pergo, Differential Equation and Dynamical System, third edition, Springer – Verlag, Newyork,2006  
Unit-III Chapter -1,sections (1.1 to 1.7and 1.10) –pg(1-39 , 60-63)  
Unit-IV Chapter -2,sections (2.1 to 2.5)-pg(65-101)
3. Unit-V : Covey, Stephen. (2004),7 Habits of Highly effective people, Free Press.  
Driscoll, M. P. (2005),Psychology of Learning for Instruction, Pearson HigherEd.  
Gardner, Howard (1983; 1993) Frames of Mind: The theory of multiple intelligences, New York: Basic Books

**QUESTION PATTERN**

**Internal Examination (25 marks)**

Two Internal Examinations	15 marks
Assignment / Seminar	10 marks
<b>Total</b>	<b>25 marks</b>

**External Examination (75 marks)**

**Question Pattern**

**M. Phil. COMPUTER SCIENCE**

**Time: 3 Hours**

**Max. Marks: 75**

PART A (5x6=30)

**ANSWER ALL FIVE QUESTIONS**

Internal Choice (Either or Pattern)

PART B (3x15=45)

**ANSWER ANY THREE QUESTIONS**

Out of Six Questions (Open Choice)

**TOTAL (30+45=75)**