

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



**PG & RESEARCH DEPARTMENT OF MATHEMATICS**

**M.Phil. MATHEMATICS**

**SYLLABUS (2017-2018)**

## CURRICULUM DESIGN TEMPLATE

<b>Yr/ Sem</b>	<b>Subject</b>	<b>SUB CODE</b>	<b>Paper</b>	<b>Title of the paper</b>	<b>Hrs</b>	<b>Credits</b>
I YEAR / I SEM	Core	MMT101A	I	<b>ALGEBRA AND ANALYSIS</b>	6	5
	Core	MMT102A	II	<b>TOPOLOGY AND DIFFERENTIAL EQUATIONS</b>	6	5
II SEM	Core	GMT201	III	<b>GUIDE PAPER</b>	6	5
II SEM	Core	JMT201	IV	<b>DISSERTATION AND VIVA VOCE</b>		19

<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>

### **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 (pg. 335 – 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> FOR THE STUDENT ADMITTED FROM 2016	<b>MMT102A</b>
<b>SEMESTER –I</b>		<b>Hrs / Week: 6</b>
<b>CORE-2</b>		<b>Credit: 5</b>

### **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, Spring-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, thirdedition, 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), Habits of Highly effective people, Free Press.  
Driscoll. M. P. (2005),Psychology of Learning for Instruction, Pearson Higher Ed.  
Gardner, Howard (1983; 1993) Frames of Mind: The theory of multiple intelligences, New York: Basic Books

## **QUESTION PATTERN**

**Time: 3Hrs**

**Max. Marks: 75**

**Section – A**

**5x6=30**

**Answer ALL Questions (Either or Type)**

**Section – B**

**3x15=45**

**Answer any THREE Questions (Out of five)**