



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Science College  
Semester-1 (M.Sc.)

**Subject:** Mathematics Practical-MSMA11506

**Type of course:** Major

**Prerequisite:** Real Analysis, Number Theory, Topology, Differential Equations.

**Rationale:** Number Theory is a branch of mathematics that focuses on the properties and relationships of integers and their fundamental structures. The field of topology is a branch of mathematics that studies the properties of spaces that are preserved under continuous deformations. The study of differential equations requires a solid understanding of several mathematical concepts.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks					Total Marks
CI	T	P		Theory Marks		Practical Marks		CA	
			ESE	MSE	V	P	ALA		
0	0	12	6	00	00	40	80	30	150

*Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1.	<b>Journal:</b> Unit wise Practical will be given by faculty and students will prepare Journal for the Practicals.	30



**List of Practical:**

Sr. No	Descriptions	Hrs
1.	Write down all possible algebra of sets of $X=\{a,b,c,d\}$	3
2.	Define F6 set and show that following intervals are F6 set for every $a,b \in \mathbb{R}$ (i) $[a,b]$ (ii) $[a,b)$ (iii) $(a,b]$ (iv) $(a,b)$	3
3.	Show that the lebesgue measure function is finite additive.	3
4.	Show that the lebesgue measure function $m$ is countable subadditive.	3
5.	Let $E_1$ and $E_2$ are measurable sets then show that $m(E_1 \cup E_2) + m(E_1 \cap E_2) = m(E_1) + m(E_2)$	3
6.	Show that $f : [2,5] \rightarrow [-\infty, \infty]$ given by $f(x)=x-1 ; \forall x \in [2,5]$ is a measurable function.	3
7.	Let $\Phi : \mathbb{R} \rightarrow [-\infty, \infty]$ be defined as given function $\Phi(x) = \begin{cases} -4 & \text{if } x \in (1,3] \cup \{-2,-1\} \\ -1 & \text{if } x \in (5,6) \cup (9,11) \\ 3 & \text{if } x \in (0,1) \cup (-3,-2) \\ 2 & \text{if } x \in (-5,-4) \cup (-3,-2) \\ 0 & \text{otherwise} \end{cases}$	3
8.	Using euclidean algorithm to obtain integer $x$ and $y(1)$ $\gcd(56,72) = 56x + 72y$ $(2)\gcd(20,128) = 20x + 128y$	3
9.	Prove that the only prime $P$ for which $3P + 1$ is perfect square (where $p=s$ )	3
10.	Verify that $\gcd(a,b) \operatorname{lcm}(a,b) = a \cdot b$ , $a = 119$ $b = 272$	3
11.	Find all positive solutions of the linear diophantine equation.(a) $172x + 20y = 1000$	3
12.	There is an infinite number of prime numbers of the form $4k + 3$ .	3
13.	Find the remainder when sum $1! + 2!+3!+ \dots +100!$ is divisible by 12	3



14.	Let P be a prime then prove that $(p-1)! \equiv (p-1) \pmod{(1+2+\dots+(p-1))}$	3
15.	p and q are twin prime then $ \sigma(P) - \sigma(q)  = 2$	3
16.	In usual notation prove the following results (1) $X^{\circ} = X, \emptyset^{\circ} = \emptyset$ (2) $A^{\circ} \subset A$ (3) $A \subset B \Rightarrow A^{\circ} \subset B^{\circ}$ (4) $(A \cap B)^{\circ} = A^{\circ} \cap B^{\circ}$	3
17.	Let $\zeta = \{X, \emptyset, \{p\}, \{p,q\}, \{p,q,t\}, \{p,q,r,s\}, \{p,r,s\}\}$ be a topology on X. $X = \{p,q,r,s,t\}$ . determine the closure of A .A = $\{r,s,t\}$	3
19.	Two open sets of topological space are separated iff they are disjoint.	3
20.	Prove that a topological $(X, \zeta)$ is disconnected iff there exists a nonempty proper subset of X which is both $\zeta$ -open and $\zeta$ -closed in x.	3
21.	Prove that a continuous image of a connected space is connected.	3
22.	Define and prove co-countable topology.	3
23.	Show that every discrete topological space is $T_0$ space, $T_1$ space, $T_2$ space.	3
24.	Solve : $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$	3
25.	Solve: $(y-z)p + (x-y)q = (z-x)$	3
26.	Solve : $yzp + zxq = xy$	3
27.	Solve : $r-4s+4t = e^{2x+y}$	3
28.	Solve : $(D^2 + 2DD' + D'^2)Z + e^{2x+3y}$	3
29.	Solve : $(D^2 - 6DD' + 9D'^2)Z = 6x+2y$	3
30.	Express $F(n) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of legendre's polynomial.	3
	<b>Total</b>	<b>90</b>



**Suggested Specification table with Marks (Theory) : 60**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	30%	20%	10%	20%	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Instructional Method:**

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

