	National Institute of Technology Meghalaya An Institute of National Importance	**CURRICULUM**

Programme	**Master of Science**	Year of Regulation	**2018-19**
Department	**Mathematics**	Semester	**IV**

Course Code	Course Name	Pre-requisite	Credit Structure				Marks Distribution			
			L	T	P	C	INT	MID	END	Total
MA 552	**Advanced Number Theory**	**NIL**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	Number theory is strongly connected with many other branches of mathematics. The objective of the course is to present a balance view of the subject to gain insights into the many branches of number theory.	Course Outcomes	CO1	Understand the concept of congruences and use various results related to congruences including the Chinese Remainder Theorem and congruences of higher degree.
			CO2	Understand the concept of quadratic Gaussian sums and reciprocity.
			CO3	Know about Gauss and Jacobi Sums and their applications.
			CO4	Solve certain types of Diophantine equations.
			CO5	Know writing real number in continued fraction and applications involving continued fraction.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1															
2	CO2															
3	CO3															
4	CO4															
5	CO5															

SYLLABUS

No.	Content	Hours	Cos
I	Review of congruences, Euler's function, results of Fermat, Euler and Wilson; linear congruences, Chinese remainder theorem. Primitive roots and the group structure of $U(\mathbb{Z}/n\mathbb{Z})$; applications to congruences of higher degree.	**8**	**CO1**
II	Quadratic Gaussian Sums and Reciprocity: Quadratic Residues, Gaussian reciprocity law, the Jacobi symbol, Quadratic Gauss Sums, Sign of the Quadratic Gauss Sum.	**8**	**CO2**
III	Gauss and Jacobi Sums: Finite Field and its properties, Gauss Sums, Jacobi sum, the equation $x^n + y^n = 1$.	**8**	**CO3**
IV	Diophantine equations. Linear equations, the equation $x^2 + y^2 = z^2$. Method of Descent; the equation $x^4 + y^4 = z^2$.	**6**	**CO4**
V	Simple continued fractions. Infinite continued fractions and irrational numbers. Periodic continued fractions.	**6**	**CO5**
	Total Hours	**36**	

Essential Readings

1. S. K. Ireland and M. Rosen, "A Classical Introduction to Modern Number Theory", Springer, 2nd edition, 2009.
2. I. Niven and H. S. Zuckerman, "An Introduction to the Theory of Numbers", Wiley, 5th edition, 2005.

Supplementary Readings

1. J. H. Silverman, "A Friendly Introduction to Number Theory", Pearson Education India, 4th edition, 2014.
2. D. M. Burton, "Elementary Number Theory", McGraw Hill Education, 7th edition, 2017.