NUMBER THEORY

THEORY OF NUMBERS IS ONE OF THE OLDEST BARANCH OF MATHEMATICS. EUCLID (300 B. C.), A GREEK MATHEMATICIAN, WAS ONE OF THE EARLY MATHEMATICIANS WHO MADE SUBSTANTIAL CONTRIBUTION TO THE THEORY OF NUMBERS.

BEFORE 1000 A.D., THE SUBJECT HAD FLOURISHED IN THE HANDS OF CHINESE, INDIAN AND GREEK MATHEMATICIANS WHO STUDIED IT SYSTEMATICALLY AND MADE SIGNIFICANT CONTRIBUTIONS TO IT. DURING THE LAST FOUR CENTURIES, THE SUBJECT HAS ENGAGED THE ATTENTION OF GREAT MATHEMATICIANS LIKE FERMAT (1601 – 1665), EULER (1707 – 1783), LEGENDRE (1752 – 1833), GAUSS (1777 – 1855) AND MANY OTHERS.

ORIGINALLY THIS BRANCH STARTED WITH THE STUDY OF NATURAL NUMBERS AND THEIR PROPERTIES. SUBSEQUENTLY, IT DEVELOPED WITH THE GROWTH OF THE NUMBER SYSTEM. BESIDES, THE ATTEMPTS TO SOLVE CERTAIN DIFFICULT PROBLEMS OF NUMBER THEORY LED TO THE DEVELOPMENT OF SOME IMPORTANT BRANCHES OF MATHEMATICS SUCH AS MODERN ALGEBRA AND THE THEORY OF FUNCTIONS OF A COMPLEX VARIABLE.

APPLICATIONS:

CRYPTOGRAPHY, CODING THEORY, PHYSICS, DIGITAL INFORMATION, COMPUTING AND AUTOMATED TELLER MACHINE (ATM).

DEFINITION

NUMBER THEORY IS THE BRANCH OF MATHEMATICS CONCERNED WITH THE PROPERTIES OF NUMBERS IN GENERAL, AND INTEGERS IN PARTICULAR, AS WELL AS THE WIDER CLASSES OF PROBLEMS THAT ARISE FROM THEIR STUDY.

TOPICS

IN THIS COURSE, WE WILL STUDY THE FOLLOWING TOPICS:

NUMBER THEORY

a. THE INTEGERS, PROPERTIES, INTEGER REPRESENTATION
b. DIVISIBILITY
c. PRIME NUMBERS AND GREATEST COMMON   DIVISORS
d. CONGRUENCES
e. APPLICATIONS OF CONGRUENCIES

BOOKS

a. ELEMENTARY NUMBER THEORY AND ITS APPLICATIONS BY KENNETH H. ROSEN.
b. ELEMENTARY NUMBER THEORY BY DAVID M. BURTON.
c. A COURSE IN NUMBER THEORY AND CRYPTOGRAPHY BY N. KOBLITZ.
d. INTRODUCTION TO NUMBER THEORY BY PRENTICE HALL.
e. AN INTRODUCTION OF THEORY OF NUMBERS BY G. H. HARDY AND E. M. WRIGHT.

GRADING CRITERIA

ASSIGNMENTS	10%
QUIZZES	10%
MID TERM EXAMS	30%
FINAL	50%

REVIEW

SET THEORY

- SET
- FINITE SETS
- INFINITE SETS
- SUBSET

NUMBER THEORY

- PROPER SUBSET
- IMPROPER SUBSET
- NULL SET
- UNIVERSAL SET
- DISJOINT SETS
- EQUAL SETS
- OPERATIONS
    a. UNION
    b. INTERSECTION
    c. COMPLEMENT OF A SET
    d. CARTESIAN PRODUCT
- RELATIONS
    a. REFLEXIVE
    b. SYMMETRIC
    c. TRANSITIVE
- EQUIALENCE RELATION
- BINARY OPERATION
- PROPERTIES
    a. CLOSURE

    b. COMMUTATIVE
    c. ASSOCIATIVE
    d. DISTRIBUTIVE
    e. IDENTITY (ADDITIVE AND MULTIPLICATIVE)
    f. INVERSE (ADDITIVE AND MULTIPLICATIVE)

SETS OF NUMBERS AND THEIR NOTATIONS

    a. REAL NUMBERS: R
    b. INTEGERS: Z
    c. NATURAL NUMBERS: N

NUMBER THEORY

d. RATIONAL NUMBERS: Q

e. IRRATIONAL NUMBERS: Q'

f. WHOLE NUMBERS: W

g. EVEN NUMBERS: E

h. ODD NUMERS: O

i. PRIME NUMBERS $P, ETC....$