Faculty: Science
Department: Mathematics **Program: Bachelor's**

Course Plan

First: Course Information

Course Name	**Number Theory**		**Course Number**		**0301342**	
Credit Hours	**3 hours**	**Theoretical**	**3 hours**		**Practical**	**0 hours**
Prerequisite	**0103151**	**Section Number: 1**			**Lecture Time: 9:00 – 10:00**	
Level in JNQF	**7**					
Type Of Course	☐	**Obligatory Faculty Requirement**		☐	**Elective University Requirement**	
	☐	**Obligatory University Requirement**		☐	**Faculty Requirement**	
	☐	**Course Elective Specialty Requirement**		■	**Obligatory Specialization Requirement**	
Type of Learning	■	**Face-to-Face Learning**				
	☐	**Blended Learning (2 Face-to-Face + 1 Asynchronous)**				
	☐	**Online Learning (2 Synchronous + 1 Asynchronous)**				

Third: Course Description

Divisibility, division algorithm, greatest common divisor and least common multiple, Diophantine equation, primes and their distributions, the fundamental theorem of arithmetic, congruences, binary and decimal representations of integers, divisibility tests, linear congruences, Chinese remainder theorem, Fermat's theorem, Wilson's theorem, theoretic functions, Euler's theorem, primitive roots

Fourth: Course Objectives

Upon completion of this course, the student should be able to

1. Understanding the concepts of divisibility, division algorithm, Euclidean algorithm, greatest common divisor, prime numbers, congruences.
2. Follow and to construct a formal mathematical proof using each of the following methods: a direct proof, a proof by contradiction and a proof by induction.
3. Demonstrate an understanding of the relationship of number theory to other branches of mathematics and to related fields.
4. Independently explore related topics using resources other than the text.

Fifth: Learning Source

Main Reference			**Elementary Number Theory**							
Author: David M. Burton			**Issue No.: Sixth Edition**			**Publication Year:2007**				
Additional Sources & Websites			**Elementary Number Theory, by Kenneth H. Rosen**							
Teaching Type	■	**Classroom**	☐	**Laboratory**	☐	**Workshop**	☐	**MSTeams**	■	**Moodle**

Sixth: Learning Outcomes

Level descriptor according to (JNQF)	**CILOs Code**	**CILOs**	**Associated PILOs Code** Choose one PILO for each CILO*	**Assessment method**** Choose at least two methods	**Scores out of 100** State the total score identified for each CILO	**Minimum acceptable Score/percentage (%)** The percentage should not be less than 50% ***
Knowledge	K1	Define and illustrate the concept of divisibility, greatest common divisor, least	PK1	First Exam, Second Exam,	10	5 (50%)

		common multiple, congruences and prime numbers.		Final Exam		
	K2	Comprehend basic properties of division.	PK2	First Exam, Second Exam, Final Exam, Assignment	22	11 (50%)
	K3	Comprehend the Euclidean algorithm	PK2			
	K4	Comprehend basic properties of prime numbers	PK2			
	K5	Comprehend the fundamental theorem of arithmetic	PK2			
	K6	Comprehend the decimal representation	PK2			
	K7	Define and illustrate the concept of theoretic and multiplicative function	PK2			
Skills	S1	Employ basic properties of division	PS1	First Exam, Assignment	6	3 (50%)
	S2	Employ the Euclidean algorithm to find greatest common divisor	PS2	First Exam, Second Exam, Final Exam, Assignment	36	18 (50%)
	S3	Find integer solutions of Diophantine equations.	PS2			
	S4	Determine whether the number is prime or composite.	PS2			
	S5	Write the canonical form of positive integers	PS2			
	S6	Discuss divisibility for special numbers.	PS2			
	S7	Find the remainder of division numbers	PS2			
	S8	Solve linear congruences	PS2			
	S9	Employ Chinese remainder theorem to solve systems of linear congruences	PS2			
	S10	Find the remainder of the division using Fermat Little Theorem, Euler Theorem and Wilson Theorem	PS3	Second Exam, Final Exam	10	5 (50%)
	S11	Prove some fundamental theorems in Number Theory	PS3			
Competencies	C1	Working in a team to handle some advanced topics in number theory	PC3	Assignment	4	2 (50%)
	C2	Develop the personal skills and capacity to carry responsibility	PC1	Second Exam, Final Exam, Assignment	12	6 (50%)

***Refer to document ( ) and page 2 in document ( )**
**** Refer to document ( )**
****80% of the students must achieve the minimum acceptable percentage or higher for each CILO**

Seventh: Course Structure

Lecture Date	Intended Teaching Outcomes(ILOs)	Topics	Teaching Procedures*	Teaching Methods**	References
		Introduction to the Course	Face-to-Face	Lectures, cooperative learning and discussion	Main Reference
Divisibility Theory in the Integers					

	K1, K2	Divisibility Theory in the Integers	Face-to-Face	Lectures, cooperative learning and discussion	13-16
	K1, K2, S1, S11	Some Properties	Face-to-Face	Lectures, cooperative learning and discussion	13-16
	K1, K2, S1, S11	The Division Algorithm	Face-to-Face	Lectures, cooperative learning and discussion	17-18
	S1, S2, C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	19
	K1, S2	Greatest Common Divisor	Face-to-Face	Lectures, cooperative learning and discussion	20-22
	K1, S2, S11	Properties of Greatest Common Divisor	Face-to-Face	Lectures, cooperative learning and discussion	23-24
	K1, S2, C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	25
	K3, S2, S11	The Euclidean Algorithm	Face-to-Face	Lectures, cooperative learning and discussion	26-28
	K3, S2, S11, C1, C2	Applications on The Euclidean Algorithm	Face-to-Face	Lectures, cooperative learning and discussion	29
	K1, S2	Least Common Multiple	Face-to-Face	Lectures, cooperative learning and discussion	29-30
	K1, S2, , C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	31
	S3, S11	Diophantine Equations (1)	Face-to-Face	Lectures, cooperative learning and discussion	32-34
	S3, S11, C1	Diophantine Equations (2)	Face-to-Face	Lectures, cooperative learning and discussion	34-37
First Exam					
Primes and Their Distribution					
	K1, K4, S4	Prime Numbers	Face-to-Face	Lectures, cooperative learning and discussion	39-40
	K5, S5	The Fundamental Theorem of Arithmetic	Face-to-Face	Lectures, cooperative learning and discussion	41-42
	K4, K5, S4, S5, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	43
	K1, K4, S4	The Distribution of Primes and Sieve of Eratosthene	Face-to-Face	Lectures, cooperative learning and discussion	44-46
	K4, K5, S4, S5, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	49
	K1, K4, S4	The Goldbach Conjecture	Face-to-Face	Lectures, cooperative learning and discussion	50-52
The Theory of Congruences					
	K1, S7	Basic Properties of Congruence (1)	Face-to-Face	Lectures, cooperative learning and discussion	64-65
	K1, S7	Basic Properties of Congruence (2)	Face-to-Face	Lectures, cooperative learning and discussion	66-67
	K1, S7, C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	68
	K1, K6, S6	Binary and Decimal Representations of Integers	Face-to-Face	Lectures, cooperative learning and discussion	69-70

	K1, K6, S6, S7	Special Divisibility Tests	Face-to-Face	Lectures, cooperative learning and discussion	71-72
	K1, S6, S7, C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	73
	S6, S8, S9, S11	Linear Congruences	Face-to-Face	Lectures, cooperative learning and discussion	76-78
	S6, S8, S9, S11	The Chinese Remainder Theorem	Face-to-Face	Lectures, cooperative learning and discussion	79-81
	S8, S9, S11, C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	82
Second Exam					
Fermat's Theorem					
	K1, S7, S10, S11	Fermat's Little Theorem and Pseudoprimes	Face-to-Face	Lectures, cooperative learning and discussion	87-88
	S7, S10, S11	Some Applications and Examples	Face-to-Face	Lectures, cooperative learning and discussion	89-91
	S7, S10, S11, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	92
	K1, S7, S10, S11	Wilson's Theorem	Face-to-Face	Lectures, cooperative learning and discussion	93-96
	S7, S10, S11, C1	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	96
Number-Theoretic Functions					
	K1, K7, S11	The Sum and Number of Divisors	Face-to-Face	Lectures, cooperative learning and discussion	103-106
	K1, K7, S11	More on Number-Theoretic Functions	Face-to-Face	Lectures, cooperative learning and discussion	107-108
	K7, S11, C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	110
Euler's Generalization of Fermat's Theorem					
	K1, K7, S11	Euler's Phi-Function	Face-to-Face	Lectures, cooperative learning and discussion	131-134
	K7, S11, C1, C2	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	135
	K1, K7, S7, S10, S11	Euler's Theorem	Face-to-Face	Lectures, cooperative learning and discussion	136-138
	K7, S7, S10, S11, C1	Exercises from the Book	Face-to-Face	Lectures, cooperative learning and discussion	140
Final Exam					

Eighth: Assessment methods

Methods	Direct Teaching	Specific Course Output to be measured *State the score identified for each CILO for each method of assessment out of 100 **If any CILO will not be assessed in the course, mark NA.																			
		K1	K2	K3	K4	K5	K6	K7	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	C1	C2
First Exam	20	4	3	4					4	3	2										
Second Exam	20	2			1	1	1					2		3	2	2	2		2		2
Final Exam	50	4	2		2	2	2	4		3	3	2	3		2	3	2	4	4		8
Assignment	10								2					2						4	2
Total	100	10	22						6	36								10		4	12

ninth: Course Policies

- All course policies are applied on all teaching patterns (online, blended, and face-to-face Learning) as follows:
  a. Punctuality.
  b. Participation and interaction.
  c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).