

QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Mathematics Department
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Study plan No.	2022/2021		University Specialization		Bachelor of Mathematics	
Course No.	0101212		Course name		Number Theory	
Credit Hours	3		Prerequisite/ Co-requisite		Foundations of Mathematics	
Course type	<input type="checkbox"/> MANDATORY UNIVERSITY REQUIREMENT	<input type="checkbox"/> UNIVERSITY ELECTIVE REQUIREMENTS	<input type="checkbox"/> FACULTY MANDATORY REQUIREMENT	<input type="checkbox"/> Support course family requirements	<input checked="" type="checkbox"/> Mandatory requirements	<input type="checkbox"/> Elective requirements
Teaching style	<input type="checkbox"/> Full online learning		<input checked="" type="checkbox"/> Blended learning		<input type="checkbox"/> Traditional learning	
Teaching model	<input type="checkbox"/> 1 Synchronous: 1 asynchronous		<input checked="" type="checkbox"/> 1 face to face : 1 asynchronous		<input type="checkbox"/> 2 Traditional	

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	Time	Place	Number of students	Teaching style	Approved model

### Brief description

Properties of integer numbers, Division algorithm, Greatest common divisor, Least common multiple, Prime numbers, Fundamental theorem of arithmetic, Diophantine equations, Congruence, Linear congruence, Chinese remainder theorem, Fermat's theorem, Euler's theorem and Wilson's theorem.

### Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Elementary Number Theory. Author: Strayer. Publisher: Waveland Press, 2001				
Supportive learning resources (Books, databases, periodicals, software, applications, others)	<ol style="list-style-type: none"> <li>1) Elementary Number Theory. By: David M. Burton</li> <li>2) Number Theory and its application. By: Kenneth H. Rosen.</li> <li>3) Number Theory and its history. By: Oystein ore.</li> <li>4) Number Theory: an Introduction. By: D. Redmond.</li> </ol>				
Supporting websites	<ul style="list-style-type: none"> <li>• <a href="#">Number Theory Notes. Stanford University:</a></li> <li>• <a href="#">Discrete Mathematics Notes. Stanford University.</a></li> <li>• <a href="#">Vladlen Koltun, Discrete Structures lecture notes.</a></li> <li>• <a href="http://www.ugrad.math.ubc.ca/coursedoc/math100/index.html">http://www.ugrad.math.ubc.ca/coursedoc/math100/index.html</a></li> </ul>				
The physical environment for teaching	<input checked="" type="checkbox"/> Class room	<input type="checkbox"/> labs	<input checked="" type="checkbox"/> Virtual educational platform	<input type="checkbox"/> Others	
Necessary equipment and software	N/A				
Supporting people with special needs					
For technical support					

Course learning outcomes (S= Skills, C= Competences K= Knowledge,)

QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Mathematics Department
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No.	Course learning outcomes	The associated program learning output code
<b>Knowledge</b>		
<b>K1</b>	Recognize rings, examples of rings and main rings properties	MK2
<b>K2</b>	Test subrings and ideal	MK2
<b>K3</b>	Describe isomorphism and homomorphism	MK4
<b>K4</b>	Utilize ideals	MK2
<b>K5</b>	Discuss polynomial rings.	MK4
<b>Skills</b>		
<b>S1</b>	Exercising mathematical logic in practical life.	MS1
<b>S2</b>	Using scientific methodology as a way of thinking and as a tool in facing problems.	MS2
<b>Competences</b>		
<b>C1</b>	Applying mathematics in various abstract algebra sectors.	MC2
<b>C2</b>	Developing scientific methodology for pursuing abstract algebra graduate studies.	MC3

#### Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	30%	40%	30%
Participation / practical applications	0	0	10%	30%
Asynchronous interactive activities	30%	20%	0	0
Final exam	40%	50%	50%	40%

#### Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style	Reference
1	Properties of Integer Numbers	Lecture	
2	Divisibility with properties, the division algorithm theorem (state and proof) with applications	Lecture	3 – 11
3	The division algorithm theorem (state and proof) with applications.	Lecture	11 – 18
4	Prime and composite numbers.	Lecture	11 – 18
5	Mersenne prime twin prime and Fermat prime. The greatest common divisor and the meaning of relatively primes.	Lecture	18 – 26
6	The G.C.D.	Lecture	18 – 26
7	The G.C.D by using Euclidean algorithm.	Lecture	26 – 29
8	Theorem of prime numbers. State and prove the fundamental theorem of arithmetic.	Lecture	29 – 37
9	Diophantine Equations and <b>Mid Exam</b>	learning through problem solving	37-43
10	Congruence's. Congruence modulo m is an equivalence relation on z. def. of a complete residue. system modulo m.	Lecture	43 – 48

QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Mathematics Department
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11	Linear Congruence	Lecture	48 – 54
12	the multiplicative inverse of a modulo m	Lecture	48 – 54
13	The Chinese remainder theorem	learning through problem solving	54 – 59
14	Wilson's theorem, Fermat's little theorem and Euler phi-function and Euler's theorem.	Lecture	59 – 68
15	Cryptography and RSA	learning through projects	68 – 75
16	<b>Final Exam</b>		

**Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)**

Week	Task / activity	Reference	Expected results
1	Assignments 1	Ref.2	Submitting pdf document on the virtual educational platform
2	Work sheet 1	Internet sources	Pdf document
3	Assignments 2	Text Book	Submitting pdf document on the virtual educational platform
4	Assignments 3	Ref.2	Submitting pdf document on the virtual educational platform
5	Assignments 4	Ref.2	Submitting pdf document on the virtual educational platform
6	Assignments 5	Lecture note	Submit a pdf that list the properties G.C.D and relatively prime numbers.
7	Video 1	E-learning	Discussion in the class
8	Work sheet 2	Internet sources	Document that describe the fundamental theorem of arithmetic and its applications.
9	Assignments 6	Lecture note	Submit a pdf or word sheet that solve some Diophantine equations correctly
10	Assignments 7	Text Book	Submitting pdf document on the Virtual educational platform that apply Euclid algorithm to represent the G.C.D of two numbers as a linear combination of them.
11	Assignments 8	Text Book	Submitting pdf document on the virtual educational platform
12	Quiz 1	E-learning	Submitting pdf on the virtual educational platform
13	Assignments 9	Lecture note	Submit a pdf or word sheet
14	Video 2	E-learning	Discussion in the class
15	Assignments 9	Lecture note	Submitting pdf document on the virtual educational platform g that use the theory of congruence and primitive roots to encrypt a plain text and decrypt a secret message.
16	Final Exam		