	ABS	STRAC	CT ALGEBRA								
1	Course Title:	ABSTRA	CT ALGEBRA								
2	Course Code:	MAT301	9								
3	Type of Course:	Compuls	ory								
4	Level of Course:	First Cyc	le								
5	Year of Study:	3									
6	Semester:	5									
7	ECTS Credits Allocated:	6.00									
8	Theoretical (hour/week):	2.00									
9	Practice (hour/week):	2.00									
10	Laboratory (hour/week):	0									
11	Prerequisites:	None									
12	Language:	Turkish									
13	Mode of Delivery:	Face to f	ace								
14	Course Coordinator:	Prof. Dr.	İSMAİL NACİ CANGÜL								
15	Course Lecturers:	Yrd. Doç	. Dr. Musa DEMİRCİ, Yrd. Doç. Dr. Hacer ÖZDEN								
16	Contact information of the Course Coordinator:	cangul@ Matemat	uludag.edu.tr, 0224 2941756, Fen-Edebiyat Fakültesi, ik Bölümü, 16059, Görükle / Bursa								
17	Website:	http://www.ismailnacicangul.com/									
18	Objective of the Course:	To teach divisibility, congruences, linear Diophant equations, arithmetic functions, and also the applications of those together with the origins of the notions									
19	Contribution of the Course to Professional Development:										
20	Learning Outcomes:		-								
		1	Differentiates between prime and composite numbers and knows the reasons of different situations.								
		2	Knows the Notion of divisibility on the ring of integers and related notions.								
		3	Knows daily applications of Diophantine equations.								
		4	Knows daily applications of congruences.								
		5	Knows the origins and history of the main notions.								
		6	Knows the corresponding English meanings of the main notions.								
		7									
		8									
		9									
		10									
21	Course Content:	-									
147	Course Content:										
Week											
1	Division and Evaluate states in the second s		Divisibility examples								
2	Icm	icd and	Examples of division and Euclid algorithms								
3	Linear Diophantine equations		Examples of linear Diophantine equations								

5 Euler ?-function Calculation of the values of Euler ?-function 6 Properties of Euler ?-function Examples of properties 7 Congruences Examples of congruences 8 Operations in Zm and properties of congruences Examples of properties 9 Midterm exam, Euler and Fermat theorems Examples of function of the values of gruences 10 Linear congruences with one variable equations Examples of linear congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 12 Congruence systems Solution of congruence systems Iteration soft congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 13 Quadratic residues and Legendre symbol Calculation of quadratic residues Applications of reciprocity law 22 Textbooks, References and/or Other 1. Saylar Teorisi Problemieri, Ismail Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Basti Naci Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangul & Cangu	4	Fundar divisors	theore	m of a	arithme	tic and	b	Ex nu	Examples of the number and the sum of the divisors of a number														
6 Properties of Euler ?-function Examples of properties 7 Congruences Examples of congruences 8 Operations in Zm and properties of congruences Examples of properties 9 Midterm exam, Euler and Fermat theorems Examples of Euler and Fermat theorems 10 Linear congruences with one variable Examples of linear congruences 11 Linear congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 12 Congruence systems Solution of congruence systems Ital 13 Quadratic reciprocity law Applications of reciprocity law Applications of reciprocity law 14 Gauss' quadratic reciprocity law Applications of reciprocity law Calculation (hour) Total Work Load (hour) 14 Causs' quadratic reciprocity law Number Duration (hour) Total Work Load (hour) 7 Condo 0.00 0.00 0.00 0.00 Fractical-Labs 14 2.00 28.00 Pale and the and the and the and and the and the and the and the and and the and the and the and the and the and the and the and the and the and the and the and the and the and the and the and the and the and t	5	Euler?	on					Ca	Calculation of the values of Euler ?-function														
7 Congruences Examples of congruences 8 Operations in Zm and properties of congruences Examples of properties 9 Midterm exam, Euler and Fermat theorems Examples of Euler and Fermat theorems 10 Linear congruences with one variable equations Examples of linear congruences 11 Linear congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 12 Congruence systems Solution of congruence systems 13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Sayliar Teorisi Problemieri, Ismail Naci Cangul & Basri Activites Number Duration (hour) Total Work Load (hour) Preoretical Middern Exam 1 44/do 2:00 28:00 Protentical Middern Exam 1 44/do 2:00 2:00 0:00 0:00 Protentical Middern Exam 1 44/do 2:00 2:00 0:00 0:00 0:00 Preoretic	6	Propert	Euler?	-funct	ion			Ex	Examples of properties														
8 Operations in Zm and properties of congruences Examples of properties 9 Midterm exam, Euler and Fermat theorems Examples of Euler and Fermat theorems 10 Linear congruences with one variable Examples of linear congruences 11 Linear congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 12 Congruence systems Solution of congruence systems 13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Sayliar Teorisi Problemileri, Ismail Naci Cangul & Basri Activites Number Duration (hour) Total Work Load (hour) Practicals/Labs 14 2:00 28:00 Printight Samt 1 4/tdo 2:00 26:00 Presterical 0 0.00 0:00 0:00 Propretical 0 0 0:00 0:00 0:00 Propretical 1 4/tdo 2:00 2:00 2:00 2	7	Congru						Ex	Examples of congruences														
8 Operations in 2m and properties of congruences Examples of properties 9 Midterm exam, Euler and Fermat theorems Examples of Euler and Fermat theorems 10 Linear congruences with one variable Examples of linear congruences 11 Linear congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 12 Congruence systems Solution of congruence systems 13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Saylar Teorisi Problemieri, Ismail Naci Cangul & Basti Number 14 Gauss' quadratic reciprocity law Applications of reciprocity law Mider Teorisi Problemieri, Ismail Naci Cangul & Basti Number 14 2.00 28.00 Practicals/Labs 14 2.00 28.00 15 Quadratic reciprocity law 0 0.00 0.00 14 2.00 20.00 20.00 20.00 20.00 16 0 0.00 0.00											(
9 Midterm exam, Euler and Fermat theorems Examples of Euler and Fermat theorems 10 Linear congruences with one variable equations Examples of linear congruences 11 Linear congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 12 Congruence systems Solution of congruence systems 13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Saylar Teorisi Problemieri, Ismail Naci Cangul & Basri Activities Number Duration (hour) Total Work Load (hour) Practicals/Labs 1 40.00 2:00 28:00 2015 14 2:00 28:00 20:00 28:00 Practicals/Labs 0 0:00 0:00 0:00 0:00 11 40.00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00	8	congrue	ons in ences	∠m an	a prop	perties	OT		EX	Examples of properties													
10 Linear congruences with one variable Examples of linear congruences 11 Linear congruences and linear Diophantine equations Relation between linear congruences and linear Diophantine equations 12 Congruence systems Solution of congruence systems 13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Sayılar Teorisi Problemleri, Ismail Naci Cangul & Basri Activites Number Duration (hour) Total Work Load (hour) Practicals/Labs 14 2.00 28.00 28.00 Self studies 0 0.00 0.00 0.00 10.00 Homewriks 0 0.00 0.00 0.00 0.00 Field Studies 0 0.00 0.00 0.00 0.00 Number 194.00 28.00 28.00 28.00 28.00 28.00 Self studies 0 0.00 0.00 0.00 0.00 0.00 Tota	9	Midtern	n exan	n, Eule	r and I	Fermat	t theor	ems	Ex	ample	s of Eu	ler and	Ferma	t theor	ems								
11 Linear congruences and linear Diophantine equations Relation between linear congruences and linear Diopharitine equations 12 Congruence systems Solution of congruence systems 13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Saylar Teorisi Problemleri, Ismail Naci Cangul & Basri Activities Number Duration (hour) Total Work Load (hour) Practicals/Labs 14 2.00 28.00 Biddstess stante 0 0.0dd 5.00 70.00 Homeworks 0 0.00 0.00 0.00 0.00 Videses stante 1 20.00 20.00 20.00 20.00 Contral Work Load 1 20.00	10	Linear	congru	ences	with o	ne var	iable		Ex	ample	s of lin	ear con	gruenc	es									
12 Congruence systems Solution of congruence systems 13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Sayılar Teorisi Problemleri, İsmail Naci Cangül & Basri Activites Number Duration (hour) Total Work Activites 1 40.00 2:00 28:00 Practicals/Labs 1 40.00 2:00 28:00 Practicals/Labs 14 2:00 28:00 0 Practicals/Labs 14 2:00 28:00 0 Propertical 1 40:00 2:00 28:00 Practicals/Labs 0 0.00 0:00 0:00 Homeworks 0 0.00 0:00 0:00 0:00 Field Studies 0 0.00 0:00 0:00 0:00 Total Work Load 1 20:00 28:00 28:00 26:00 Contreleverk load/30 hr	11	Linear (equatio	congru ns	ences	and lii	near D	iophai	ntine	Re Die	elation ophant	betwee tine eq	en linea uations	r congr	uence	s and lir	near							
13 Quadratic residues and Legendre symbol Calculation of quadratic residues 14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Sayılar Teorisi Problemleri, İsmail Naci Cangül & Basri Activites Number Duration (hour) Total Work Load (hour) Practicals/Labs 1 40.00 28.00 28.00 Self study and preperation 0 0/df 5.00 70.00 Homeworks 0 0/df 5.00 70.00 Field Studies 0 0.00 0.00 0.00 Midleers 2 1 M 0.00 0.00 0.00 0.00 Momeworks 0 0.00 0.00 0.00 0.00 0.00 Momeworks 0 0.00 0.00 0.00 0.00 0.00 Momeworks 0 0.00 0.00 0.00 0.00 0.00 Momeworks 0 0.00 0.00 0.00 0.00 0.00 Field Studies <th>12</th> <th>Congru</th> <th>ence s</th> <th>system</th> <th>S</th> <th></th> <th></th> <th></th> <th>So</th> <th>olution</th> <th>of con</th> <th>gruence</th> <th>e systen</th> <th>ns</th> <th></th> <th></th> <th></th>	12	Congru	ence s	system	S				So	olution	of con	gruence	e systen	ns									
14 Gauss' quadratic reciprocity law Applications of reciprocity law 22 Textbooks, References and/or Other 1. Sayilar Teorisi Problemleri, Ismail Naci Cangül & Basri Activities Number Duration (hour) Total Work Load (hour) Treation 1 40.00 2.00 28.00 Practicals/Labs 14 2.00 28.00 70.00 Number 0 0.0df 5.00 70.00 Homeworks 0 0.0df 5.00 70.00 Homeworks 0 0.00 0.00 0.00 0.00 Number 0 0.00 0.00 0.00 0.00 Number 0 0.0df 5.00 70.00 Homeworks 0 0.00 0.00 0.00 0.00 Number 0 0.00 0.00 0.00 0.00 Noncers 0 0.00 0.00 0.00 0.00 Noncers 0 0.00 0.00 0.00 0.00 0.00	13	Quadra	Quadratic residues and Legendre symbol									Calculation of quadratic residues											
22 Textbooks, References and/or Other 1. Sayilar Teorisi Problemleri, İsmail Naci Cangül & Basri Activites Number Duration (hour) Total Work Load (hour) Teorisi Activites Number Duration (hour) Total Work Load (hour) Teorisi Activites 1 40/d0 2:00 28:00 Practicals/Labs 14 2:00 28:00 20:00 20:00 Practicals/Labs 14 2:00 28:00 20:00 28:00 20:00 28:00 20:00 28:00 20:00	14	Gauss'	quadra	atic rec	iproci	ty law			Ap	Applications of reciprocity law													
Activities Number Duration (hour) Total Work Load (hour) Theoretical study and propertion 1 40.00 2.00 28.00 Practicals/Labs 14 2.00 28.00 28.00 Practicals/Labs 14 2.00 28.00 28.00 Practicals/Labs 14 2.00 28.00 28.00 Practicals/Labs 0 0.00 0.00 0.00 Homeworks 0 0.00 0.00 0.00 Homeworks 0 0.00 0.00 0.00 Field Studies 0 0.00 0.00 0.00 Stateses stands 1 20.00 28.00 28.00 Others 0 0.00 28.00 28.00 28.00 Total Work Load 100.00 28.00 28.00 28.00 28.00 COStatesers wards 100.00 28.00 28.00 28.00 28.00 Cotal Work Load 194.00 0.00 28.00 28.00 28.00	22	Textho	nks Ri	oferen	nes an	d/or O	ther		1	Savila	r Teori	si Probl	emleri	İsmail	Naci C	angül & I	Rasri						
Theoretical N 1 44/00 2:00 28:00 Practicals/Labs 14 2:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 28:00 0 0:00 <	Activites								Numb	ber		Dura	Duration (hour)			Total Work Load (hour)							
Inductinit L2Abs Induction Inductio	Theoretical 1								40.00				2.00 28.00										
Bit study and preperation 0 0 0 0 0 0 0 70.00 Homeworks 0	Practica	als/Labs							 /	14				2.00 28.00									
Homeworks 0 0.00 0.00 0.00 Projects 2 1 0.00 0.00 0.00 Field Studies 0 0.00 0.00 0.00 0.00 Suideess Gearde 1 20.00 20.00 0.00 0.00 Others 0 0.00 0.00 0.00 0.00 Others 0 0.00 0.00 0.00 0.00 Total Work Load 100.00 28.00 28.00 28.00 28.00 Cotal Work Load/30 hr 5.80 5.80 5.80 5.80 5.80 ECTS Credit of the Course 6.00 5.80 6.00 5.80 Z CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS 90	Self stu Home v	idy and work-pro	oreper liect	ation			0		0.0	5.dð				5.00			70.00						
Projects 2 1 0 0.00 0.00 Field Studies 0 0.00 0.00 0.00 Studserss @varde 0 0.00 0.00 0.00 Others 0 0.00 0.00 0.00 Others 0 0.00 0.00 0.00 Others 0 0.00 0.00 0.00 Field Studies 100.00 28.00 28.00 28.00 Others 100.00 28.00 28.00 28.00 Total Work Load 100.00 28.00 28.00 28.00 ECTS Credit of the Course 5.80 5.80 5.80 ECTS Credit of the Course 6.00 6.00 6.00 Z5 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS 90 0 0 0 0 0 0 0 ÖK1 5 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Homew	vorks							(0				0.00 0.00									
Field Studies 0 0.00 0.00 Sliddeeres exarde 1 20.00 20.00 Others 0 0.00 0.00 Others 0 0.00 0.00 Others 0 0.00 28.00 28.00 Total Work Load 30 hr 5.80 Contribution of Learning outcomes to programme QUALIFICATIONS ČK1 5 0 0 0 0 0.00 Others 5.80 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS ÖK1 5 0 0 0 0 0 0 0 0 Other course 5.80 0 0 0 <th 0"<<="" colspan="6" th=""><th>Project Total</th><th colspan="9">ojects 2</th><th colspan="4">100.00</th><th></th><th colspan="2">0.00</th></th>	<th>Project Total</th> <th colspan="9">ojects 2</th> <th colspan="4">100.00</th> <th></th> <th colspan="2">0.00</th>						Project Total	ojects 2									100.00					0.00	
Indexerse example 20.00 20.00 Others 0 0.00 0.00 Others 0.00 0.00 Total Work Load 28.00 28.00 Total Work Load 30 hr 5.80 ECTS Credit of the Course CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS ÖK1 5 0 0 0 0 0 OK1 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS ÖK1 5 0 0 0 0 0 0 0 0 PQ1 PQ2 PQ8 PQ9 PQ1 PQ14 PQ15 PQ16 OK1 5 0 0 0 0	Field S	eld Studies									0			0.00			0.00						
Others 0 0.00 0.00 0.00 Final Exams 100.00 28.00 28.00 28.00 28.00 Total Work Load 194.00 194.00 194.00 194.00 Cotalswork load/ 30 hr 5.80 5.80 5.80 5.80 ECTS Credit of the Course 6.00 6.00 6.00 25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS PQ1 PQ1 PQ2 PQ3 PQ4 PQ5 PQ6 PQ7 PQ8 PQ9 PQ1 PQ11 PQ12 PQ1 PQ14 PQ15 PQ16 ÖK1 5 0 2 0 <th>Slictcers</th> <th colspan="9">Slidters exance</th> <th colspan="3">1</th> <th colspan="3">20.00</th> <th colspan="2">20.00</th>	Slictcers	Slidters exance									1			20.00			20.00						
Figs Exams 100.00 28.00 28.00 28.00 Total Work Load 194.00 194.00 5.80 5.80 ECTS Credit of the Course 6.00 6.00 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS PQ1 PQ2 PQ3 PQ4 PQ5 PQ6 PQ7 PQ8 PQ9 PQ1 PQ11 PQ12 PQ1 PQ14 PQ15 PQ16 ÖK1 5 0 2 0	Others								(0			0.00	0.00 0.00									
Total Work Load 194.00 Cotal Work load/ 30 hr 5.80 ECTS Credit of the Course 6.00 25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS PQ1 PQ2 PQ3 PQ4 PQ5 PQ6 PQ7 PQ8 PQ9 PQ1 PQ11 PQ12 PQ1 PQ14 PQ15 PQ16 ÖK1 5 0 2 0 0 2 2 0 <td< th=""><th>Final E</th><th>xams</th><th>_</th><th></th><th></th><th></th><th></th><th></th><th>10</th><th>b.oo</th><th></th><th></th><th>28.00</th><th colspan="5">28.00 28.00</th></td<>	Final E	xams	_						10	b.oo			28.00	28.00 28.00									
CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS 5.80 PQ1 PQ2 PQ3 PQ4 PQ5 PQ6 PQ7 PQ8 PQ9 PQ1 PQ1 PQ1 PQ14 PQ15 PQ16 ÖK1 5 0 2 0 0 2 2 0	I otal W	I otal Work Load									194.00												
25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS PQ1 PQ2 PQ3 PQ4 PQ5 PQ6 PQ7 PQ8 PQ9 PQ1 PQ11 PQ12 PQ1 PQ14 PQ15 PQ16 ÖK1 5 0 2 0 0 2 2 0	ECTS Credit of the Course									5.80													
25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS PQ1 PQ2 PQ3 PQ4 PQ5 PQ6 PQ7 PQ8 PQ9 PQ1 PQ11 PQ12 PQ1 PQ1 PQ1 PQ1 PQ14 PQ14 PQ15 PQ16 ÖK1 5 0 2 0 0 2 2 0 </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>0.00</th> <th></th>																0.00							
PQ1 PQ2 PQ3 PQ4 PQ5 PQ6 PQ7 PQ8 PQ9 PQ1 PQ11 PQ12 PQ1 PQ14 PQ15 PQ16 ÖK1 5 0 2 0 2 2 0	25			CON	IRIE	BUTIC		IALIFICATIONS															
ÖK1 5 0 2 0 0 2 2 0		PQ	1 PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ1 0	PQ11	PQ12	PQ1 3	PQ14	PQ15	PQ16						
ÖK2 5 3 0 0 2 0 5 2 0	ÖK1	5	0	2	0	0	0	2	2	0	0	0	0	0	0	0	0						
ÖK3 3 0 0 3 0 5 2 2 0	ÖK2	5	3	0	0	2	0	5	2	0	0	0	0	0	0	0	0						
ÖK4 5 0 0 0 0 0 0 2 2 0 0 0 0 0 0 0 0	ÖK3	3	0	0	0	3	0	5	2	2	0	0	0	0	0	0	0						
	ÖK4	5	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0						

ÖK5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK6	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
LO: Learning Objectives PQ: Program Qualifications																
Contrib ution Level:	Contrib 1 very low ution Level:		2 low		3 Medium			4 High			5 Very High					