٦	THEORY OF ELLIPTIC	CUR	VES AND ITS APPLICALTIONS I					
1	Course Title:	THEOR	Y OF ELLIPTIC CURVES AND ITS APPLICALTIONS I					
2	Course Code:	MAT6111						
3	Type of Course:	Optional						
4	Level of Course:	Third Cycle						
5	Year of Study:	1						
6	Semester:	1						
7	ECTS Credits Allocated:	5.00						
8	Theoretical (hour/week):	3.00						
9	Practice (hour/week):	0.00						
10	Laboratory (hour/week):	0						
11	Prerequisites:	none						
12	Language:	Turkish						
13	Mode of Delivery:	Face to t	face					
14	Course Coordinator:	Prof. Dr.	İSMAİL NACİ CANGÜL					
15	Course Lecturers:	Prof. Dr.	Osman Bizim					
16	Contact information of the Course Coordinator:	Uludağ Üniversitesi, Fen-Edebiyat Fakültesi Matematik Bölümü, Görükle Bursa-TÜRKİYE 0 224 294 17 57 / obizim@uludag.edu.tr						
17	Website:							
18	Objective of the Course:	The theory of elliptic curves brings important areas of mathematics such as abstract algebra, number theory and related fields. The aim of this course is to make the students get all connections among all these areas. The goal is to teach the elementary theory of elliptic curves. So students can bring new ideas the theory of elliptic curves and have the ability conduct original research and independent publication.						
19	Contribution of the Course to Professional Development:							
20	Learning Outcomes:							
		1	Learn the group structure of the points on the elliptic curves and the proof of associativity.					
		2	Learn division polynomials and torsion points of the elliptic curves and Weil pairing and Tate-Licthenbaum pairing.					
		3	Learn elliptic curves over finite fields and counts the number of the points on these curves, the theorem of Hasse, Frobenius enomorphism an Schoof's algorithm.					
		4	Learn the discrete logarithm problem, general attacks on discerete logs, baby step, giant step, Pollard's method, to Pohling-Hellman method.					
		5	Learn MOV attack, Frey-Rück attack and other attacks.					
		6	Learn the elliptic curves over Q and the torsion subgroup and the Lutz-Nagell theorem, the method of descent, the Mordell- Weil theorem.					
	Learn the elliptic curves over C, doubly periodic functori are elliptic curves, the arithmetic and geometric r Cantor's algorithm, zeta functions, Fermat's last theose sketch of Wiles's proof.							

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21	Course Content:		
		Co	urse Content:
	Theoretical		Practice
1	Basic concepts of elliptic curves, the law on the elliptic curves and proof of associativity.		
2	Other equations for elliptic curves, Le equation, cubic equations and quartic equations. The j-invariant of an ellipti and isomorphisms and endomorphism curves.	c curve	
3	Torsion points of elliptic curves and dipolynomials of an elliptic curve. Weil Tate-Licthenbaum pairing.		
4	Elliptic curves over finite fields, count number of the points on these curves theorem of Hasse, The frobenius endomorphism, Schoof's Algorithm.		
5	Determining the group structure of th on the elliptic curves over finite fields group order. Some family of elliptic co over finite fields, singular and supersi curves.	and the urves	
6	The discrete logarithm problem, generattacks on discerete logs, baby step, step, Pollard's method, the Pohling-Fmethod.	giant	
7	MOV attack, Frey-Rück attack and ot attacks.	her	
8	The basic concepts in the elliptic curveryptography, Diffie-Hellman key Exc Massey-Omura encryption.		
9	ElGamal public key encryption and th signatures, the digital signature algor	ithm.	
10	The elliptic curves over Q and the tor subgroup and the Lutz-Nagell theore method of descent, the Mordell- Weil theorem.	m, the	
11	2-Selmer groups, Shafarevich-Tate g nontrivial Shafarevich-Tate groups, G cohomology.		
12	The elliptic curves over C, doubly per functions, tori are elliptic curves, the arithmetic and geometric mean.	riodic	
13	Division poliynomials and the torsion subgroups, Doud's method, complex multiplication and numerical example integrality of j-invariants.		
14	Hyperelliptic curves, Cantor's algorith functions, Fermat's last theorem, ske Wiles's proof.		
22	Textbooks, References and/or Other Materials:		 [1] Rational Points on Elliptic Curves, J. H. Silverman ve J. Tate, [2] The Arithmetic of Elliptic Curves, J. H. Silverman, [3] Elliptic Curves, L. C. Washington. [4] Introduction to Elliptic Curves and Modular Forms, N. Koblitz.

23 Assesment	Assesment							
TERM LEARNING ACTIVITIES	NUMBE R	WEIGHT						
Midterm Exam	0	0.00						
Quiz	0	0.00						
Home work-project	0	0.00						
Final Exam	1	100.00						
Total	1	100.00						
Contribution of Term (Year) Learning Activities Success Grade	es to	0.00						
Contribution of Final Exam to Success Grade)	100.00						
Total		100.00						
Measurement and Evaluation Techniques Us Course	sed in the							
24 ECTS / WORK LOAD TABLE								

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	5.00	70.00
Homeworks	0	0.00	0.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	0	0.00	0.00
Others	14	5.00	70.00
Final Exams	1	13.00	13.00
Total Work Load			195.00
Total work load/ 30 hr			6.50
ECTS Credit of the Course			5.00

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ1 0	PQ11	PQ12	PQ1 3	PQ14	PQ15	PQ16
ÖK1	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
ÖK2	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
ÖK3	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
ÖK4	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
ÖK5	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
ÖK6	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
ÖK7	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
	LO: Learning Objectives PQ: Program Qualifications															

Contrib	1 very low	2 low	3 Medium	4 High	5 Very High
ution					
Level:					