AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Godel's Theorems								
Course Code	MTK619		Couse Level		Third Cycle (Doctorate Degree)				
ECTS Credit	7.5	Workload	188 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	To introduce the student to Gödel's two incompleteness theorems and to their most important corollaries.								
Course Content	Can a computer be programmed to generate all true statements of mathematics and no false ones? An extraordinary result, proved by Kurt Gödel in 1931, shows that even if we restrict ourselves to the most fundamental part of mathematics, namely statements about the natural numbers, the answer to the above question is no. The course unit will be centred on proofs of Gödel's two incompleteness theorems and will examine some of their principal applications.								
Work Placement	N/A								
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Discussion, Individual Study, Problem Solving								
Name of Lecturer(s)									

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	30
Final Examination	1	60
Assignment	1	10

Recommended or Required Reading	
1	A Mathematical Introduction to Logic, (especially chapter 3),H.B. Enderton, Academic Press
2	Mathematical Logic, (chapters 4 and 6), J.R. Shoenfield, Addison-Wesley, 1967.
3	Mathematical Logic and the Foundations of Mathematics, G.T. Kneebone, Van Nostrand, 1963.
4	From Mathematics to Philosophy., Hao Wang, RKP, 1974

Week	Weekly Detailed Course Contents	
1	Theoretical	The completeness theorem for the predicate calculus: a review
2	Theoretical	First order theories
3	Theoretical	Recursive functions and relations.
4	Theoretical	Basic properties.
5	Theoretical	Primitive recursion
6	Theoretical	Closure under bounded quantification
7	Theoretical	Gödel's Coding of finite sequences
8	Intermediate Exam	Midterm exam
9	Theoretical	Church's Thesis
10	Theoretical	Gödel numbering and the arithmetization of logic. The recursiveness of the proof predicate.
11	Theoretical	Gödel's first theorem
12	Theoretical	Tarski's undefinability theorem. Applications of the incompleteness theorem to show the undecidability of the predicate calculus and other axiom systems. Examples of decidable theories: Presburger arithmetic
13	Theoretical	Gödel's second incompleteness theorem. The philosophical impact of Gödel's work
14	Theoretical	The limitations of the axiomatic method

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	3	3	84
Assignment	1	0	18	18
Project	1	0	22	22
Midterm Examination	1	25	2	27

Final Examination	1	35	2	37
			Total Workload (Hours)	188
			[Total Workload (Hours) / 25*] = **ECTS**	7.5
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	be familiar with the notion of recursive function
2	have developed a facility in the manipulation and application of these functions, with particular emphasis on applications to logic and decision problems
3	To be able to gain the skill of interpreting some interrelations among these concepts
4	To be able to use mathematical concepts in solving certain types of problems
5	To be able to develop analytical skills and apply to problems

Programme Outcomes *(Mathematics Doctorate)*	
1	To be able to develop the current and advanced knowledge of mathematics domain to expertise level by an original idea or research, based on the level of its knowledge at the graduate level, and to be able to reach original definitions that will bring innovation to Mathematics.
2	To be able to comprehend the interdisciplinary interaction associated with Mathematics.
3	To be able to use and evaluate the new knowledge in the field of Mathematics with a systematic approach.
4	To be able to develop an idea, a method, a design or an application that will bring innovation to Mathematics, to use well known ideas, methods, designs or applications on a different research area, or to search, comprehend, design, adapt and apply an original subject matter.
5	To be able to criticize, analyze, synthesize and evaluate new and complex ideas.
6	To be able have high-level skills in research methods related to studies on Mathematics.
7	To be able to expand the frontiers knowledge in the field of Mathematics via generating or interpreting an original study, or publishing at least a scientific paper in national/international refereed journals.
8	To be capable of leadership in the positions that require the analyses of problems related to the field of Mathematics.
9	To be able to defend his/her original ideas among the experts in the discussion of math related issues, and to be able to communicate effectively to show his/her competence in the field of Mathematics.
10	To be able to contribute to the solution of the social, scientific, cultural and ethical problems related to the Mathematics, and to be able to support the development of social, scientific, cultural and ethical values.
11	To be able to have both oral and written communication using a foreign language.
12	To be able to use computer software and information and communication technologies at an advanced level as required by mathematics.
13	To be able to supervise and teach values ??by taking into account social, scientific, cultural and ethical values ??during the collection, interpretation, application and announcement of mathematics-related data.
14	To be able to develop strategies, policies, and implementation plans for mathematics-related issues and to evaluate the results within the framework of quality processes.
15	To be able to apply the knowledge, problem-solving, and application skills acquired in mathematics to interdisciplinary studies.

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5
P1	3	4	4	4	4
P2	3	4	4	4	4
P3	3	4	4	4	4
P4	3	4	4	4	4
P5		4	4	4	4
P7		4			
P8	3				
P11	4	4			