AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Mathematical Methods in Physics								
Course Code	FZK506		Couse Level	Second Cycle (Master's Degree)					
ECTS Credit	9	Workload	225 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	To teach the fundamental principles of mathematical methods in physics.								
Course Content	Vectors and vector fields. Coordinate transformations. Eigenvalues and eigenvectors. Diagonalization. Operators. Complex Analysis. Ordinary differential equations. Special functions in physics.								
Work Placement									
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Individual Study, Problem Solving								
Name of Lecturer(s)	Assoc. Prof. Yelda KADIOĞLU, Lec. Cenk AKYÜZ								

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	20
Final Examination	1	30
Quiz	2	8
Attending Lectures	14	28
Assignment	14	14

Recommended or Required Reading	
1	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.
2	Mathematical Physics. S. Hassani.
3	Special Functions and their applications. N.N.Lebedev.
4	Mathematics of Classical and Quantum Physics. F.W. Byron, R.W.Fuller.
5	Mathematics for Physicists. P.Dennery, A. Krzywicki

Week	Weekly Detailed Course Contents	
1	Theoretical	Vector analysis
	Preparation Work	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.(p.1-68).
2	Theoretical	Potential theory
	Preparation Work	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.(p.68-103).
3	Theoretical	Generalized curvilinear coordinates
	Preparation Work	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.(p.103-165).
4	Theoretical	Matrices, determinants, and eigenvalue problems
	Preparation Work	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.(p.161-239).
5	Theoretical	Linear vector spaces
	Preparation Work	Mathematics of Classical and Quantum Physics. F.W. Byron, R.W.Fuller.(p.142-192). Mathematics for Physicists. P.Dennery, A. Krzywicki.(p.103-119).
6	Theoretical	Linear operators
	Preparation Work	Mathematical Physics. S. Hassani. (p.49-76).
7	Theoretical	Functional spaces
	Preparation Work	Mathematics of Classical and Quantum Physics. F.W. Byron, R.W.Fuller.(p.212-295).
8	Intermediate Exam	Midterm Exam
9	Theoretical	Complex analysis
	Preparation Work	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.(p.403-453).
10	Theoretical	Complex series and residues
	Preparation Work	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.(p.455-497).
11	Theoretical	Ordinary differential equations
	Preparation Work	Mathematical Methods for Physicists. G.B.Arfken, H.J.Weber, F.Harris.(p.535-618).
12	Theoretical	Legendre polynomials

12	Preparation Work	Special Functions and their applications. N.N.Lebedev. (p.44-60).
13	Theoretical	Hermite polynomials
	Preparation Work	Special Functions and their applications. N.N.Lebedev. (p.60-76).
14	Theoretical	Bessel functions
	Preparation Work	Special Functions and their applications. N.N.Lebedev. (p.99-111).
15	Theoretical	Laguerre polynomials
	Preparation Work	Special Functions and their applications. N.N.Lebedev. (p.76-91).
16	Final Exam	Final Exam

Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	5	3	112
Assignment	12	2	3	60
Individual Work	4	3	2	20
Quiz	4	1	1	8
Midterm Examination	1	7	5	12
Final Examination	1	8	5	13
			Total Workload (Hours)	225
			[Total Workload (Hours) / 25*] = **ECTS**	9

**25 hour workload is accepted as 1 ECTS*

Learning Outcomes

1	To be able to express the physical problems by using vectors.
2	To be able to solve the ordinary differntial equations in physical problems by analytical or numerical techniques.
3	To be able to use complex functions.
4	To be able to express the tasks of special functions in physics.
5	To be able to coordinate transforms.

Programme Outcomes *(Physics Master)*

1	The student should conceive the concepts in physics and may apply them on her/his own
2	The student should be able to conceive the relationship between the different physics laws and integrity of them and apply them in solving different physics problems
3	The student should know the basic principles of classical, quantum and relativistic physics and use them in the solutions of problems
4	The student should be able to do research in a specific area of physics
5	The student should be able to prepare reports on papers on the subject of her/his research and present her/his research subject in scientific conferences
6	The student should be able to explain the relationship between complicated problems and basic physics laws.
7	The student should be able to use computers for solving complicated physics problems
8	The student should be able to interrelate between the theory and the experiment. If she/he is experimentalist he/she has to explain the theory behind her/his work. If she /he is a theorist she/he should has to know the experiments in her/his subject.

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	4	5	5	5	4
P2	5	5	4	5	5
P3	4	4	5	5	4
P4	4	3	3	3	3
P5	2	2	2	2	2
P6	4	4	4	4	4
P7	2	5	3	3	4
P8	2	4	2	2	3