İZMİR UNIVERSITY OF ECONOMICS

Faculty of Arts and Sciences
Physics
PHYS 306 - Mathematical Methods in Physics

COURSE INTRODUCTION AND APPLICATION INFORMATION

Course Name	Mathematical Methods in Physics

Code	Semester	Theory (hour/week)	Application/Laboratory (hour/week)	Local Credits	ECTS
PHYS 306	Spring	2	2	3	6

Prerequisites	None
Course Language	English
Course Type	Required
Course Level	First Cycle
Mode of Delivery	Online
	* Discussion * Problem Solving * Lecture / Presentation
Course Coordinator	-
Course Lecturer(s)	* Prof. Dr. Uğur TIRNAKLI
Course Assistants	* Araş. Gör. Dr. Hülya KARAASLAN

Course Objectives	This course aims to provide the students with various mathematical tools and techniques which are commonly required to analyse physics problems.
Course Learning Outcomes	The students who succeeded in this course; * use the methods of linear algebra for solving problems in physics. * define the properties of various special mathematical functions that prove to be relevant in physics. * apply the Sturm-Liouville theory in physics problems.

	* compare Fourier analysis of differential equations with standard methods. * discuss the general properties of complex valued functions. * evaluate integrals using the technique of contour integration.
Course Description	This course includes the topics of linear algebra, diagonalization of matrices, vector analysis, dirac-delta function, beta and gamma functions, Sturm-Liouville theory, Legendre, Bessel, Hermite and Laguerre functions, Fourier series, Laplace and Fourier transformations, partial differential equations, functions of complex variables, contour integration, and tensors.

Course Category	Core Courses	X
	Major Area Courses	
	Supportive Courses	
	Media and Managment Skills Courses	
	Transferable Skill Courses	

WEEKLY SUBJECTS AND RELATED PREPARATION STUDIES

Week16	Subjects	Related Materials
1	Linear Algebra	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 3. ISBN: 9780471198260
2	Linear Algebra	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 3. ISBN: 9780471198260
3	Vector Analysis	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 6. ISBN: 9780471198260
4	Vector Analysis	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 10. ISBN:

9780471198260

5	Gauss, Green and Stokes Theorems	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 4-5. ISBN: 9780471198260
6	Infinite Series	George B. Arfken, Hans J. Weber, and Frank E. Harris, Mathematical Methods For Physicists, 7th edn. (Elsevier, 2012). Chapter 8. ISBN: 9789381269558
7	Infinite Series and Midterm Exam 1	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 11-12. ISBN: 9780471198260
8	Fourier Series and Transforms	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 7. ISBN: 9780471198260
9	Fourier Series and Transforms	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 7. ISBN: 9780471198260
10	Coordinate Transformations	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 10. ISBN: 9780471198260
11	Functions of Complex Variables	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 14. ISBN: 9780471198260
12	Functions of Complex Variables and Midterm Exam 2	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 14. ISBN: 9780471198260
13	Contour Integrals	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 14. ISBN: 9780471198260

14	Contour Integrals	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). Chapter 14. ISBN: 9780471198260
15	Semester Review	
16	Final Exam	

SOURCES

Course Notes / Textbooks	Mary L. Boas, Mathematical Methods in the Physical Sciences, 3rd edn. (Wiley, 2005). ISBN: 9780471198260
Suggested Readings/Materials	George B. Arfken, Hans J. Weber, and Frank E. Harris, Mathematical Methods For Physicists, 7th edn. (Elsevier, 2012). ISBN: 9789381269558

EVALUATION SYSTEM

Semester Activities	Number	Percentage of Grade
Participation	1	5
Laboratory / Application	-	-
Field Work	-	-
Quiz/Studio Critic	-	-
Portfoilo	-	-
Homework Assignment	1	15
Presentation/Jury	-	-
Project	-	-
Seminar/Workshop	-	-
Oral Exam	-	-
Midterm	2	40
Final	1	40
Total	5	100

WEIGHTING OF SEMESTER ACTIVITIES ON THE FINAL GRADE	**3**	**60**
WEIGHTING OF END-OF-SEMESTER ACTIVITIES ON THE FINAL GRADE	**1**	**40**
Total	4	100

ECTS / WORKLOAD TABLE

Semester Activities	Number	Duration (Hours)	Total Workload
Course Hours (Including Exam Week: 16 x Total Hours)	16	2	32
Laboratory / Application Hours	16	2	32
Study Hours Out of Class	12	4	48
Field Work	-	-	-
Quiz / Studio Critique	-	-	-
Portfolio	-	-	-
Homework / Assignment	1	3	3
Presentation / Jury	-	-	-
Project	-	-	-
Seminar / Workshop	-	-	-
Oral Exam	-	-	-
Midterm	2	15	30
Final	1	23	23
		Total Workload	**195**

THE RELATIONSHIP BETWEEN COURSE LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS

#	Program Qualifications / Outcomes	* Level of Contribution				
		1	2	3	4	5
1	To be able master and use fundamental phenomenological and applied physical laws and applications,					X
2	To be able to identify the problems, analyze them and produce solutions based on scientific method,				X	
3	To be able to collect necessary knowledge, able to model and self-improve in almost any area where physics is applicable and able to criticize and reestablish his/her developed models and solutions,				X	
4	To be able to communicate his/her theoretical and technical knowledge both in detail to the experts and in a simple and understandable manner to the non-experts comfortably,					
5	To be familiar with software used in area of physics extensively and able to actively use at least one of the advanced level programs in European Computer Usage License,					
6	To be able to develop and apply projects in accordance with sensitivities of society and behave according to societies, scientific and ethical values in every stage of the project that he/she is part in,					
7	To be able to evaluate every all stages effectively bestowed with universal knowledge and consciousness and has the necessary consciousness in the subject of quality governance,					
8	To be able to master abstract ideas, to be able to connect with concreate events and carry out solutions, devising experiments and collecting data, to be able to analyze and comment the results,					
9	To be able to refresh his/her gained knowledge and capabilities lifelong, have the consciousness to learn in his/her whole life,					
10	To be able to conduct a study both solo and in a group, to be effective actively in every all stages of independent study, join in decision making stage, able to plan and conduct using time effectively.					
11	To be able to collect data in the areas of Physics and communicate with colleagues in a foreign language ("European Language Portfolio Global Scale", Level B1).					
12	To be able to speak a second foreign at a medium level of fluency efficiently					
13	To be able to relate the knowledge accumulated throughout the human history to their field of expertise.					

*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest