Course Information

COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Numerical Methods in Physics	FZK308	6. Semester	2 + 2	3.0	5.0

Prerequisites	None
Language of Instruction	Turkish
Course Level	Bacheclor's Degree (First Cycle)
Course Type	Compulsory
Mode of delivery	Face to face
Course Coordinator	Assist. Prof. Dr. Sezgin AYGÜN
Instructors	Assoc. Prof. Dr. Hüseyin ÇAVUŞ
Assistants	
Course Objectives	Many scientific problems cannot be solved in an analytical method. For these systems, numerical methods must be used to solve the equations. In this course, students will learn the numerical solution methods in the solution of the scientific problems.
Course Content	General introduction on numerical methods, Statistical methods, Numerical derivative and integration of functions, Root finding: Newton-Raphson method, Integration of delay differential equations, Runge-Kutta method, Stability and Chaos, Stability and Chaos, Eigenvalue problems, Small oscillations, Schrödinger Equation, Hartree-Fock approximation, Code optimization, Monte Carlo method, Monte Carlo method
Course Learning Outcomes	1) to learn how to use the numerical methods in solving the many scientific problems 2) to completing this course will learn the practicality on the problem solutions in real life 3) to apply the solving methods in the physical problems. 4) To recognize numerical methods and learn its properties

WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods and Techniques	Study Materials
1. Week	Introduction to Numerical methods	Oral lectures Homeworks, discussions	
3. Week	Numerical derivative and integration of functions	Oral lectures Homeworks, discussions	
4. Week	Root finding: Newton-Raphson method	Oral lectures Homeworks, discussions	

Quick Access

Physics
- Qualification Awarded
- Level of Qualification
- Qualification Requirements and Regulations
- Specific Admission Requirements
- Recognition of Prior Learning
- Profile of the Program
- Program Key Learning Outcomes
- Occupational Profile of Graduates
- Access to Further Studies
- Course Structure & Credits
- Exam Regulations & Assessment & Grading
- Graduation Requirements
- Mode of Study
- Programme Director(or Equivalent)
- Evaluation Questionnaire
- TYYÇ

Course Information
- Course Information
- Weekly Course Content
- Resources
- Assessment
- Course Category
- CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES
- ECTS credits and course workload

5. Week	Integration of delay differential equations	Oral lectures Homeworks, discussions	
6. Week	Runge-Kutta method	Oral lectures Homeworks, discussions	
7. Week	Stability and Chaos	Oral lectures Homeworks, discussions	
8. Week	Stability and Chaos	Oral lectures Homeworks, discussions	
9. Week	Eigenvalue problems	Oral lectures Homeworks, discussions	
10. Week	Small oscillations	Oral lectures Homeworks, discussions	
11. Week	Schrödinger Equation	Oral lectures Homeworks, discussions	
12. Week	Hartree-Fock approximation	Oral lectures Homeworks, discussions	
13. Week	Code optimization, Monte Carlo method	Oral lectures Homeworks, discussions	
14. Week	Monte Carlo method	Oral lectures Homeworks, discussions	
15. Week	repetition of the general period	Oral lectures with interactive discussions, Applications	
16. Week	Final Exam		

RESOURCES

Recommended Sources
Alejandro L. Garcia, Numerical Methods for Physics (Prentice Hall, Englewood Cliffs NJ, 2000)
W. H. Press, S. A. Teukolsky, W. T. Wetterling, and B. P. Flannery, Numerical Recipes in C. The Art of Scientific Computing, 2nd ed., Cambridge University Press (1992).
S. E. Koonin: Computational Physics, Benjamin/Cummings (Menlo Park, CA) 1986
S.E. Koonin, Computational Physics Fortran codes: http://www.computationalphysics.info
W. Krauth s Introduction to Monte Carlo: http://www.lps.ens.fr/~krauth/budapest.pdf

ASSESSMENT

Measurement and Evaluation Methods and Techniques		
Mid-term exam, homework, final exam		
In-Term Studies	**Quantity**	**Percentage**
Mid Term Exam 1	1	40
Total	1	40
End-Term Studies	**Quantity**	**Percentage**
Final Exam	1	60

Total	1	60
Contribution Of In-Term Studies To Overall Grade		40
End-Term Studies		60
Total		100

COURSE CATEGORY

Course Category	Percentage
Core Courses	% 100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2	DK3	DK4
PY1	5	5	5	5	5
PY2	4	4	4	4	4
PY3	4	4	4	4	4
PY4	5	5	5	5	5
PY5	3	3	3	3	3
PY6	3	3	3	3	3
PY7	2	2	2	3	1
PY8	2	2	2	2	2
PY9	3	3	3	3	3
PY10	4	4	4	4	4
PY11	4	4	4	4	4
PY12	4	4	4	4	4
PY13	5	5	5	4	5
PY14	3	3	3	3	3
PY15	3	3	3	3	3

*DK = Course's Contrubution.

	0	1	2	3	4	5
Level of contribution	None	Very Low	Low	Fair	High	Very High

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ECTS CREDITS AND COURSE WORKLOAD

Event	Quantity	Duration (Hour)	Total Workload (Hour)
Class Hours (14 weeks)	14	4	56
Final Exam Preparation	1	13	13
Mid Term Exam Preparation	1	13	13
Assignment 1	9	2	18
Further Study	16	1	16
Assignment 2	4	2	8
Mid Term Exam 1	1	2	2
Final Exam	1	2	2
		Total Workload	128

Total Workload / 25.5 (s)	5.02
ECTS Credit of the Course	5