COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
MONTE CARLO MODELLING IN PHYSICS	PHYS 547	1	3 + 0	3	10

Prerequisites	

Language of Instruction	English
Course Level	Postgraduate
Course Type	Elective
Course Coordinator	Prof.Dr. Avadis S. Hacınlıyan
Instructors	Prof.Dr. Avadis S. Hacınlıyan
Assistants	
Goals	To give the posgraduate students a good understanding on the basic concepts of Monte Carlo method and its applications in physics
Content	Introduction to structured and object oriented programming, numerical differentiation, numerical interpolation, extrapolation and fitting of data, review of statistical concepts, outline of the Monte-Carlo strategy, random walks and the Metropolis algorithm, Monte Carlo methods in statistical physics, quantum Monte Carlo methods, At least two diffenent applications in Monte Carlo Computation.

Learning Outcomes	**Teaching Methods**	**Assessment Methods**
1- Knows Monte Carlo method and simulates random number generator	1, 5, 15	A, B, C
2-Able to use Monte Carlo methods in various fields of physics	1, 5, 15	A, B, C
3-Able to use Statistical Simulation Software.	1, 5, 15	A, B, C
4- Able to write and/or implement Monte Carlo Applications	1, 5, 15	A, B, C

Teaching Methods:	1: Lecture, 5: Problem solving, 15: Homework
Assessment Methods:	A: Presentation B: Tests C: Homework and Labwork

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Introduction to structured and object oriented programn languages	Lecture Notes, textbooks, articles
2	Numerical differentiation and integration	Lecture Notes, textbooks, articles
3	Numerical interpolation, extrapolation and fitting of data	Lecture Notes, textbooks, articles
4	Random number generation and outline of the Monte-Carlo strategy	Lecture Notes, textbooks, articles
5	Random walks and the Metropolis algorithm	Lecture Notes, textbooks, articles
6	Monte Carlo methods in statistical physics	Lecture Notes, textbooks, articles
7	Monte Carlo methods in quantum physics	Lecture Notes, textbooks, articles
8	Review and Midterm (Can be administered on line or as presentation)	Lecture Notes, textbooks, articles
9	Review of statistical concepts	
10	Monte Carlo Software 1 including needed OS presentation	
11	Monte Carlo Software 1	
12	Monte Carlo Software 2 including needed OS presentation	
13	Monte Carlo Software 2	
14	Review	
15	Final (Can be administered on line or as term paper and presentation)	

RECOMMENDED SOURCES	
Textbook	Sobol I.M., “Primer to Monte Carlo Method”, CRC Press, 1994 M. Hjorth-Jensen, Computational Physics”, University of Oslo, 2003

Additional Resources	

MATERIAL SHARING	
Documents	
Assignments	12
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Assignment	10	35
Midterm	1	25
Total		60
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution					
		1	2	3	4	5
1	gains the ability to apply the knowledge in physics and mathematics					X
2	gains the ability to construct an experimental setup, perform the experiment, analyze and interpret the results		X			
3	is supposed to have the education required for the measurements in scientific and technological areas			**X**		
4	is able to work in an interdisciplinary team					**X**
5	is able to identify, formulate and solve physics problems					X
6	is conscious for the professional and ethical responsibility					**X**
7	is able to communicate actively and effectively					X

8	is supposed to have the required education for the industrial applications and the social contributions of physics			**X**		
9	is conscious about the necessity of lifelong education and can implement it			**X**		
10	is supposed to be aware of the current investigations and developments in the field				X	
11	can make use of the techniques and the modern equipment required for physical applications				X	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	12	168
Assignment	10	5	50
Total Work Load			270
Total Work Load / 25 (h)			10,4
ECTS Credit of the Course			10