



Faculty: Faculty of Science	
Department: Physics	Program: BSc Physics
Semester: First	Academic year:2022/2023

First: Course Information

Course Name	Computer Applications in Physics			Course NO: 0302355	
Credit Hours	3 hours	Theoretical	3	Practical	0
Level in JNQF	7				
Prerequisite: 0302201	Class Number : 1			Lecture Time:	
Type Of Course:	<input type="checkbox"/> <i>Obligatory Faculty Requirement</i>		<input type="checkbox"/> <i>Elective University Requirement</i>		
	<input type="checkbox"/> <i>Obligatory University Requirement</i>		<input type="checkbox"/> <i>Faculty Requirement</i>		
	<input type="checkbox"/> <i>Course Elective Specialty Requirement</i>		<input checked="" type="checkbox"/> <i>Obligatory Specialization requirement</i>		
Type Of Learning :	<input type="checkbox"/> <i>Face-to-Face Learning</i> <input checked="" type="checkbox"/> <i>Blended Learning(2 Face-to-Face + 1Asynchronous)</i> <input type="checkbox"/> <i>Online Learning (2 Synchronous+1 Asynchronous)</i>				

Second: Instructor's Information

Course coordinator:		
Instructor:		
Name :	Office Number:	Email:
Office Hours:		

Third: Course Description

In this course is to learn the basics of Mathematica program, and use Mathematica to deal with vectors and matrices. In addition, the students will be learned how to derive, integrate, and plot functions and data. Moreover, a physical problems will be solved using Mathematica. The students



will be able to solve both partial and ordinary differential equations using Mathematica. Monte Carlo method will be introduced and used to solve various problems.

Fourth: Course Aims

The aim of this course is to

1. Familiarize the students with basic knowledge of Mathematica and its benefits in solving difficult *and* abstract mathematical problems.
2. Develop the problem solving and critical thinking skills through solving physical problems using Mathematica.
3. Understand and simulate physical problems by graphics.

Fifth: Learning Source

Designated Book:	Mathematical Methods Using Mathematica For Students of Physics and Related Fields	
Author: <i>Sadri Hassani</i>	<i>Print: 3rd Edition</i>	<i>Year:2003</i>
Additional Sources: Website:	<ul style="list-style-type: none"> • <i>Introduction to Mathematica for Physics</i> • https://www.wolfram.com/mathematica/ 	
Teaching Type:	Moodl <input checked="" type="checkbox"/> MS Teams <input type="checkbox"/> Workshop <input type="checkbox"/> Laboratory <input checked="" type="checkbox"/> Classroom <input checked="" type="checkbox"/>	



Sixth: Learning Outcomes

<i>Level descriptor according to (JNQF)</i>	<i>CILOs Code</i>	<i>Course learning output</i>	<i>Associated Program Outcome Code</i>	<i>Assessment method** Choose at least two methods</i>	<i>Scores out of 100</i> State the total score identified for each CILO	<i>Minimum acceptable Score/percentage (%)</i> <i>The percentage should not be less than 50%</i> <i>***</i>
Knowledge	**K1	Describe the basic principles of Mathematica. Recall some Mathematica functions and methods. State physical problems in symbolic form.	*PK1	Quiz Assignment Mid Exam Final	10	10%
	K2	Identify modern programming methods and describe the extent and limitations of computational methods in physics,	PK2	Assignment Mid Exam Final	20	45%
	K3	Review the current computer programs used in physical researches such as nuclear and solid state physics. The real physical problems cannot be solved exactly, and computers must be used to solve these problems.	PK3	Quiz Mid Exam Final	20	10%
Skills	***S1	Solve physical problems using Mathematica	PS1	Assignment Mid Exam Final	20	10%
	S2	To model some physical issues using Monte Carlo method and simulate some physical quantities as field lines.	PS2	Assignment	5	5%
	S3	Interpret the solutions of the physical problems	PS3	Assignment	5	5%



		and to relate them to real live		Mid Exam Final		
	S4	Formulate plans designed to solve the physical problems to be suitable for Mathematica to achieve maximum useful of Mathematica	PS3	Quiz Mid Exam Final	5	5%
Competencies	****C1	Interpret the solutions of the physical problems and to relate them to real live.	PC1	Project	2.5	2.5%
	C2	Begin to develop intellectual independence and foster a commitment to lifelong learning. Design new methods of solving physical problems	PC2	Project	2.5	2.5%
	C3	Appreciate the need to communicate information and arguments effectively using written and oral skills.	PC3	Project	2.5	2.5%
	C4	Understand and demonstrate how to work as part of a team by working with a group in the lab to perform programming, analyzing the data and submit solution.	PC4	Project	2.5	2.5%



Seventh: Course Structure

Lecture Date	Teaching Outcome	Topics	Teaching Procedures	Teaching Methods	References
16/10/2022	K1	Running <i>Mathematica</i>	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	1
18/10/2022	K1,S1	Numerical Calculations	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	2
20/10/2022	K2,S1,S2	Exercise	Asynchronous	Moodle	
23/10/2022	K1,K2,C2,S1	Algebraic and Trigonometric Calculations	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	4
25/10/2022	K2,S1,S2	Calculus in <i>Mathematica: Derivatives</i>	Face to Face	Lecture, Data Show, Simulation	4
27/10/2022	K2,S1,S2	Exercise	Asynchronous	Moodle	
30/10/2022	K2,S1,S2	Calculus in <i>Mathematica: Integrations</i>	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	4
1/11/2022	K2,S1,S2	Calculus in <i>Mathematica: functions</i>	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	8
3/11/2022	K2,S1,S2,C1,C3	Short video ; Exercise	Asynchronous	Moodle	
6/11/2022	K2,S1,S2,C1,C3	Numerical Mathematics: Solve	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	9
8/11/2022	K2,S1,S2,C1,C3	Numerical Mathematics: NSolve	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	10



10/11/2022	K1	Short Exam	Asynchronous	Moodle	
13/11/2022	K2,S1,S2,C1,C3	Numerical Mathematics: FinRoot	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	13-18
15/11/2022	K1,K2	Graphics: Simple Plot	Face to Face	Lecture, Data Show, Simulation	13-18
17/11/2022	K2,S1,S2,C1,C3	Short Video, Questions	Asynchronous	Moodle	
20/11/2022	K1,S1	Lists	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	https://reference.wolfram.com/language/ref/List.html
22/11/2022	K2,S1,S2,C1,C3	Tables	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	https://reference.wolfram.com/language/ref/Table.html
24/11/2022	K1,S1	Project	Asynchronous	Moodle	
27/11/2022	K1,S1	Graphics: Simple Plot: properties	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	18
29/11/2022	K2,S1,S2,C1,C3	Graphics: Parametric Plot	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	19
1/12/2022	K2,S1,S2,C1,C3	Project	Asynchronous	Moodle	
4/12/2022	K2,S1,S2,C1,C3	Three-Dimensional Plots	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	22
6/12/2022	K2,S1,S2,C1,C3	Fit and Find Fit	Face to Face	Lecture, Data Show, Simulation	22
8/12/2022	K2,S1,S2,C1,C3	Exercise Short Exam	Asynchronous	Moodle	https://reference.wolfram.com/language/ref/Fit.html
10/12/2022	K2,S1,S2,C1,C3	FindFit	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	https://reference.wolfram.com/language/ref/FindFit.html



13/12/2022		Mid Exam		Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	
15/12/2022	K2,S1,S2	Short Video Exercise	Asynchronous	Moodle	
18/12/2022	K2,S1,S2	Complex numbers: optics	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	26
20/12/2022	K2,S1,S2	Animations	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	36
22/12/2022	K2,S1,S2	Project	Asynchronous	Moodle	
25/12/2022	K1,K2,S1,S2	Manipulate	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	https://reference.wolfram.com/language/ref/Manipulate.html
27/12/2022	K1,K2,S1,S2,S3	Vectors: dot and cross product	Face to Face	Lecture, Data Show, Simulation	https://reference.wolfram.com/language/guide/OperationsOnVectors.html
29/12/2022	K1,K2,S1,S2	Exercise	Asynchronous	Moodle	
1/1/2023	K1,K2,S1,S2	Solving ordinary differential equations 1D	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	177-185
3/1/2023	K1,K2,S1,S2	Solving ordinary differential equations 2D	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	185-191
5/1/2023	K1,K2,S1,S2	Short Video: Exercise	Asynchronous	Moodle	
8/1/2023	K1,K2,S1,S2	Solving ordinary differential equations 2D	Face to Face	Lecture, Data Show, Simulation	185-191
10/1/2023	K1,K2,S1,S2	Curd, Div, and Gradient	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	https://reference.wolfram.com/language/guide/OperationsOnVectors.html



12/1/2023	C1,C2,C3,C4	Project	Asynchronous	Moodle	
14/1/2023	K1,K2,S1,S2	Electric Field and Magnetic Field	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	
16/1/2023	K1,S2	Monte Carlo Method In Mathematica	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	https://reference.wolfram.com/language/howto/PerformAMonteCarloSimulation.html
19/1/2023	K1,K2,S1,S2	YouTube video Quiz	Asynchronous	Moodle	https://reference.wolfram.com/language/howto/PerformAMonteCarloSimulation.html
21/1/2023	K1,S2	Monte Carlo Method In Mathematica	Face to Face	Lecturing, Discussion, Whiteboard, Data Show, Computer. Simulation	https://reference.wolfram.com/language/howto/PerformAMonteCarloSimulation.html

Education procedures: (Face to Face, synchronous, asynchronous). ** Teaching methods: Lecture, video.....). ** Reference:(Pages of the book, recorded lecture, video....).



Eighth: Assessment methods

Methods	Fully Electronic Education	Integrated Teaching	Face to Face Teaching	Specific Course Output to be measured										
				K1	K2	K3	S1	S2	S3	S4	C1	C2	C3	C4
Mid-term Exam			30	5	5	5	5	2	5	3	0	0	0	0
Final Exam			50	3	13	13	13	3	3	2	0	0	0	0
Quizzes			5	1	1	1	1	0	1	0	0	0	0	0
Assignments			5	1	1	1	1	0	1	0	0	0	0	0
Project			10	0	0	0	0	0	0	0	2.5	2.5	2.5	2.5
Total out of 100			100	10	20	20	20	5	10	5	2.5	2.5	2.5	2.5

Ninth: Course Polices

- All course policies are applied on all teaching patterns (online, blended, and face-to-face Learning) as follows:
 - a. Punctuality.
 - b. Participation and interaction.
 - c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).

Approval.	Name	Date	Signature
Head of Department	Dr. Riad Masharfe		
Faculty Dean	Dr. Aliaa Burqan		

