Course Specification
(Bachelor)

Course Title:	**Computer Applications in Physics**
Course Code:	**PHY 1335**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	1
Last Revision Date:	***26/09/2024***

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A. General information about the course:

1. Course Identification

1. Credit hours: (2)					
2. Course type					
A.	☐University	☐ College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 6/ Year 3)					
4. Course General Description:					
This course offers a foundational understanding of MATLAB as a computational tool in the field of physics. It emphasizes the application of MATLAB to solve real-world physics problems, equipping students with essential skills for analysis and modeling across diverse physical scenarios.					
5. Pre-requirements for this course (if any)**:**					
Mathematical Physics (2), PHY 1334					
6. Co-requisites for this course (if any)**: None**					
7. Course Main Objective(s):					
• **Develop a foundational understanding of MATLAB as a computational tool for physics.** • **Apply MATLAB to solve real-world physics problems.** • **Gain proficiency in data analysis, visualization, and simulation of physical phenomena.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours

1.	**Lectures**	**0**
2.	**Laboratory/Studio**	**30**
3.	**Field**	**0**
4.	**Tutorial**	**30**
5.	**Others (specify)**	**0**
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe the basic knowledge of MATLAB.**	**K1, K2**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Outline simple computer programmes to solve problems in physics.**	**K1, K2**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
2.0	**Skills**			
2.1	**Explain and summarize the basic knowledge gained from studying computer applications in physics.**	**S1, S2**	▪ Lectures. ▪ Class discussions. ▪ Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**	▪ Problem classes and group tutorial. ▪ Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation. ▪ Homework. ▪ Mini-project(s).

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to MATLAB:** Overview of MATLAB Interface, Basic Programming in MATLAB.	**15**
2.	**Fundamental Tools for Physics in MATLAB:** Vectors and Matrices, Plotting and Visualization, Symbolic Mathematics, Symbolic Mathematics.	**15**
3.	**Data Analysis and Fitting**: Data Import and Export in MATLAB, Curve Fitting and Optimization.	**10**
4.	**Physical problems:** Classical Mechanics, Electricity and Magnetism, Waves and optics, Modern Physics and Quantum Mechanics.	**20**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2.	**Midterm Exam 1**	**6thweek**	**25 %**
3.	**Midterm Exam 2**	**12th week**	**25 %**
4.	**Final Exam**	**16th week**	**40 %**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Mathematical Methods for Physics: Using MATLAB and Maple by J. R. Claycomb, Mercury Learning and Information, 2018.
Supportive References	- MATLAB for Engineers and Scientists by Amos Gilat, 6th Edition, John Wiley & Sons, 2017. - One Hundred Physics Visualizations Using Matlab by Dan Green, World Scientific, 2013.

	- More Physics with Matlab by Dan Green, World Scientific Publishing Company, 2015. - Computational Physics by Nicholas Giordano and Hisao Nakanishi, 2nd Edition, Pearson Education India, 2012
Electronic Materials	https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx MATLAB Documentation and Tutorials. Physics-related MATLAB examples on MathWorks.
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**- Classrooms.** **- Labs.**
Technology equipment (projector, smart board, software)	**- Classroom equipped with a whiteboard and a projector.** **- Software.**
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students** **Second examiner**	**Indirect (The students complete the evaluation forms at the end of term. Final exam is evaluated by the second examiner)**
Effectiveness of Students assessment	**Instructors**	**Direct (exams, HW, project, …)**
Quality of learning resources	**Faculty** **Students**	**indirect (surveys)**
The extent to which CLOs have been achieved	**Instructors** **Program Leaders**	**Direct (excel sheet)**
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Quality Unit-Physics Department
REFERENCE NO.	Department council No. 06
DATE	26/09/2024