هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Computer Application in Physics (1)**
Course Code:	**2032204-3**
Program:	**Bachelor in Physics**
Department:	**Physics Department**
College:	**College of Science**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours: 3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 7th Level / 3rd Year
4. Pre-requisites for this course (if any)**: None**
5. Co-requisites for this course (if any)**: None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**6**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	20
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers important parts in the computational programming in physics using Matlab program. Students will study the basics of Matlab. In addition, important topics including; the use of the different tool boxes and windows in Matlab, the use of vectors and matrices as well as the application of statistical analysis and mathematical algebra

2. Course Main Objective

Students will be able to programming with Matlab, write different scripts and functions and solve physical problems. The plotting with 2D and 3D dimensions are also included.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recognize how to use Matlab to create scripts and functions in Matlab	K3
1.2	Define the plotting, Loops structure, and condition statements	K3
2	**Skills :**	
2.1	Apply important of the programming for the complex calculation in physics	S1
2.2	Develop and solving a real problems in physics using Matlab.	S2
3	**Values:**	
3.1	Show responsibility for work independently and as a part of team in performing simple and complicated programming in Matlab.	V1

C. Course Content

No	List of Topics	Contact Hours
	Part 1 (Lectures)	
1	Unit 1: **An introduction to Matlab and simple calculation** • Looking inside Matlab program • Looking to the most important windows. • Simple mathematical functions. • The order and priority of the calculations. • Scalar and vector quantities and the variables.	**4**
2	Unit 2: **Format command and how can we control the output** • Format commands • Initializing the format of the input and the output. • Protecting your data. • The variables and their sizes	**4**
3	Unit 3: **Vectors and Matrices in Matlab** • Initializing vector and matrices in Matlab • Mathematical operation on the elements of vector and Matrix • Eigenvalues and Eigenvectors • Specific commands for vectors and matrices.	**4**
4	Unit 4: **Creating a script and functions** • Simple script • Simple script • Call the functions inside the script • Save, update your functions and scripts	**4**
5	Unit 5: **Plotting in 2D and 3D dimensions.** • Preparing data files • Import and export your experimental data • Evaluating polynomials and plotting curves. • Create your own plotting curves.	**4**
6	Unit 6: **Detecting the errors and Debugging** • Numerical errors • User error	**3**

	• Debugging.	
7	Unit 7: **Create your own functions.** • Calling the built-in functions in a specific program • Calling the built-in function in several programs. • Function of functions	**3**
8	Unit 8: **Loops structure** • Different statements of looping • Loop structures • Loops within loop	**3**
9	Unit 9: **Conditions statements** • constructing logical statements • Different condition statements such as case, switch, if … etc	**3**
10	Unit 10: **Interpolation and extrapolation** • Saving and reading your data • Linear interpolation and extrapolation • Nonlinear interpolation and extrapolation • Spline, cubic spline and best fits. • Minimizing the resultant errors of the fitting.	**4**
11	Unit 11: **Application of some physics problems** • Dealing with the experimental data of physics	**2**
12	**Revision**	**2**
Part 2 (Laboratory)		
1	Introduction , Matlab windows and simple calculations	**2**
2	Output formatting and the output controlling	**2**
3	Vector and Matrices in Matlab	**2**
4	Creating script and functions: Create your own functions	**2**
5	Plotting in 2D and 3D dimensions	**2**
6	Detecting and Debugging the errors	**2**
7	Loops structures and conditions statements	**2**
8	Interpolation and extrapolation	**2**
9	Application of some physics problems	**2**
10	Reports evaluation and practical exam	**2**
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Know how to use Matlab to create scripts and functions in Matlab	Class Lectures	Practical Exam
1.2	Able to define the, plotting, Loops structure, and condition statements	group discussion	MCQ
2.0	**Skills**		
2.1	Apply important of the programming for the complex calculation in physics	Class Lectures and Homework assignment	Practical Exams

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	Develop and solving a real problems in physics using Matlab.	Class lectures and practical at the laboratory	written Exam
3.0	**Values**		
3.1	Work effectively and responsibly even in teamwork in performing simple and complicated programming in Matlab.	Group discussion	Projects

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam	6th	20%
2	Activities	Periodically	10%
3	Lab reports	Weekly/ 9th	20%
4	Final Lab Exam	10th	10%
5	Final exam	12th	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Each faculty member is assigned a group of students for continuous academic advice during six office hours weekly (6 hrs./week).
- Also teaching staff are available for individual student consultations during office hours

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	A guide to Matlab for beginners and experienced users", B. R. Hunt, R. L. Lipsman, J. M. Rosenberg. Cambridge, 2001
Essential References Materials	"An introduction to programming and numerical methods in Matlab", by S. R. Otto, J. P. Denier, Springer verlag 2003.
Electronic Materials	• Matlab Marina http://www.matlabmarina.com/
Other Learning Materials	• CD associated with the text books (when available). Lecture notes and PowerPoints presentations prepared by the lecturer.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classrooms • Computational Physics laboratory
Technology Resources (AV, data show, Smart Board, software,	• Data show • Laptop

Item	Resources
etc.)	• Smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	• Students	• Indirect
Evaluation of Teaching	• Instructor • Program coordinator • Departmental council • Faculty council	• Indirect
Improvement of Teaching	• Program leaders • Relevant committee	• Direct
Quality of learning resources	• Students • Instructor • Faculty	• Indirect
Extent of achievement of course learning outcomes,	• Program leaders • Instructor	• Direct
Course effectiveness and planning for improvement	• Program leaders • Instructor	• Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	October 2, 2022