Course Specification

(Postgraduate Programs)

Course Title: :	**Physics Laboratory**
Course Code:	**PHYS611**
Program:	**Master of Science in Physics**
Department:	**Physical Sciences**
College:	**Science**
Institution:	**Jazan University**
Version:	
Last Revision Date:	20/4/2024

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	☐University	☐ College	☒ Department	☐Track
B.	☐Required		☒ Elective	
3. Level/year at which this course is offered: (Level 3 or 4/Year 1 or 2**)**				
4. Course general Description: **This course is designed to provide graduate level experimental experience for research in physics. This includes learning how to conduct experiments, mastering experimental instrumentation and methods, analyzing data and presenting results in a scientific manner. The course contains experiments covering a wide range of fields in Physics**				
5. Pre-requirements for this course (if any)**: Non**				
6. Co-requirements for this course (if any)**: Non**				
7. Course Main Objective(s):				

The main objectives of this course are focused on the following:

- **Use some of the equipment commonly used in research.**
- **Perform experiments in different fields of physics.**
- **Analyze measurements data considering error calculations.**
- **Interpret measurements data considering error calculations.**
- **Assess the experimental results and write lab. reports.**
- **Analyze the data using a computer.**

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom		
2.	Laboratory	90	100%
3.	E-learning		

No	Mode of Instruction	Contact Hours	Percentage
4.	Hybrid • Traditional classroom • E-learning		
5.	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	
2.	**Laboratory/Studio**	90
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)……**	
	Total	90

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding: **Upon completing the course students will be able to**			
1.1	Recognize the knowledge of principles and concepts of Physics to practical problems in physics.	PLO1.1	Self-learning, Open discussion, interactive comparisons, Question-answer method.	**Direct**: Quizzes, and ffinal Practical Exam. **Indirect**: student survey
1.2	Discuss the operational principles and performance of key physics instrumentation and technologies relevant to their chosen specialization.	PLO1.2	Self-learning, Open discussion, interactive comparisons, Question-answer method.	**Direct**: Quizzes, and fanal Practical Exam. **Indirect**: student survey

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
…				
2.0	Skills: **Upon completing the course students will be able to**			
2.1	Collect data and revise the experimental procedure iteratively, reflectively, and responsively	PLO2.3	demonstrations of laboratory equipment and experiments	**Direct**: assignments, Step-by-step checkpoint assessment of experiment, Final Practical Exam. **Indirect**: student
2.2	Interpret professional quality of textual and graphical presentations of laboratory data using the physical scientific framework and learn experimental tools.	PLO2.3	Demonstrations of laboratory equipment and experiments- Hands-on lab work	**Direct**: Observation questioning, Discussion, Final Practical Exam **Indirect**: student survey
2.3	Assess the validity of data generated by computers or physics instrumentation including the estimation of error sources.	PLO2.3	Demonstrations of laboratory equipment and experiments-	**Direct**: Observation questioning, Discussion, Final Practical Exam **Indirect**: student survey
2.4	Communicate the experimental results in the context of the current understanding of physical phenomena.	PLO2.4	Interactive discussion- Case study, self-learning, open discussion, individual presentation.	**Direct**: Observation questioning, Discussion, individual presentation, Final Practical Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				Indirect: student survey
3.0	Values, autonomy, and responsibility: **Upon completing the course students will be able to**			
3.1	Demonstrate awareness of safety for own and other competencies during lab work.	PLO3.1	Group discussion during the lecture and in the lab, Direct evaluation	**Direct**: Observation questioning, discussion **Indirect**: student survey
3.2	Demonstrate capacity to work both independently and in collaboration with others to lead and manage the practical work.	PLO3.3	Lab work-guidelines, Safety presentation in the first lab lectures.	**Direct**: Observation questioning, discussion, **Indirect**: student survey

C. Course Content:

No	List of Topics	Contact Hours
	Atomic and Modern lab	
1.	Zeeman effect (transverse and longitudinal– Zeeman splitting– optical pumping).	6
2.	Frank Hertz experiment (Mercury and Neon)	6
3.	X-rays: (Bragg's reflection– spectroscopy–absorption-Moseley's Law).	6
4.	Helium-Neon laser (wavelength– polarization –beam diameter inside the resonator).	6
	Solid State Physics lab	
5.	Hall Effect for different metals and different semiconductors.	6
6.	Electrical conductivity and photoconductivity of solids. (temperature dependence of metals and semiconductor resistors– current-voltage characteristics of photo-resistors).	6
7.	Scanning-tunneling microscope (surface analysis of gold and graphite samples).	6
	Nuclear and Particle Physics lab	
8.	Radioactivity (attenuation of beta and gamma radiation – radioactive decay and half-time).	6
9.	Gamma-ray Spectroscopy (detection – recording and calibrating – absorption – activity).	6
10.	Compton Scattering (quantitative observation of Compton effect).	6

	Plasma Lab	
11.	Nanoparticles fabrication using Micro plasma	6
12.	Analysis of nanoparticles using DLS and UV-VIS	6
	Ultra-Low Level Quantum Measurements (JURLQM)	
13.	Time domain, real-time, voltage and current measurement and analysis with high-speed Digital storage oscilloscope and DAQ	6
14.	Frequency domain FFT-based real time signal analysis	6
15.	Data acquisition using DAQ hardware and analysis	6
Total		90

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Lab Activities**	**1-15**	15
2.	**Presentation**	**13-14**	5
3.	**Lab Report**	**1-15**	40
4.	**Final Lab Exam**	**16**	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	equipment manuals
Supportive References	1- Advanced Lab Manual prepared by the department. Advanced Physics Laboratory Manual by J. W. Hammer, University of Notre Dame, 2008. 2- Daryl W. Preston and Eric R. Dietz, The Art of Experimental Physics, (John Wiley and Sons, 1991) Adrian C. Mellissinos and Jim Napolitano, Experiments in Modern Physics, 2nd edition, (Academic Press, 2003). R.A. Dunlap, Experimental Physics-Modern Methods, (Oxford University Press**).**
Electronic Materials	SDL
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Equipped lab with the necessary experiments
Technology equipment (projector, smart board, software)	Smart Board, and computer with required software

Items	Resources
Other equipment (depending on the nature of the specialty)	1. Zeeman Effect (transverse and longitudinal– Zeeman splitting– optical pumping). 2. Frank Hertz experiment (Mercury and Neon) 3. X-rays: (Bragg's reflection–spectroscopy–absorption-Moseley's Law) 4. Nanoparticles fabrication using Microplasma 5. Analysis of nanoparticles using DLS and UV-VIS 6. Time domain, real-time, voltage and current measurement and analysis with high speed Digital storage oscilloscope and DAQ 7. Frequency domain FFT-based real time signal analysis 8. Data acquisition using DAQ hardware and analysis

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Students, Faculty members	Indirect
The extent to which CLOs have been achieved	Instructor	Direct/Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Department Council**
REFERENCE NO.	**Psci2415**
DATE	**1/10/2024**