Physics Handbook

MSc. In Physics

جامعة المجمعة

Majmaah University

كلية العلوم

قسم الفيزياء

Physics Department

Contents

1. Introduction

The **Master of Science in Physics** is a prominent postgraduate program dedicated to graduating distinguished researchers in the field of physical sciences. The program aims to qualify students scientifically and professionally in accordance with societal values, national needs, and the standards of academic quality and accreditation. Furthermore, it enables researchers to stay abreast of modern trends and advancements in physics.

Like any academic program aspiring for continuous improvement, a clear strategy for self-evaluation is essential. This involves a comprehensive and ongoing assessment of all program elements including teaching methodologies, examinations, study plans, course specifications, and educational administration to utilize feedback for development. The program leadership maintains a clear vision and a future-oriented development strategy that interacts with global changes to achieve constructive modification, serving the academic core and enhancing graduate outcomes.

About the College

To understand the Master's program, it is essential to look at the **College of Science in Zulfi**, where the program is hosted. The college was established on Sha'ban 5, 1426 AH, and academic instruction began in the 1427/1428 AH academic year. The college comprises the following departments:

- Mathematics
- Physics
- Computer Science
- Biology
- Chemistry

The college notably held international academic accreditation from the German agency **ASIIN** from 2015 to 2020. Currently, the college serves approximately 623 male students and 355 female students, supported by 100 faculty members. The facilities are equipped with state-of-the-art technology, including smart boards, modern offices, a rich specialized library, high-speed internet, sports units, specialized science clubs, a mosque, and a restaurant.

Program Profile

Upon successful completion, candidates are awarded the **Master of Science (M.Sc.) in Physics**. The program offers two specialized tracks:

1. **Radiation and Environmental Protection**
2. **Material Science and Applications**

The program strives to instill a culture of applied scientific research and promote a growing volume of publication in globally ranked (ISI/Scopus) scientific journals.

2. Institutional and Program Identification

Item	Description
Institution	Majmaah University
College	College of Science
Department	Physics
Program Title	Master of Science in Physics (MSc.)
Qualification Level	Level 7 (Master's degree – Saudi Qualifications Framework)
Mode of Study	Full-time (Evening)
Language of Instruction	English (with supporting Arabic where necessary)
Credit Hour System	Semester-based credit hour system
Total Credit Hours	31 credit hours

3. Program Vision, Mission, and Objectives

MSc Program Vision, Mission and Values	**Vision:** "A pioneering program in physical sciences and their technical applications, dedicated to developing innovative graduates who drive sustainable development and national technological advancement." **Mission:**

	Program of Master of Science in physics is promoting excellence in physics education through building knowledge, creating skills, conducting research and collaborating with society **الرؤية** " **:**برنامج رائد في العلوم الفيزيائية وتطبيقاتها التقنية، مكرس لتطوير خريجين مبتكرين يقودون التنمية المستدامة والتقدم التكنولوجي الوطني". **الرسالة:** يهدف برنامج ماجستير العلوم في الفيزياء إلى تعزيز التميز في تعليم الفيزياء من خلال بناء المعرفة، واكتساب المهارات، وإجراء البحوث العلمية، والتعاون مع المجتمع.
MSc Program Objectives	1. **Advanced and Contemporary Knowledge** To provide in-depth understanding and modern insights into both theoretical and applied physics. 2. **Scientific Research and Analytical Skills** To develop rigorous research capabilities and precise analytical skills for addressing complex physical problems. 3. **Technological Proficiency** To ensure the optimal utilization of modern technology and advanced instrumentation in the field of physics. 4. **Academic and Community Collaboration** To foster partnerships with academic, research, and community entities to address advanced physical challenges and issues. 1. **المعرفة المتقدمة والمعاصرة في الفيزياء النظرية والتطبيقية** 2. **مهارات البحث العلمي والتحليل العلمي الدقيق للمشكلات الفيزيائية** 3. **التعامل الامثل في استخدام التقنية الحديثة والتجهيزات المتقدمة فى الفيزياء** 4. **التعاون مع الجهات الاكاديمية و البحثية و المجتمعية لمعالجة قضايا فيزيائية متقدمة**

4.Program Learning Outcomes (PLOs)

MSc Program Learning Outcomes	**Knowledge and Understanding**	
	K1	To recognize the physics conceptus at an advanced level in their physics fields of study for solving complex problems.
	K2	Fundamental knowledge and interdisciplinary approach in physics.
	K3	Mastery of the fundamental knowledge in physics.
	K4	Identifying the key factors and applying appropriate principles and assumptions in the formulation of physics problems.
	Skills	
	S1	Perform experiments, data acquisition, data analysis and draw results and conclusions.
	S2	Apply the theories and concepts of physics relations relating to the global research in local and international contexts.
	S3	Ability to use analytical and/or computational methods to solve physics problems.
	S4	Explain to a general audience, both other experts in the field and to people outside the field, physics concepts and results.
	Values, Autonomy, and Responsibility	
	V1	Work effectively in groups as well as individually
	V2	Be aware of professional and ethical responsibilities
	V3	Having good time management skills.

5. Curriculum Structure

5.1. Physics Program Curriculum- Structure

Study plan (Curriculum) of the academic program.				
Courses	Type	Number of Course (each Track)	Total of Credit Hours	Percentage from the total credit hours in the study plan (%)
University	Compulsory	1	2	6.45
	Elective	0	0	0
College	Compulsory	0	0	0
	Elective	0	0	0
Department	Compulsory	6	11	35.48
	Elective	2	12	38.71
Thesis		1	6	19.36
Total Sum and Percentages		10	31	100.00

5.2. Physics Program Curriculum- Distributed into Levels

Level	Track	Course Code	Course Title	Required/ Elective	Pre-Required	Credit Hours	Type of Requirements
Level 1		PHYS 611	Computational Physics	Required		3 (3,0,0)	Department
		PHYS 612	Advanced Quantum Mechanics	Required		3 (3,0,0)	
		PHYS 613	Electrodynamics	Required		3 (3,0,0)	
Level 2	**Radiation and Radiation protection**	PHYS 621	Advanced Nuclear Physics	Required	PHYS 612 PHYS 613	3 (3,0,0)	Department

		PHYS 622	Radiation Physics and Dosimetry	Required	PHYS 612 PHYS 613	3 (3,0,0)	
	Material science and Applications	PHYS 624	Physics and Technology of Semiconductors	Required	PHYS 612 PHYS 613	3 (3,0,0)	Department
		PHYS 625	Characterization of Advanced Materials	Required	PHYS 612 PHYS 613	3 (3,0,0)	
Level 3		PHYS 623	Statistical Physics	Required	PHYS 612 PHYS 613	2 (2,0,0)	Department
	Radiation and Radiation protection	PHYS ….	Elective	Elective	------	3 (3,0,0)	
		PHYS ….	Elective	Elective	------	3 (3,0,0)	
	Material science and Applications	PHYS ….	Elective	Elective	-----	3 (3,0,0)	
		PHYS ….	Elective	Elective	-----	3 (3,0,0)	
Level 4		PHYS 640	Dissertation	Required	PHYS 630	6 Cr H	Department
Department Elective Course	**Radiation and Radiation protection**	PHYS 631	Applications of Ionizing Radiation Physics	Elective	PHYS 621, PHYS 622	3 (3,0,0)	Department
		PHYS 632	Radiation Detection and Measurements	Elective	PHYS 622	3 (3,0,0)	
		PHYS 633	Detector Instrumentation	Elective	PHYS 621, PHYS 622	3 (3,0,0)	
		PHYS 634	Radiation Protection	Elective	PHYS 622	3 (3,0,0)	
	Material science and Applications	PHYS 635	Heat Transfer in Microelectronic Devices	Elective	PHYS 611	3 (3,0,0)	Department
		PHYS 636	Solar Cells	Elective	PHYS 624	3 (3,0,0)	
		PHYS 637	Non Crystalline Materials	Elective	PHYS 625	3 (3,0,0)	
		PHYS 638	Nanostructures Engineering	Elective	PHYS 624	3 (3,0,0)	

		PHYS 639	Optical Properties of Nanostructures	Elective	PHYS 624	3 (3,0,0)	

6. Teaching and Learning Strategies

- Lectures
- Problem-solving sessions
- Laboratory experiments
- Research projects
- E-learning platform integration
- Cooperative learning
- Independent study

7. Student Assessment System

Assessment Methods

- Written exams (midterm & final)
- Quizzes
- Laboratory reports
- Research projects
- Assignments

8. Faculty and Human Resources

8.1 Academic Staff

Academic Rank		Saudi		Non-Saudi		Total
		Male	Female	Male	Female	
1	Professor	1	0	2	0	3
2	Associate Prof.	1	0	3	0	4
3	Assistant Prof.	2	2	4	1	9
4	Lecturer	1	4	1	0	6
5	Teaching Assistent	0	0	0	0	0

6	Doctoral Fellow	5	0	6	0	11
7	**Lab Technician**	1	1	0	0	2
8	**Secretary, Male Section**	1	1	0	0	2

9. Research and Scholarly Activities

Faculty members actively publish in:

- ISI-indexed journals
- Scopus-indexed journals
- Q1–Q4 ranked journals

The Physics Department at Majmaah University is no longer a standalone academic unit; it is a **collaborative powerhouse**. By aligning its research with the Deanship's 3–5 year priorities—specifically in **Renewable Energy** and **Medical Physics**—and maintaining its role as the "Scientific Engine" for the Engineering and Medical colleges, the department directly contributes to the university's ranking and the Kingdom's industrial future.

- List of published papers in (2023-2025) and Citations

No.	Faculty Member	2023	2024	2025	Total	Q1	Q2	Citations
1	H. Belmabrouk	16	16	4	**36**	**0**	**4**	*4892*
2	Yasser B Saddeek	7	10	7	**24**	**13**	**9**	**6718**
3	Anouar Jbeli	6	6	10	**22**	**8**	**13**	**N/A**
4	MA Albedah	8	11	2	**21**	**9**	**6**	*177*
5	Nouf Ahmed Althumairi	1	4	14	**19**	**5**	**13**	*91*
6	Mohd Shakir Khan	6	6	4	**16**	**2**	**8**	*926*
7	Mahmoud Gaballah	6	5	4	**15**	**5**	**10**	*630*
8	Abdullah Aldukhayel	1	2	6	**9**	**3**	**4**	*74*
9	Hassan Hanafy	0	4	3	**7**	**1**	**5**	*1197*
10	Ibrahim S. Mahmoud	1	3	2	**6**	**0**	**6**	*508*
11	Mouna Ben Henda	0	0	6	**6**	**4**	**2**	*606*
12	Mahmoud Ahmad	1	3	1	**5**	**3**	**2**	*855*
13	Mansour Alhabradi	1	3	0	**4**	**3**	**2**	*335*
15	Elham A. Aldufeery	0	0	0	**0**	**0**	**0**	*16*
17	Sabry A. mohamed	1	1	0	**2**	**1**	**0**	*32*

18	Thamer Alharbi	7	3	0	**10**	**5**	**5**	*2391*

10. Facilities and Learning Resources

10.1 Laboratories

The Physics program emphasizes inquiry-based learning through structured laboratory experiences.

- The Physics Department maintains **nine teaching laboratories**, modernized annually subject to available funding.
- Laboratory group sizes do not exceed **25 students**.
- Laboratories support Bachelor's, Master's, and research activities.

Teaching Laboratories include:

- General Physics
- Thermal Physics
- Electricity and Magnetism
- Waves and Optics
- Modern Physics
- Electronics
- Nuclear Physics
- Solid State Physics
- Modeling and Simulation

Research Laboratories include:

- Nuclear and Radiological Physics Research Lab
- Materials Science Research Lab
- SEM (Scanning Electron Microscopy) Lab

Each laboratory is equipped with:

- Safety systems (fire alarms, extinguishers, first-aid kits)

- Adequate lighting, ventilation, and workspace
- Secure storage areas and technician offices (except where specialized design applies)
- Annual safety inspections and compliance with radiation and laser safety standards

10.2. Library Resources and Services

The University Library, located on the **second floor of the Zulfi Campus**, serves students, faculty, and the general public.

- **Holdings:**
  - 21,441 Arabic books
  - 11,722 English books
  - 15,283 total titles, including 845 volumes in physical sciences
- **Usage:**
  - Approximately 170 daily visitors
  - Around 174 daily book loans
  - About 200 daily users of **Saudi Digital Library (SDL)** services
- **Departments:**
  - Library Administration
  - Beneficiary Services
  - Electronic Indexing

11.Graduate Characteristics

Physics Master's graduates exhibit a high level of academic capability and specialized expertise. They possess:

- **Self-Confidence:** Ability to defend research findings and participate in professional discourse.

- **Critical & Independent Thinking:** Using innovative approaches to enhance scientific understanding.
- **Effective Communication:** Conveying complex technical details clearly in writing and speech.
- **Deep Specialization:** Mastery of their chosen track (Theoretical, Experimental, or Applied).
- **Ethical & Social Awareness:** Reflecting on the ethical impact of research and promoting social well-being.
- **Inquiry & Research:** A strong curiosity and the ability to conduct original, impactful research.

12. Quality Assurance and Accreditation

12.1 National Accreditation Alignment

The program aligns with standards of the:

- National Center for Academic Accreditation and Evaluation (NCAAA)

Key quality practices:

- Annual program evaluation
- KPI monitoring
- Stakeholder surveys (students, alumni, employers)
- Continuous improvement action plans

12.2 International Accreditation

The College of Science programs have previously undergone international accreditation review by ASIIN, demonstrating compliance with international quality benchmarks.

13. Key Performance Indicators (KPIs)

Examples:

- Student–faculty ratio

- Graduation rate
- Retention rate
- Average GPA
- Employment rate
- Student satisfaction rate
- Research publication rate

14. Student Support Services

The Physics Department ensures that all students receive comprehensive academic and non-academic support throughout their study period by integrating departmental, college, and university-wide resources. This integrated support system is designed to promote academic success, student well-being, and timely graduation.

Support services are provided through coordinated efforts between the Physics Department, the College of Science, and Majmaah University, primarily overseen by the Deanship of Student Affairs.

14.1. Physics Department and College of Science: Core Support Structures

The Physics Department provides discipline-specific academic guidance through a structured framework supported by qualified faculty, academic advisors, and technical staff. These services are complemented by College of Science units that address the particular academic and practical needs of science students. Additional facilities supporting the academic environment include:

Faculty offices and departmental meeting rooms

- Sports and recreational facilities
- Mosque for religious practices
- Designated parking areas for students and faculty

15. Career Opportunities

1. Academic and Higher Education

Graduates can work in:

- **University Teaching and Research Assistantships**
- **Lecturer/Instructor positions** in physics and related applied fields
- **Postgraduate Research Positions (Ph.D.)**
- **Academic Laboratory Supervisors**

2. Research and Development (R&D)

Physics master's holders are well-suited for research careers in:

- **National research centers**
- **Scientific institutes in physics and material science**
- **Renewable energy research labs**
- **Nuclear and radiation research laboratories**
- **High-tech R&D departments (industrial or scientific)**

3. Healthcare and Medical Physics

Master's graduates, particularly with specialization in **Radiation and Environmental Protection**, can work in:

- **Medical Physics Departments**
- **Radiology and Diagnostic Imaging Units (X-Ray, CT, MRI)**
- **Radiation Safety and Protection Units**
- **Hospitals and Clinical Research Facilities**

4. Energy, Nuclear, and Environmental Sectors

Skills in physics are highly relevant in:

- **Nuclear energy planning and safety**
- **Renewable energy technology development (solar, wind, hydrogen)**
- **Environmental monitoring and radiation protection**
- **Energy consultancy and sustainability projects**

5. Engineering, Materials and Technology Industries

Graduates can enter:

- **Materials science and manufacturing**
- **Semiconductor and electronics**
- **Nanotechnology applications**
- **Advanced materials development (polymers, composites)**
- **Instrumentation and measurement technology**