



Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	06

1.	Course Title	Mathematical Physics-2
2.	Course Number	0332981
3.	Credit Hours (Theory, Practical)	3
	Contact Hours (Theory, Practical)	3
4.	Prerequisites/ Corequisites	-
5.	Program Title	PhD in Physics
6.	Program Code	
7.	School/ Center	Science
8.	Department	Physics
9.	Course Level	PhD
10.	Year of Study and Semester (s)	TBA
11.	Other Department(s) Involved in Teaching the Course	none
12.	Main Learning Language	English
13.	Learning Types	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	Online Platforms(s)	<input type="checkbox"/> Moodle <input type="checkbox"/> Microsoft Teams
15.	Issuing Date	Dec. 2025
16.	Revision Date	

17. Course Coordinator:

Name: Usama Al Khawaja	Contact hours: TBA
Office number:	Phone number:
Email:	



18. Other Instructors:

19. Course Description:

Revision of Calculus of Variations; Chebyshev Polynomials, Hypergeometric Functions; Fourier Series; Integral Transforms; Confluent Hypergeometric Functions; Riemann Zeta Function.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. **SO1:** to be able to demonstrate an advanced and comprehensive understanding of core physics concepts and specialized knowledge in a chosen field of research, contributing to the frontier of physics.
2. **SO2:** to be able to develop and execute independent, original research projects that address complex scientific problems, advancing theoretical and experimental physics.
3. **SO3:** to be able to apply advanced mathematical and computational techniques to analyze complex physical phenomena and critically evaluate scientific literature and experimental results.
4. **SO4:** to be able to effectively communicate complex physics concepts, research findings, and their significance through academic writing, presentations, and public outreach.
5. **SO5:** to be able to adhere to high ethical standards and professional responsibility in conducting research, including data integrity, ethical treatment of subjects, and the responsible use of resources.
6. **SO6:** to be able to demonstrate leadership and collaborative skills within multidisciplinary teams, contributing to the development of new scientific knowledge and promoting knowledge-sharing across disciplines.
7. **SO7:** to be able to cultivate the ability to adapt to new scientific advancements and continuously engage in professional development to contribute to innovation in the field of physics.
8. **SO8:** to be able to master experimental and computational techniques relevant to the research field, demonstrating competency in operating and developing specialized physics instrumentation and software.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

- | | |
|-------------------|--|
| 1. (Knowledge A1) | Explain the theory of calculus of variations. |
| 2. (Knowledge A2) | Identify special functions including hypergeometric functions. |
| 3. (Skills B1) | Derive Euler-Lagrange equations for various systems in Physics. |
| 4. (Skills B2) | Use special functions in Physics problems. |


5. (Skills B3)

Apply Calculus of variations to classical and quantum Physics problems. Physics problems.

6. (Competences C1)

Model the solution of a real-life Physics problem using calculus of variations and special functions.

Course ILOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1		x				
2		x				
3			x			
4			x			
5			x	x	x	
6						x

2٢. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Course ILOs \ Program ILOs	ILO (1)	ILO (2)	ILO (3)	ILO (4)	ILO (5)	ILO (6)
1	x	x	x	x	x	x
2						
3		x	x	x	x	x
4						
5						
6						
7						
8						



2٣. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types	Platform Used	Synchronous / Asynchronous	Evaluation Methods	Learning Resources
1	1.1	Calculus of Variations	1,3,5,6					
	1.2	Calculus of Variations	1,3,5,6					
	1.3	Calculus of Variations	1,3,5,6					
2	2.1	Calculus of Variations	1,3,5,6					
	2.2	Calculus of Variations	1,3,5,6					
	2.3	Calculus of Variations	1,3,5,6					
3	3.1	Calculus of Variations	1,3,5,6					
	3.2	Calculus of Variations	1,3,5,6					
	3.3	Calculus of Variations	1,3,5,6					
4	4.1	Calculus of Variations	1,3,5,6					
	4.2	Calculus of Variations	1,3,5,6					
	4.3	Calculus of Variations	1,3,5,6					
5	5.1	Calculus of Variations	1,3,5,6					
	5.2	Calculus of Variations	1,3,5,6					
	5.3	Calculus of Variations	1,3,5,6					
6	6.1	Calculus of Variations	1,3,5,6					
	6.2	Calculus of Variations	1,3,5,6					
	6.3	Calculus of Variations	1,3,5,6					
7	7.1	Special functions	2,4					
	7.2	Special functions	2,4					
	7.3	Special functions	2,4					
8	8.1	Special functions	2,4					
	8.2	Special functions	2,4					
	8.3	Special functions	2,4					
9	9.1	Special functions	2,4					
	9.2	Special functions	2,4					
	9.3	Special functions	2,4					
	10.1	Special functions	2,4					
	10.2	Special functions	2,4					



10	10.3	Special functions	2,4						
11	11.1	Special functions	2,4						
11	11.2	Special functions	2,4						
11	11.3	Special functions	2,4						
12	12.1	Special functions	2,4						
12	12.2	Special functions	2,4						
12	12.3	Special functions	2,4						
13	13.1	Special functions	2,4						
13	13.2	Special functions	2,4						
13	13.3	Special functions	2,4						
14	14.1	Special functions	2,4						
14	14.2	Special functions	2,4						
14	14.3	Special functions	2,4						
15	15.1	Special functions	2,4						
15	15.2	Special functions	2,4						
15	15.3	Special functions	2,4						

2٤. Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform
Test1	20	TBA	1,3,5,6	TBA	Paper exam
Test2	20	TBA	2,4	TBA	Paper exam
Project and presentation	30	TBA	1,2,3,4,5,6	TBA	presentation
Final exam	30	TBA	1,2,3,4,5,6	TBA	Paper exam

2٥. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform...etc.):



2٦. Course Policies:

- A- Attendance policies:
- B- Absences from exams and submitting assignments on time:
- C- Health and safety procedures:
- D- Honesty policy regarding cheating, plagiarism, misbehavior:
- E- Grading policy:
- F- Available university services that support achievement in the course:

2٧. References:

- A- Required book(s), assigned reading and audio-visuals:

TBA

- B- Recommended books, materials, and media:

TBA

2٨. Additional information:

Name of the Instructor or the Course Coordinator:	Signature:	Date:
.....
Name of the Head of Quality Assurance Committee/ Department	Signature:	Date:
.....
Name of the Head of Department	Signature:	Date:
.....
Name of the Head of Quality Assurance Committee/ School or Center	Signature:	Date:
.....
Name of the Dean or the Director	Signature:	Date:
.....