Faculty: Faculty of Science	
Department: Physics	**Program: Bachelor's Program**
Semester: Second semester	**Academic year: 2022/2023**

Course Plan

First: Course Information

Course Title: Mathematical Physics 2	**Course ID:**	**0302301**	
Credit Hours:	**3 hours**	**Theoretical: 3**	**Practical: 0**
Prerequisite: 0302201	**SectionNumber:1**	**Lecture Time:**	
Level in JNQF	**7**		
Type Of Course:	☐ ***Obligatory Faculty Requirement*** ☐ ***Elective University Requirement*** ☐ ***Obligatory University Requirement*** ☐ ***Faculty Requirement*** ☐ ***Course Elective Specialty Requirement*** ■ ***Obligatory Specialization*** ☐		
Type Of Learning:	■ ***Face-to-Face Learning*** ☐ ***Blended Learning(2 Face-to-Face + 1Asynchronous)*** ☐ ***Online Learning (2 Synchronous+1Asynchronous)***		

Second: Instructor's Information

***Name*:**	***Academic Rank :***	
***Office Number*:**	***Phone Number*:**	***Email:***
Office Hours:		

Third: Short Description of the Course

Fourier series and transforms, Dirichlet's conditions, Parseval's theorem. Ordinary differential equations (separable functions, first order and second order), Laplace transforms, Dirac delta function, Greens functions, Calculus of variations, Euler and Lagrange equations, Brachistochrones, isoperimetric problem. Special functions, factorial, gamma beta and error functions, elliptic integrals, series solution of differential equations, Legendre and Bessel orthogonal polynomials.

Fourth: Course objectives: The aim of this course is to achieve an understanding and appreciation, in as integrated a form as possible, of some mathematical techniques which are widely used in theoretical physics.

Fifth: Learning Source

Designated Book:	Mathematical Methods in the Physics Sciences	
Author: David J. Griffiths	***Print:*** (3th Edition)	***Year:***
Additional Sources: Website:	Essential Mathematics Methods for physicists, Hans J.Weber and George B. Arfken, 2003	
Teaching Type:	x ***Classroom*** ☐ ***Laboratory*** ☐ ***Workshop*** **MS Teams** ☐ **Moodle** ☐	

Sixth: Learning Outcomes

Number	***Course learning output***	***CILOs Code***	***Assessment method**** *Choose at least two methods*	***Scores out of 100*** State the total score identified for each CILO	***Minimum acceptable Score/percentage (%)*** *The percentage should not be less than 50%* ***
Knowledge					
K1	**Concepts and Theories:** **Concepts and Theories:** -Define and derive convergent and asymptotic series -Apply techniques of complex analysis, to study of special functions of mathematical physics -Define of Hamiltonians principle	PK1	First exam Second exam Quiz Final exam	6	3(50%)
K2	**Contemporary Trends, Problems and Research:** -Be fluent in calculations of Fourier coefficients -Have confidence in solving mathematical problems arising in physics by a variety of mathematical techniques.	PK2	First exam Second exam Quiz Final exam	12	6(50%)
K3	**Professional Responsibility:** Solve integrals using Gamma and Beta functions	PK3	First exam Second exam Quiz Final exam	12	6(50%)
Skills					
S1	**Problem solving skills:**	PS1	First exam Second exam	14	7(50%)

	-Apply appropriate theories, principles and concepts relevant to physics.		Quiz Final exam		
S2	**Modeling and Design:** -Demonstrate a reasonable argument to the solution of familiar and unfamiliar problems relevant to mathematical equations in physics	**PS2**	First exam Second exam Quiz Final exam	16	8(50%)
S3	**Application of Methods and Tools:** -Integrate the concepts and principles of mathematical physics to solve physical problems. -Integrate the concepts and principles of mathematical physics and its role in life sciences -Interprets any phonomenon according to mathematical physical laws .	PS3	First exam Second exam Quiz Final exam	10	5(50%)
S4	**Analytic skills:** -Plan, design and execute practical activities using techniques and procedure appropriate to mathematics related to different aspects of physics.	**PS4**	First exam Second exam Quiz Final exam	**10**	**5(50%)**
S5	**Strategic thinking**: -Plan design, record , execute and communicate apiece of independent research using mathematical median technique in physics	**PS4.**	First exam Second exam Quiz Final exam	**10**	**5(50%)**
S6	**Creative thinking and innovation:** -Solve problems relevant theoretical physics.	**PS4**	First exam Second exam Quiz Final exam	**10**	**5(50%)**
Competences					
C1	**Communication:** -Apply different physical principles in different disciplines of science and medicine -Enhance the observation of individual to the natural phonomenon	PC1	First exam Second exam Quiz Final exam		
C2	Teamwork and Leadership: -Increase the cooperative behavior between the different research groups of different applications. -To communicate effectively. -Use the efficient IT capabilities	PC2	First exam Second exam Quiz Final exam		

	-Refer to relevant literature effectively -Searching for the information and going to self learning a new topic				

Seventh: Course Structure

Lecture Date	Teaching Outcome	Topics	Teaching *Procedures	Teaching ***Methods	References***
6/3/2023	PK1, PK3,PC2,PS3	CH. 11(Special functions) CH. 11(Special functions)- Definition of the Gamma Function; Recursion Relation		Lecturing Discussion Whiteboard Power point You tube videos	538
8/3/2023	PK1,PK3,PC2,PS3	CH. 11(Special functions)- The Gamma Function of Negative Numbers CH. 11(Special functions)- Some Important Formulas Involving Gamma Functions	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	540,541
13/3/2023	PK1,PK3,PS3,PC2	CH. 11(Special functions)- Beta Functions CH. 11(Special functions)- Beta Functions in Terms of Gamma Functions	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	542, 543
15/3/2023	PK1,PK3,PS3,PC2	CH. 11(Special functions)- The Simple Pendulum CH. 11(Special functions)- The Error Function	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	545,547
20/3/2023	PK1,PK3,PS3,PC2	CH. 11(Special functions)Asymptotic Series CH. 11(Special functions) (Special functions)- Stirling's Formula	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	549, 552

22/3/2023	PK1,PK3,PS3,PC2	CH. 11- The Factorial Function Miscellaneous Problems	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	553-556
27/3/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations) Introduction Legendre's Equation 564 21. Series Solutions; Fuchs's Theorem 605	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	562
29/3/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations. Leibniz' Rule for Differentiating Products Rodrigues' Formula	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (567, 568)
3/4/2023	K3,S3,S4,S5,S1	Ch.12 (Series Solutions of differential equations)- Generating Function for Legendre Polynomials - Complete Sets of Orthogonal Functions	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (569-575)
5/4/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations)- The Second Solution of Bessel's Equation - Graphs and Zeros of Bessel Functions	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (590,591
10/4/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of	Direct teaching	Lecturing Discussion	Pages (577,578)

		differential equations)- Orthogonality of the Legendre Polynomials 577 - Normalization of the Legendre Polynomials 578		Whiteboard Power point You tube videos	
12/4/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations)- Legendre Series -The Associated Legendre Functions	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (580-583)
17/4/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations)- Generalized Power Series or the Method of Frobenius - Bessel's Equation	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (585-587)
19/4/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations)- Recursion Relations 16. Differential Equations with Bessel Function Solutions	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (592,593)
24/4/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations)- Other Kinds of Bessel Functions - The Lengthening Pendulum	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (595-598)
26/4/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of	Direct teaching	Lecturing Discussion	Pages (601-

		differential equations)- Orthogonality of Bessel Functions - Approximate Formulas for Bessel Functions		Whiteboard Mathematica simulation Power point You tube videos	604)
1/5/2023	PK3,PS3,PS4,PS5,PS1	Ch.12 (Series Solutions of differential equations-.Hermite Functions; Laguerre Functions; Ladder Operators Miscellaneous	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (607-615)
3/5/2023	PK3,PS3,PS4,PS5,PS1	Ch. 9 (Calculus of Variations) Introduction 472 Ch. 9 (Calculus of Variations)- The Euler Equation	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	472-478
8/5/2023	PK3,PS3,PS4,PS5,PS1	Ch. 9 (Calculus of Variations)- The Brachistochrone Problem; Cycloids Ch. 9 (Calculus of Variations)- Several Dependent Variables; Lagrange's Equations	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	482-485
10/5/2023	PK3,PS3,PS4,PS5,PS1	Ch. 9 (Calculus of Variations) Isoperimetric Problems Ch. 9 (Calculus of Variations)- Variational Notation	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (491-493)
15/5/2023	PK3,PS3,PS4,PS5,PS1	Ch. 9 (Calculus of Variations)- Miscellaneous Problems	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (494)
17/5/2023	PK1,PK3, PS3,PS4, PS5,PS6	Ch. 13 (Partial differential equations)	Direct teaching	Lecturing Discussion	Pages (619)

		Introduction		Whiteboard Power point You tube videos	
22/5/2023	PK1,PK3, PS3,PS4, PS5,PS6	Ch. 13 (Partial differential equations)- Laplace's Equation; Steady-State Temperature in a Rectangular Plate	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	621
24/5/2023	PK1,PK3, PS3,PS4, PS5,PS6	Ch. 13 (Partial differential equations)- 3. The Diffusion or Heat Flow Equation; the Schrodinger Equation	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	628
			Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	
5/6/2023	PK1,PK3, PS3,PS4, PS5,PS6	Ch. 13 (Partial differential equations) Ch. 13 (Partial differential equations)- The Wave Equation; the Vibrating String - Steady-state Temperature in a Cylinder Ch. 13 (Partial differential equations)- Vibration of a Circular Membrane	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (631-644)
7/6/2023	PK1,PK3, PS3,PS4, PS5,PS6	Ch. 13 (Partial differential equations)- - Steady-state Temperature in a Sphere Ch. 13 (Partial differential equations)- Poison's Equation Ch. 13 (Partial differential equations)- Integral Transform Solutions of Partial Differential Equations	Direct teaching	Lecturing Discussion Whiteboard Power point You tube videos	Pages (644-663)

Education procedures: (Direct, synchronous, asynchronous). * * Teaching methods: Lecture, video…..). * * Reference: .(Pages of the book, recorded lecture, video….)

Eighth: Assessment methods

Methods	Fully Electronic Education	Integrated Teaching	Direct Teaching	K1	K2	K3	S1	S2	S3	S4	S5	S6
First Exam			20	2	2	2	4	4		2	2	2
Second exam			20		4	4	2	4	5	1		
Quiz			10			2	2	2		2	2	
Final			50	4	6	4	6	6	5	5	6	8
Total out of 100			100	6	12	12	14	16	10	10	10	10

Nignth: Course Polices

- Meeting the deadline for the lecture.
- Commitment to interaction and participation.
- Interactive lectures will be given through a platform (MS Teams).
- Duties and tests will be given through a platform(Moodle).
- Commitment to the right appearance in front of the camera with the proper background.
- University regulations for attendance and absence from lectures and examinations are in force.
- Academic Integrity: Fraud or moral impersonation are unacceptable and are punishable according to university regulations and instructions.

Approval	Name	Date	Signature
Head of Department			
Faculty Dean			