

QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ physics Department
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Study plan No.	2022/2023	University Specialization	Bachelor of physics
Course No.	0150251	Course name	Mathematical Physics 1
Credit Hours	3	Prerequisite/ Co-requisite	None
Course type	<input type="checkbox"/> MANDATORY UNIVERSITY REQUIREMENT <input type="checkbox"/> UNIVERSITY ELECTIVE REQUIREMENTS	<input type="checkbox"/> FACULTY MANDATORY REQUIREMENT <input type="checkbox"/> Support course family requirements	<input checked="" type="checkbox"/> Mandatory requirements <input type="checkbox"/> Elective requirements
Teaching style	<input type="checkbox"/> Full online learning	<input checked="" type="checkbox"/> Blended learning	<input type="checkbox"/> Traditional learning
Teaching model	<input type="checkbox"/> 1 Synchronous: 1 asynchronous	<input checked="" type="checkbox"/> 1 face to face : 1 asynchronous	<input type="checkbox"/> 2 Traditional

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	Time	Place	Number of students	Teaching style	Approved model

Brief description

<p>This is an Introductory course in mathematical physics for students who already took successfully Calculus II and General Physics II. We begin by reviewing the concept of the vector. After that introduce gradient, divergence, and curl and give their physical meaning and their applications in physics. We discuss Gauss and Stokes Theorems. Transformations between the three coordinates (Cartesian, spherical and cylindrical) are discussed. Separation of variables. The concept of complex numbers is introduced. How to add, subtract, multiply, divide complex numbers is discussed. Determinants and matrices are defined and their applications is discussed. Solving first and second order ordinary differential equations is introduced, Finally, we discuss Fourier series and learn how to expand periodic functions.</p>
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Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Introduction to Mathematical Physics, Nabil. Laham and Nabil. Ayoub, 2 nd Edition, 2004.			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	Mathematical methods in the physical science, 2 nd Edition Mary Boas			
Supporting websites	<ul style="list-style-type: none"> https://en.wikipedia.org/wiki/Physics 			
The physical environment for teaching	<input checked="" type="checkbox"/> Class room	<input type="checkbox"/> labs	<input checked="" type="checkbox"/> Virtual educational platform	<input type="checkbox"/> Others

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Necessary equipment and software	
Supporting people with special needs	
For technical support	

Course learning outcomes (S= Skills, C= Competences K= Knowledge,)

No.	Course learning outcomes	The associated program learning output code
Knowledge		
K1	Define various quantities related to the course	MK 1
K2	Recognize the basic characteristics and properties of vectors	MK 4
Skills		
S1	Calculate the physical quantity related to the course.	MS 1
S2	Solve physical problems	MS 3
S3	Drive physics laws.	MS 3
Competences		
C1	Cooperate to work effectively in the group assignments.	MC 1
C2	Show responsibility for self-learning to be aware with recent developments in physics.	MC 4

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	30%	40%	30%
Participation / practical applications	0	0	10%	30%
Asynchronous interactive activities	30%	30%	0	0
Final exam	40%	40%	50%	40%

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style*	Reference **
1-4	Vector Analysis: Scalars and vectors, Vector Algebra, Rotation of Axes, Scalar or Dot Product, Triple Product, Gradient, Vector Integration, Divergence, Gauss's Divergence Theorem , The Curl, Stokes' Theorem, Green's Theorem, Potential Theorem, Poisson Equation and Laplace's Equations .	Lecture	
5-7	Curvilinear Coordinate: Cartesian, spherical, and cylindrical coordinates, transformation from spherical to Cartesian Coordinates, transformation from Cartesian to Spherical Coordinates, transformation from cylindrical to Cartesian	Lecture	

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	Coordinates, transformation from Cartesian to cylindrical Coordinates, separation of variables in Cartesian coordinates, separation of variables in Spherical coordinates and separation of variables in Cylindrical coordinates.		
8	Complex Numbers: Introduction, graphical representation of complex number, complex conjugate, Addition, subtraction, multiplication and division of complex numbers, De Moivre's formula, powers and roots of a complex number, function of complex variable and examples and applications	Lecture	
9	Determinants : Definition and Properties, Laplace's Development of Minors, Properties of Determinants, Solution of a set of Homogeneous Equations, Solution of Nonhomogeneous Equations	Lecture	
10	Review and Mid-Term Exam	Lecture	
11	Matrices: Basic Definition, Laws and Properties of Matrices, Special Matrices, Orthogonal Matrices, Eigenvalues and Eigenvectors	Lecture	
12-14	Ordinary Differential Equation : Introduction, separable equations, linear equations, exact equations homogenous differential equations, Bernoulli equation, homogenous second order linear differential equations with constant coefficients, Inhomogeneous second order linear differential equations with constant coefficients	Lecture	
15	Fourier Series: Introduction , useful integrals, calculations of Fourier coefficients	Lecture	
16	Review and Final Exam		

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1.	Background	Vectors Notes or any text book	Self-reading and Discussion
2.	Video 1 Solving exercises	E-learning	Discussion in the class
3.	Assignment 1: On the subjects studied on the first three weeks	(Lecture notes and Ref.1)	Submit a pdf or word sheet
4.	Quiz 1	On the subjects studied on the first three weeks	Submitting on the E-learning
5.	Video 2	Solving exercises	Discussion in the class
6.	Assignment 2: On the subjects studied in the weeks 4 and 5	(Lecture notes and Ref.1)	Submit a pdf or word sheet
7.	Self-reading	Separation of variables in	Talk

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		Spherical coordinates and separation of variables in Cylindrical coordinates. (Ref.1)	
8.	Video3 : Solving exercises	E-learning	Discussion in the class
9.	Video 4 : Revision	E-learning	Video
10.	midterm exam	-	-
11.	Assignment 3: On the subjects studied in the weeks 9-11	(Lecture notes and Ref.1)	Submit a pdf or word sheet
12.	Quiz 2	On the subjects studied on the subject studied after midterm exam	Submitting on the E-learning
13.	Presentation of the subject: Fourier Series	Internet sources and the reference book	Video
14.	Video 5 Revision of all the course	E-learning	Video
15.	Assignment 4: On the subjects studied in the weeks 12-14	(Lecture notes and Ref.1)	Submit a pdf or word sheet
16.	Final Exam	-	