Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Lab.	Credit	ECTS			
Mathematical Physics	PHYS600	3	-	3	9	1st	1st	-

Student's workload			
In-class activities	Contact Hours	Self-learning/study	Hours
Lectures	45	Preparation for classes	116
Laboratory	-	Case studies	-
Exams and quizzes	5	Working on lab experiment	-
Lab demo	-	HW/Assignments	31
		Study for exam	47
Total	50	Total	194
Total Learning Hours = 244		Equivalent ECTS points = Total LH/28 = 9	

BRIEF COURSE DESCRIPTION

- This course is designed to provide a mathematical foundation for theoretically oriented research areas. It covers basic mathematical tools such as the eigenvalue problem, tensor analysis, transformations and solutions of partial differential equations.

COURSE OBJECTIVES

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

1. Perform calculations in vector calculus in different coordinates.
2. Solve eigenvalue problem.
3. Apply matrix theory and tensor analysis to solve problems with many variables.
4. Solve first-order and second-order partial differential equations using various techniques.
5. Apply special functions to carry out various integrations.
6. Perform calculations of complex valued functions and variables including integration.

COURSE CONTENTS

- Vector analysis in different coordinates
- Matrix theory , tensor analysis and eigenvalue problems and orthonormal functions
- Complex variables and functions
- Laplace and Fourier transforms
- Special functions
- Solution of partial differential and integral equations

ASSESSMENT CRITERIA

- Mid-Term exams and Quizzes: 30 %
- Assignments, classroom activities: 20 %
- Final Exam: 50%

COURSE TEACHING STRATEGIES

- Lectures, Discussion, Expository and Discovery, and Interactive Discussions.

TEXT BOOK

- G. Arfken and H. J. Weber, Mathematical Methods for Physicists (Elsevier academic press, 2005).

REFERENCE BOOKS

- J. Matthews and R. L. Walker, Mathematical Methods of Physics (W. A. Benjamin, Inc, 1970).
- P. Dennereyand A. Kryzwicki, Mathematics for Physicists (Dover, 1996).
- G. L. Trigg, Mathematical Tools for Physicists, (John Wiley & Sons, 2006)

6.2 COURSES DESCRIPTIONS

Course Title	Course Code	Number of Study Hours				Year	Level	Prerequisites
		Theo.	Lab.	Credit	ECTS			
Classical Mechanics	PHYS601	3	-	3	8	1st	1st	-

Student's workload			
In-class activities	Contact Hours	Self-learning/study	Hours
Lectures	45	Preparation for classes	104
Laboratory	-	Case studies	-
Exams and quizzes	5	Working on lab experiment	-
Lab demo	-	HW/Assignments	29
		Study for exam	46
Total	50	Total	179
Total Learning Hours = 229		Equivalent ECTS points = Total LH/28 = 8	

BRIEF COURSE DESCRIPTION

- This course covers the Lagrange mechanics: variation principle, Lagrange's equation, conservation laws; Central force field: Kepler's laws, virial theorem, scattering; Rotation of rigid bodies: orthogonal transformation, Euler's equation, Euler's angles, moment of inertia; Oscillation: formulation, forced oscillation, damped oscillation, parametric oscillation; Hamilton theory: Hamilton's equation of motion, Legendre transformation, canonical transformation, Hamilton'-Jacobi equation.

COURSE OBJECTIVES

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

1. Apply the basic foundation for courses such as quantum mechanics and electrodynamics.
2. Use the Lagrange and Hamilton formulations that are required to study the dynamics of physical systems.
3. Reformulate the Newton's laws of motion as variational principle, using Lagrange's equation for deriving equation of motions for system of particles.
4. Apply the conservation laws to study system such as rigid bodies.
5. Carry out analysis associated with vibrations of multi-degree of freedom and continuous systems, and transition from classical mechanics to quantum mechanics.

COURSE CONTENTS

- Short review of classical physics
- Lagrange Mechanics
- Central force field
- Rotation of rigid bodies
- Oscillations
- Hamilton's mechanics

ASSESSMENT CRITERIA

- Mid -Term exams: 30 %
- Assignments, classroom activities and Quizzes: 20 %
- Final Exam: 50%

COURSE TEACHING STRATEGIES

- Lectures, Discussion, Tutorial, Expository and Discovery, and Interactive Discussions.

TEXT BOOK

- H. Goldstein, Charles P. Poole & John Safko, Classical Mechanics, (Pearson Education, (2011)).

REFERENCE BOOKS

- L. D. Landau and E. M. Lifshitz, Mechanics (Course of Theoretical Physics-Volume1),3r dedition, (Butterworth-Heinemann, 1976).
- John R. Taylor, Classical Mechanics, (University Science Books, 2005).
- S. T. Thornton and J. B. Marion, Classical Dynamics of Particles and Systems, 5th edition, (Cengage Learning, 2003).