



SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
PHY	333	Mathematical Physics (1)	3	2	0	2	5	MAT 203	5	English

A. Course Description

This is a course in the applications of mathematics to solutions of physical problems. The mathematical methods covered in this course include ordinary differential equations, Laplace and Fourier transforms, special function. The course will cover some mathematical techniques commonly used in physics. This is not a course in pure mathematics, but rather on the application of mathematics to problems of interest in the physical sciences.

B. Course Outcomes

At the end of this course the student will be able to:

1. Learn and understand the basic knowledge of ordinary differential equations, Laplace and Fourier transforms, and special functions.
2. Demonstrate competence with a wide variety of mathematical tools and techniques.
3. Demonstrate a breadth of general knowledge in mathematical physics as well as depth in topics covered in this course.
4. Understand the interactions between mathematics and physics and demonstrate the ability to apply mathematical concepts and techniques into problems in physics.

C. References

Required Textbook

Boas M.L. *Mathematical Methods in the Physical Sciences*, 3rd Edition, John Wiley (2006).

Other references

- Chow T., *Mathematical Methods for Physicists: A Concise Introduction*, Cambridge University Press (2000).
- Riley K.F., Hobson M.P., and Bence S.J., *Mathematical Methods for Physics and Engineering*, 3th Edition, Cambridge University Press, 2006.

Course Website: <http://www.imamm.org/>

D. Topics Outline

1. **First order differential equations:** Definitions, separable equations, homogeneous equations, linear differential equations, exact differential equations, integrating factor. Applications (Contact hours: 16).
2. **Second order linear differential equations with constants coefficients:** Definitions: difference between linear and non-linear, homogeneous equations with constant coefficients non-homogeneous equations, variation of parameters (general method). Applications (Contact hours: 14).
3. **Integral Transforms:** Laplace transforms (LTs), properties of LT, Laplace transform of derivatives, Inverse Laplace transform. Applications (Contact hours: 10).



4. **Fourier series and Fourier transforms:** Fourier Sine – Cosine transform- complex Fourier transform, Fourier transform – inversion theorem- Fourier transform of derivatives, Convolution theorem, momentum representation. Applications (Contact hours: 10).
5. **Special Functions:** Introduction, The factorial function, definition of the Gamma function; recursion relation, The Gamma function of negative numbers, Some important formulas involving gamma functions, Beta functions, Beta functions in terms of Gamma functions, The simple pendulum, The error function, asymptotic series, Stirling's formula, Elliptic integrals and functions (Contact hours: 10).

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 20 %	Midterm 2: 20 %	Final Exam: 40 %
Quizzes, Homework, Attendance & Participation: 20 %		

The grading distribution:

A ⁺	A	B ⁺	B	C ⁺	C	D ⁺	D	F
[95, 100]	[90, 95]	[85, 90]	[80, 85]	[75, 80]	[70, 75]	[65, 70]	[60, 65]	[0, 60]

G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](#)

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