Mathematical Methods (Ordinary Differential Equations)

Module code: MP361

Credits: 5

Semester: 1

Lectures (24 hours)

Prof. Jiri Vala
Department of Theoretical Physics
Room 1.7A, Science Building, North Campus

Timetable:
Tuesday   9:05 –   9:55 RW.121
Friday   12:05 – 12:55 HE

Tutorials (11 hours)

Mr. Eddie Kelly
Department of Theoretical Physics
Room 1.1, Science Building, North Campus

Timetable:
Tuesday   14:05 – 14:55 HF

Syllabus Overview:

I. Introduction: Terminology, Definitions and Notation

II. Direct Integration (e.g. $D^n y = g(x)$)

III. 1st-Order ODEs

A. Separable ODEs (the only nonlinear cases in the module)

B. The Integrating Factor Method

IV. General Theory of Linear ODEs (introductory functional analysis)

V. Constant-Coefficient Homogeneous ODEs

VI. 2nd-Order ODEs

A. Green's Functions

B. Initial Value Problems vs. Boundary Value Problems

VII. Power Series Solutions (with the Legendre, Laguerre and Hermite equations)

VIII. Regular Singular ODEs

A. Euler-Cauchy type

B. The Frobenius Method

C. The Hypergeometric Equation and Generalised Hypergeometric Functions

IX. Transform Methods

A. Laplace Transform

B. Fourier Transform

Assessment Criteria:

Total: 100 %

- 80% University scheduled written examination (120 min)

- 20% Continuous Assessment (homework assignments)

Pass standard: 40%

Repeat Options

The continuous assessment mark is carried forward to the Autumn examinations as there is no facility available for repeating the continuous assessment components of the course.

University scheduled written examination (Autumn): 120 minutes.

REFERENCES

Dennis G. Zill, Warren S. Wright, Michael R. Cullen,
Advanced Engineering Mathematics,
4th Edition, Jones & Bartlett Publishers, 2009.

Edwin Kreyszig,
Advanced Engineering Mathematics,
10th Edition, John Wiley & Sons, 2011.

Mary L. Boas,
Mathematical Methods in the Physical Sciences,
3rd Edition, John Wiley & Sons, 2006.

LECTURE NOTES

http://www.thphys.nuim.ie/Notes/MP361/MP361.html
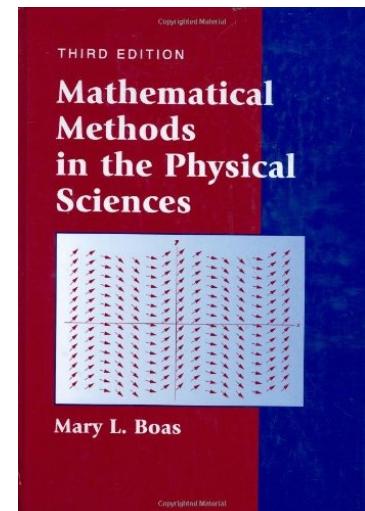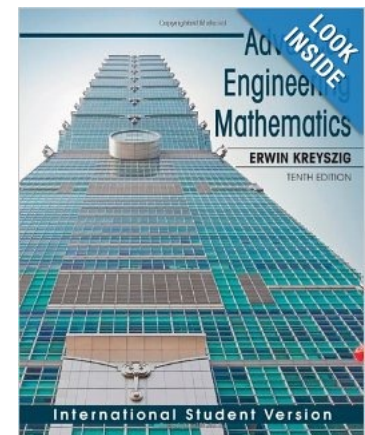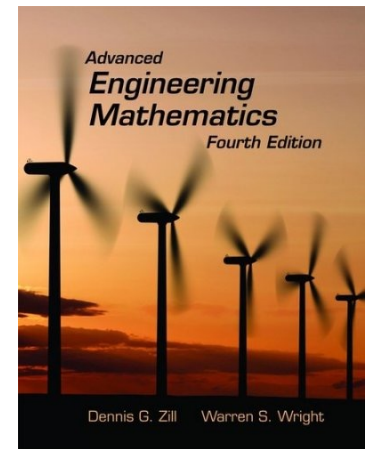
Pre-requisites:

MP201 Mathematical Methods (Vector Calculus and Fourier Series)