

Philadelphia University
Department of Basic Sciences and Mathematics

First Semester

Course Syllabus

2014/2015

Course Title	Ordinary Differential Equations
Course Code	250203
Lecturer	Dr. Jadallah Rezqallah
Office Room	906 S (Ext. 2405)
Office Hours	Sun, Tue, Thu: 12:00 – 13:00 and Mon, Wed: 11:30 – 12:30
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Course Description

This course introduces methods, theories, and applications of differential equations. The module covers the following main topics: First and higher order differential equations, Solutions by series near ordinary points, Solving initial value problems using Laplace transform, and finally, Linear systems of differential equations.

Topics by the Week

Week	Topics
1	Introduction: Classification. Solutions and initial value problems.
2 + 3	First Order Differential Equations: Separable equations. Linear equations. Exact equations. Homogeneous equations.
4+5+6	Second Order Linear Equations: Homogeneous Equations with Constant Coefficients. Fundamental solutions of linear homogeneous equations. Linear independence and the Wronskian. Complex Roots of the Characteristic Equation. Repeated Roots; Reduction of Order. Nonhomogeneous Equations; Method of Undetermined Coefficients. Variation of Parameters.
7+8	Higher Order Linear Equations: General Theory of n th Order Linear Equations. Homogeneous Equations with Constant Coefficients. The Method of Undetermined Coefficients. The Method of Variation of Parameters.
9+10+11	The Laplace Transform: Definition of the Laplace transforms. Properties of the Laplace transform. Inverse Laplace transforms. Solution of initial value problems. Transforms of discontinuous and periodic functions. Convolution. Impulses and the Dirac Delta function.
12+13	Series Solutions of Second Order Linear Equations: Introduction: The Taylor polynomial approximation, Power series. Series Solutions Near an Ordinary Point. Euler Equations; Regular Singular Points. Series Solutions Near a Regular Singular Point. Bessel's Equation.
14+15	Systems of First Order Linear Equations: Introduction. Review of Matrices and Linear Algebraic Equations. Basic Theory of Systems of First Order Linear Equations. Homogeneous Linear Systems with Constant Coefficients. Complex Eigenvalues. Fundamental Matrices. Repeated Eigenvalues. Nonhomogeneous Linear Systems.
16	Final Exams.

Course Objectives

- To demonstrate the usefulness of ordinary differential equations for modeling physical phenomena.
- To introduce different classifications of ordinary differential equations.
- To introduce different forms of differential equations and show how to solve them using analytical methods.
- To introduce systems of differential equations in normal form and show how to solve them.
- To discuss some applications on differential equations.

Learning Outcomes

- Solve different forms of first order differential equations.
- Solve some linear higher order differential equations.
- Solve some linear second order initial value problems using Laplace transform.
- Solve some linear second order differential equations using series methods.
- Solve a linear system of differential equations in normal form.

Assessment Distribution

Students will be assessed based on a 100 total marks, which are distributed as follows.

Exam Type	Expected Time	Points Allocated
First	19/11/2014 - 27/11/2014	20%
Second	28/12/2014 - 06/01/2015	20%
Quizzes	3 quizzes (at least)	20%
Final	01/02/2015 - 09/02/2015	40%

Textbook and Supporting Materials

- Boyce and Diprima, **Elementary Differential Equations, 10th Edition**, John Wiley & Sons, Inc. 2013.
- Nagle, Saff, and Snider, **Fundamentals of Differential Equations, 8th Edition**, Addison Wesley 2012.

Class Attendance

Attendance is expected of every student. Being absent is not an excuse for not knowing about any important information that may have been given in class. Under the University's regulations, a student whose absence record exceeds 15% of total class hours will automatically fail the course. Students who in any way disrupt the class will be expelled from the classroom and will not be allowed to return until the problem has been resolved.

Late Exams

Late (make-up) exams will be given only to students who have a valid excuse and are able to provide a written document for its verification. The level of difficulty of a late exam is about 50% higher than that of the corresponding regular exam. All late exams will be conducted during the last week of the semester. Each student is allowed only one make-up in a semester, either for the first exam or the second, but not both. There is no make-up for a late exam.

There is no make up on quizzes. Thus, I will cancel the grade of the lowest quiz. If you miss two quizzes with a valid written excuse for two emergencies, I will give you a make-up for only one quiz and I will choose that quiz.

Tables and Calculators

You have to bring your own calculator and tables, if they needed, to the quizzes and the exams.

Extra Credit

I may give extra credits after one of the exams or at the end of the semester, and that depends on the grades of the students. You will loose part or all of these credits in case you miss many of the classes. As an advice for you "DO NOT DEPEND ON ANY EXTRA CREDIT".