

**Quinsigamond Community College  
School of Math and Science**

**Instructor's Information:**

**Instructor:** <Professor John Smith>  
**Office:** <200A>  
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**Course Information:**

**Course:** MAT 238 Differential Equations – Section ##  
**Meets on:** <Mondays, Wednesdays, Fridays from 8:00am – 8:50am>  
**Credits:** 3 credit hours

**Course Description:**

This course covers definition of differential equations, solution of differential equations, separation of variables, homogeneous and nonhomogeneous solutions, Wronskian, second and higher order equations, solution of systems of linear differential equations, numerical methods, linear independence, the Laplace transform, transforms of derivatives, derivatives of transforms, the Gamma function, inverse transforms, and convolution theorem. Students use mathematical software to solve differential equations for numerical methods.

**Pre-requisite:**

MAT 235

**Required Textbook/Materials/Website:**

**Textbook:** *Fundamentals of Differential Equations and Boundary Value Problems*, by Nagle, Saff, Snider, Pearson Publishing, 7<sup>th</sup> edition, © 2016  
**Materials:** Graphing calculator  
**Website:** Access to [www.mymathlab.com](http://www.mymathlab.com)

**Student Learning Outcomes & Instructional Objectives:**

This course is designed to achieve the following student outcomes and objectives:

- Solve first- order differential equations.
- Solve mathematical models involving first- order equations.
- Solve linear second- order differential equations.
- Solve systems of differential equations using differential operators.
- Solve higher- order linear differential equations.
- Use Laplace transform to solve differential equations.
- Solve differential equations using power series.
- Use method of separation of variables to solve partial differential equations.
- Compute Fourier series of a given function.
- Derive a formal solution to the heat equation.
- Derive a formal solution to the wave equation.

### **Teaching Procedures:**

Most classes will be a combination of lecture, group activities, and in-class assignments. You will be given homework assignments to be completed outside of class, with due dates/times. There will occasionally be a quiz or exam given in class.

### **Course Topics & Required Assignments/Readings:**

#### Introduction

- Terminology
- Solutions and Initial Value Problems
- Direction Fields
- The approximation Method of Euler

#### First Order Differential Equations

- Separable Equations.
- Linear Equations.
- Exact Equations
- Special Integrating Factors.
- Substitutions and Transformations.

#### Mathematical Models and Numerical Methods Involving First- Order Equations

- Compartmental Analysis.
- Heating and Cooling of Buildings.
- Newtonian Mechanics.
- Electrical Circuits.

#### Linear Second Order Equations

- Homogeneous Linear Equations: The General Solution.
- Auxiliary Equations with complex Roots.
- Nonhomogeneous Equations: Undetermined Coefficients.
- Variation of Parameters.

#### Introduction to Systems and Phase Analysis

- Differential Operators and the Elimination Method for Systems.

#### Theory of Higher Order Linear Differential Equations

- Basic Theory of Linear Differential Equations.
- Homogeneous Linear Equations with Constant Coefficients.
- Undetermined coefficients and the Annihilator Method.
- Variation of Parameters (higher order differential equations).

#### Laplace Transform

- Definition of Laplace Transform.
- Properties of Laplace Transform.
- Inverse of Laplace Transform.
- Solving Initial Value Problem.
- Transforms of Discontinuous Functions.
- Transforms of Periodic and Power Functions.
- Convolutions.

### Series Solutions of Differential Equations

- Power Series and Analytic Functions
- Power Series Solutions to Linear Differential Equations
- Equations with Analytic Coefficients
- Cauchy-Euler Equations
- Method of Frobenius

If time permits:

### Partial Differential Equations

- Method of Separation of Variables
- Fourier Series
- Fourier Sine and Cosine Series
- The Heat Equation
- The Wave Equation

### Assignment & Test Schedule:

<list all assignments, quizzes, & exam dates>

### Grading Breakdown:

25% Homework  
15% Quizzes  
10% Attendance  
20% Exams  
30% Final Exam

A	95 – 100	B –	80 – 82	D +	67 – 69
A –	90 – 94	C +	77 – 79	D	63 – 66
B +	87 – 89	C	73 – 76	D –	60 – 62
B	83 – 86	C –	70 – 72	F	0 – 59

### Attendance Policy:

Students are expected to attend all classes, for the entire period. Attendance will be taken during every class, and counts towards your final course grade. If you are absent from class, a doctor's note will excuse your absence.

### Disability Statement:

If you have a disability which may require an accommodation, please notify me as soon as possible. You are responsible for forwarding your Accommodation Letter to me and discussing arrangements for this course. Your accommodations for this course begin upon my receipt of your Accommodation Letter; accommodations are not retroactive. You may request accommodations at any time during the semester, but instructors must be provided with reasonable notice prior to exams or deadlines.

Disability Services works to promote access to ensure an accessible college experience for students. If you have further questions, contact Disability Services. All discussions are confidential.

**Contact Information for Disability Services & Assistive Technology:**

Call: 508-854-4471

Sorenson Video Phone: 508-502-7647

Email: [disabilityservices@qcc.mass.edu](mailto:disabilityservices@qcc.mass.edu)

**Services for Veterans:**

If you are a veteran of the armed forces, please visit the Veteran Affairs Office located in 258A (Administration Building) or contact them at [veteranaffairs@qcc.mass.edu](mailto:veteranaffairs@qcc.mass.edu)

**Academic Honesty and Plagiarism:**

Our purpose in the classroom is to seek the truth; this work requires trust and honesty between teacher and student. If we are not honest about what we know and don't know, our learning will always be impaired. Because our teaching and learning depends on this honest communication, we expect all students to understand what plagiarism is and why it is unacceptable.

Plagiarism means taking someone else's ideas or words and presenting them as one's own. The offense can take many forms including cheating on a test, passing in a paper taken from the Internet or from another student, or failing to properly use and credit sources in an essay. Sometimes the issue is subtle, involving getting too much help on an assignment from someone else. In every instance, plagiarism means cheating both oneself and the owner of the source. Since the cheating sabotages a student's learning experience, consequences range from no credit for the assignment to failure for the course and possible expulsion from the college.

For further information concerning plagiarism, refer to the QCC Student Handbook.