# OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.

Shaded headings are subject to change at the discretion of the department and the material will vary - see course syllabus available from instructor

| FACULTY/DEPARTMENT: Science, Health & Human Services / Engineering |
|-------------------|-----------------------------|
| COURSE NAME/NUMBER: ENGR 255 |
| FORMER COURSE NUMBER: Ordinary Differential Equations |
| UCFV CREDITS: 3 |
| COURSE DESCRIPTIVE TITLE: Ordinary Differential Equations |

## CALENDAR DESCRIPTION:

Most mathematical models of a physical process are in the form of differential equations. This course provides various techniques and ideas in solving ordinary differential equations with an emphasis on applications. Graphing calculators and Maple are used in this course. Topics include first- and second-order linear differential equations, non-linear equations, series solutions, Laplace transform methods, and linear systems.

Note: This course is also offered as MATH 255. Students can receive credit for only one of ENGR 255 and MATH 255.

## PREREQUISITES:

- MATH 112

## COREQUISITES:

Prerequisites or Corequisites: MATH 211 and one of MATH 152, MATH 221, PHYS 221.

## SYNONYMOUS COURSE(S)

- (Course #) replaces:
- (Course #) cannot take:

## SERVICE COURSE TO:

- (Department/Program)
- (Department/Program)

## TOTAL HOURS PER TERM:

- 60

## TRAINING DAY-BASED INSTRUCTION

**STRUCTURE OF HOURS:**

- Lectures: 55 Hrs
- Seminar: Hrs
- Laboratory: 5 Hrs
- Field Experience: Hrs
- Student Directed Learning: Hrs
- Other (Specify): Hrs

**LENGTH OF COURSE:**

- HOURS PER DAY:
- Total:

**MAXIMUM ENROLLMENT:**

- 36

**EXPECTED FREQUENCY OF COURSE OFFERINGS:**

- Fall semester

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)

- Yes
- No

WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)

- Yes
- No

TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:

- Yes
- No

## AUTHORIZATION SIGNATURES:

- Course Designer(s): David Chu / Erik Talvila
- Chairperson: (Curriculum Committee)
- Department Head: Peter Mulhern
- Dean: Jacalyn Snodgrass
- PAC Approval in Principle Date: PAC Final Approval Date: January 28, 2005
LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:
The main objectives of this course are (i) to provide various techniques and ideas in solving ordinary differential equations and (ii) to use technology to solve mathematical models in the form of differential equations.

The successful student will be able to:
1. solve first-order linear differential equations by recognizing the equations as separable and/or exact;
2. understand and apply the Existence and Uniqueness Theorem;
3. construct and solve first-order difference equations with applications;
4. solve second-order homogeneous linear equations with constant coefficients, find the fundamental solutions, test linear independence and calculate Wronskian;
5. solve second-order nonhomogenous equations by the method of undetermined coefficients and variation of parameters;
6. derive, solve and interpret vibrational models;
7. find series solutions of second-order linear equations near an ordinary point and a regular point;
8. understand the idea of Laplace transform and apply to different elementary functions, solve differential equations involving step functions and impulse functions;
9. solve homogeneous linear systems with constant coefficients;
10. formulate mathematical models and use technology to solve them.

METHODS:
Lectures and demonstration of Maple in computer lab.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):
Credit can be awarded for this course through PLAR (Please check:) ☒ Yes ☐ No

METHODS OF OBTAINING PLAR:
Course challenge. Please check online at http://www.ucfv.ca/math/challenge.htm for the departmental challenge policy.

TEXTBOOKS, REFERENCES, MATERIALS:
[Textbook selection varies by instructor. An example of texts for this course might be:]
The text is chosen by a departmental curriculum committee.

The suggested texts are as follows:

SUPPLIES / MATERIALS:

STUDENT EVALUATION:
[An example of student evaluation for this course might be:]

<table>
<thead>
<tr>
<th>Assignments</th>
<th>15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>Tests</td>
<td>30%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>40%</td>
</tr>
</tbody>
</table>

Students must achieve at least 40% on the final exam in order to receive credit for this course.

COURSE CONTENT:
[Course content varies by instructor. An example of course content might be:]

Use of graphing calculator and Maple is expected.

1. Direction fields, mathematical models.
2. First-order linear and non-linear differential equations, separable equations, autonomous equations, population dynamics, exact equations, integrating factors.
3. The Existence and Uniqueness Theorem (without proof).
4. First-order difference equations.
5. Second-order homogeneous linear equations with constant coefficients, linear independence, Wronskian, characteristic equation.
7. Series solutions near an ordinary point and a regular singular point, Euler equations.
8. Laplace transform, step functions, discontinuous forcing functions, impulse functions.