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| **Contra Costa College** |

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| **Course Outline** |

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| **Department & Number** | MATH-292 | **Number of Weeks** | 18 |
| **Course Title** | Introduction to Differential Equations  | **Lecture Hours By Term** | 72 |
| **Prerequisite** | MATH-191 | **Lab Hours By Term** |  0 |
| **Challenge Policy**  | Satisfactory completion of an equivalent course. | **\*Hours By Arrangement** |  0 |
| **Co-requisite** |  | **Units**  |  4 |
| **Challenge Policy**  |  |  |  |
| **Advisory** | MATH-290 |

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| **\*HOURS BY ARRANGEMENT:** | 0 | Hours per term.  |
|  **ACTIVITIES:** (Please provide a list of the activities students will perform in order to satisfy the HBA requirement): |
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| **COURSE/CATALOG DESCRIPTION** |

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| The course is an introduction to ordinary differential equations including both quantitative and qualitative methods as well as applications from a variety of disciplines. Introduces the theoretical aspects of differential equations, including establishing when solution(s) exist, and techniques for obtaining solutions, including, series solutions, and singular points, Laplace transforms and linear systems. |

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| **COURSE OBJECTIVES:** |
| At the completion of the course the student will be able to: |

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| 1. Create and analyze mathematical models using ordinary differential equations;
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| 1. Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and selected higher order ordinary differential equations;
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| 1. Apply the existence and uniqueness theorems for ordinary differential equations;
 |
| 1. Find power series solutions to ordinary differential equations;
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| 1. Determine the Laplace Transform and inverse Laplace Transform of functions; and
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| 1. Solve Linear Systems of ordinary differential equations.
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**INTENDED STUDENT LEARNING OUTCOMES:**

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| 1. Students will be able to recognize and solve first-order equations of the following kinds: separable, homogeneous, linear, and exact.
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| 1. Students will be able to recognize and find the general solution to second-order linear differential equations.
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| 1. Students will be able to apply solution techniques for first- and second-order differential equations to problems from mathematics and physics.
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| 1. Students will by able to apply the methods of series and Laplace transform to differential equations and systems.
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 **COURSE CONTENT (Lecture):**

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| 1. Solutions of ordinary differential equations;
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| 1. First order DE including separable, homogeneous, exact, and linear;
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| 1. Existence and uniqueness of solutions;
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| 1. Applications of first order differential equations such as circuits, mixture problems, population modeling, orthogonal trajectories, and slope fields;
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| 1. Second order and higher order linear differential equations;
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| 1. Fundamental solutions, independence, Wronskian;
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| 1. Nonhomogeneous equations;
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| 1. Applications of higher order differential equations such as the harmonic oscillator and circuits;
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| 1. Variation of parameters;
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| 1. Laplace Transforms;
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| 1. Series Solutions; and
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| 1. Systems of Ordinary differential equations
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 **COURSE CONTENT (Lab):**

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| **METHODS OF INSTRUCTION:** |
| Lecture and discussion |
| Demonstration and collaboration |
| Daily reading assignments |
| Homework exercises |

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| **INSTRUCTIONAL MATERIALS:** |

**NOTE:** To be UC/CSU transferable, the text must be dated within the last 7 years OR a statement of justification for a text beyond the last 7 years must be included.

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| Textbook Title: | Fundamentals of Differential Equations |
| Author: | Nagle, Saff, and Snider |
| Publisher: | Addison-Wesley |
| Edition/Date: | 8th Edition / 2012 |
| Textbook Reading Level: |  |
| Justification Statement: | *(For textbook beyond 7 years)* |
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| Lab Manual Title  | (*if applicable*): |
| Author: |  |
| Publisher: |  |
| Edition/Date: |  |

**OUTSIDE OF CLASS WEEKLY ASSIGNMENTS:**

Title 5, section 55002.5 establishes that a range of 48 -54hours of lecture, study, or lab work is required for one unit of credit. For each hour of lecture, students should be required to spend an additional two hours of study outside of class to earn one unit of credit.

* State mandates that sample assignments must be included on the Course Outline of Record.

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|  **Outside of Class Weekly Assignments** | **Hours per week** |

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| Weekly Reading Assignments *(Include detailed assignment below, if applicable)* | 3 |

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| Students are responsible for reading the sections of the text corresponding to that week’s lectures. Approximately 2 – 4 sections will be covered per week. For the text cited above, this translates to approximately 20 – 25 pages of reading per week. |

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| Weekly Writing Assignments *(Include detailed assignment below, if applicable)* |  |

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| Weekly Math Problems *(Include detailed assignment below, if applicable)* | 5 - 12 |

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| Homework exercises are assigned in each section of the text covered; students are expected to do homework exercises as the material is covered in lecture. In each section, approximately 5 – 15 problems will be assigned. This translates to approximately 10 – 60 homework exercises per week. Note: 5 – 12 hours is the minimum amount of time a student is expected to spend solving homework exercises. |

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| Lab or Software Application Assignments *(Include detailed assignment below, if applicable)* |  |

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| Other Performance Assignments *(Include detailed assignment below, if applicable)* |  |

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**STUDENT EVALUATION**: **(Show percentage breakdown for evaluation instruments)**

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| * Course must require use of critical thinking, college-level concepts & college-level learning skills.
* For degree credit, course requires essay writing unless that requirement would be inappropriate to the course objectives. If writing is inappropriate, there must be a requirement of problem-solving or skills demonstration.
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|  | **%** | Essay (If essay is not included in assessment, explain below.) |
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| 25 | **%** | Computation or Non-computational Problem Solving Skills |
|  | **%** | Skills Demonstration |
| 75 | **%** | Objective Examinations |
|  |  | Other (describe) |
|  | **%** |  |
|  | **%** |  |
|  | **%** |  |

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|  **GRADING POLICY: (Choose LG, P/NP, or SC)** |
|  **X** | **Letter Grade** |  | **Pass / No Pass** |  | **Student Choice** |
| 90% - 100% = A  | 70% and above = Pass | 90% - 100% = A |
| 80% - 89% = B  | Below 70% = No Pass  | 80% - 89% = B |
| 70% - 79% = C  |  | 70% - 79% = C |
| 60% - 69% = D  |  | 60% - 69% = D |
| Below 60% = F  |  | Below 60% = F |
| *or* |
| 70% and above = Pass |
| Below 70% = No Pass |
| **Prepared by:** | Carol Stanton |

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| **Date:**  | Spring 2014 |

*Revised form 01/14*