University of the Philippines Manila
College of Arts and Sciences
Department of Physical Sciences and Mathematics
Mathematics and Computer Science Unit

Course Number: MATH 121.1
Course Title: Elementary Differential Equations I
<mark>Course Description:</mark>
Prerequisite: Math 75
Credits: 3 Units
Hours/Week: 3 Hours
<mark>Reference</mark>:   Elementary Differential Equations by Earl D. Rainville & Phillip E. Bedient

COURSE OUTLINE

Chapter I. Basic Concepts
      A.   Classifications
      B.   Formulating Proportionality Problems
      C.   Problems Involving Newton's Law of Cooling
      D.   Problems Involving Newton's Second Law of Motion
      E.   Spring Problems
      F.   Electric Circuit Problems
      G.   Geometrical Problems
      H.   Primitives

Chapter II. Solutions
      A.   Validating Solutions
      B.   Primitives
      C.   Direction Fields
      D.   Initial and Boundary Conditions
      E.   Particular Solutions
      F.   Simplifying Solutions

Chapter III. Separable First-Order Differential Equations
      A.   Solutions with Rational Functions
      B.   Solutions with Logarithms
      C.   Solutions with Transcendental Functions
      D.   Homogeneous Equations
      E.   Solutions of Homogeneous Equations
      F.   Miscellaneous Transformations
      G.   Initial-Value Problems

Chapter IV. Exact First-Order Differential Equations
      A.   Testing for Exactness
      B.   Solutions of Exact Equations
      C.   Integrating Factors
      D.   Solutions with Integrating Factors
      E.   Initial-Value Problems

Chapter V. Linear First-Order Differential Equations
      A.   Homogeneous Equations
      B.   Nonhomogeneous Equations
      C.   Bernoulli Equations
      D.   Miscellaneous Transformations
      E.   Initial-Value Problems

FIRST DEPARTMENTAL EXAMINATION

Chapter VI. Applications of First-Order Differential Equations
      A.   Population Growth Problems
      B.   Decay Problems
      C.   Compound-Interest Problems
      D.   Cooling and Heating Problems
      E.   Flow Problems
      F.   Electric Circuit Problems

G. Mechanics Problems
H. Geometrical Problems

Chapter VII. Linear Differential Equations – Theory of Solutions
    A. Wronskian
    B. Linear Independence
    C. General Solutions of Homogeneous Equations
    D. General Solutions of Nonhomogeneous Equations

Chapter VIII. Linear Homogeneous Differential Equations with Constant Coefficients
    A. Distinct Real Characteristic Roots
    B. Distinct Complex Characteristic Roots
    C. Distinct Real and Complex Characteristic Roots
    D. Repeated Characteristic Roots
    E. Characteristic Roots of Various Types
    F. Euler's Equation

Chapter IX. The Method of Undetermined Coefficients
    A. Equations with Exponential Right Side
    B. Equations with Constant Right-Hand Side
    C. Equations with Polynomial Right-Hand side
    D. Equations whose Right Side is a Product of a Polynomial and an Exponential
    E. Equations whose Right Side contains a Product Involving Sines and Cosines
    F. Modifications of Trial Particular Solutions
    G. Equations whose Right Side contains a Combination of Terms

SECOND DEPARTMENTAL EXAMINATION

Chapter X. Variation of Parameters
    A. Formulas
    B. First-Order Differential Equations
    C. Second-Oder Differential Equations
    D. Higher Order Differential Equations

Chapter XI. Applications of Second-Order Linear Differential Equations
    A. Spring Problems
    B. Mechanics Problems
    C. Horizontal-Beam Problems
    D. Buoyancy Problems
    E. Electric Circuit Problems

Chapter XII. Laplace Transforms
    A. Transforms of Elementary Functions
    B. Transforms involving Gamma Functions
    C. Linearity
    D. Functions Multiplied by a Power of Independent Variable
    E. Translations
    F. Transforms of Periodic Functions

Chapter XIII. Inverse Laplace Transforms and Their Use in Solving Differential Equations
    A. Inverse Laplace Transforms by Inspection
    B. Linearity
    C. Completing t he Square and Translations
    D. Partial-Fraction Decompositions
    E. Convolutions
    F. Solutions Using Laplace Transforms

THIRD DEPARTMENTAL EXAMINATION

ADDITIONAL/OPTIONAL TOPICS INVOLVING DIFFERENTIAL EQUATIONS

Chapter XIV. Matrix Methods (Math 120)
Chapter XV. Infinite-Series Solutions (Math 174)
Chapter XVI. Eigenfunction Expansions (Math120/Math174)

Grading Scale:

93-100	1.00
90-92	1.25
87-89	1.50
84-86	1.75
80-83	2.00
75-79	2.25
70-74	2.50
65-69	2.50
60-64	3.00
55-59	4.00
Below 55	5.00

COURSE REQUIREMENTS

Class Standing (3 Exams)   2/3
Final Exam   1/3

CLASS POLICIES

1. Attendance is required. A student who is absent for more than 6 times and fails to officially drop the course will automatically be given a grade of 5.0.
2. **Cheating is punishable with a grade of 5.0.**
3. A student is allowed to make up for only one missed exam, **provided that the reason is valid.** If another exam is missed, the student will get a zero in that exam. The special exam is usually scheduled after the Finals and covers all topics of the entire course.
4. Those who wish to take an advance exam, **provided that the reason is valid,** must inform me at least a week before the scheduled exam.
5. A student may be exempted from taking the Final Exam if his or her **class standing is 2.0 or higher (>=80%)**.
6. No special projects are to be given to compensate for either low or failing grades.
7. Complaints regarding the exam results will only be entertained within a week after the results are released.
8. A student may officially drop the course on or before the deadline for dropping. Only after a dropping slip is accomplished and the instructor's copy is submitted, can a student be considered to have officially dropped the subject.