MATH 2180: Differential Equations

2022 Winter Session	
Total Class Sessions: 25	Instructor: Staff
Class Sessions Per Week: 6	Classroom: TBA
Total Weeks: 4	Office Hours: TBA
Class Session Length (Minutes): 145	Language: English
Credit Hours: 4	

Course Description:

This course helps students develop an understanding of the theory and applications of differential equations. It will introduce methods of solving first order differential equations with and without initial conditions, second order differential equations with and without initial conditions, higher order differential equations, Laplace transforms, Fourier series, second-order partial differential equations, systems of differential equations, and applications.
Prerequisite: MATH 1220 Calculus II.

Course Material

Elementary Differential Equations and Boundary Value Problems, 10th edition, W. E. Boyce and R.C. Diprima,

Course Format and Requirements:

Students are responsible for lecture notes, any course material handed out, and attendance in class, while attendance will not to be formally recorded. Active participation in the classroom is a great way to generate the discussion necessary to fully grasp the material.

Course Assignments:

Quizzes

Quizzes will be given in lecture. There will be five quizzes given through the whole semester. Make-up quizzes will not be given, unless the absence is excused by the instructor.

Homework

Assignments: Homework and classwork will be given regularly. A total of eight assignments will be collected in class in preparation for the quizzes and exams. The problems on the quizzes will be very similar to the homework problems. No aids are allowed and a small amount of memorization might be necessary.

Exams

We will have two midterm exams and a final exam. All exams will be closed-book. A sheet of equations will be provided for you during these exams. Make-up exams will not be given, unless the absence is excused by the instructor. Appeals for exam scores must be made within one week

after the exam was handed back. To make an appeal, you must present the instructor a valid written argument pertaining to the exam problem(s) you wish you appeal.

Course Assessment:

Quizzes	10%
Homework	10%
Midterm Exam 1	25%
Midterm Exam 2	25%
Final Exam	30%
Total	**100%**

Grading Scale (percentage):

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
98-100	93-97	90-92	88-89	83-87	80-82	78-79	73-77	70-72	68-69	63-67	60-62	<60

Academic Integrity:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Chengdu University of Technology's *Academic Conduct Code.* Any work suspected of violating the standards of the *Academic Conduct Code* will be reported to the Dean's Office. Penalties for violating the *Academic Conduct Code* may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the *Academic Conduct Code*.

Special Needs or Assistance:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.

Course Schedule:

Class 1:
Overview of the course;
Go through syllabus;
Solution of Some Differential Equations;
Classification of Differential Equations

Class 2:

FIRST ORDER DIFFERENTIAL EQUATIONS;
Linear Equations with Variable Coefficients;
Separable Equations

Class 3:
Modeling with First Order Equations;
Motion with air resistance, compound interest, or Newton's law of cooling

Class 4:
Quiz 1
Motion with air resistance, compound interest, or Newton's law of cooling (Cont.);
Differences between Linear and Nonlinear Equations;
Stability of equilibrium;

Class 5:
Integrating Factors
Fundamental Solutions of Linear Homogeneous Equations;

Class 6:
Exact Equations;
Existence and Uniqueness
The Wronskian;

Class 7:
Quiz 2
The Wronskian (Cont.);
Complex Roots of the Characteristic Equations;
Repeated Roots

Class 8:
Repeated Roots (Cont.)
Reduction of Order;
Review for Midterm 1

Class 9:
Midterm Exam 1

Class 10:
Nonhomogeneous Equations;
Method of Undetermined Coefficients

Class 11:
Nonhomogeneous Equations (Cont.);
Method of Undetermined Coefficients (Cont.);
Mechanical and Electrical Vibrations

Class 12:
Quiz 3
HIGHER ORDER LINEAR EQUATIONS;
General Theory of n-th Order Linear Equations;
Homogeneous Equations with Constant Coefficients

Class 13:
Definition of the Laplace transform;
Solution of Initial Value Problems;
Step Functions

Class 14:
Step Functions (Cont.);
Introduction to SYSTEMS OF TWO LINEAR DIFFERENTIAL EQUATIONS;
2 x 2 Linear Systems of Differential Equations

Class 15:
Quiz 4
Fundamental Matrices;
Eigenvalues;
First Order Linear Systems;

Class 16:
First Order Linear Systems (Cont.);
Homogeneous Linear Systems
Review for Midterm 2

Class 17:
Midterm Exam 2

Class 18:
NONLINEAR DIFFERENTIAL EQUATIONS AND STABILITY;
Phase Portraits of 2 x 2 Linear Systems;
Autonomous Systems and Stability;

Class 19:
Locally-linear systems;
Predator-Prey Equations

Class 20:
Beginning PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER SERIES;
Two-Point Boundary Value Problems;
Fourier Series

Class 21:
Quiz 5
Two-Point Boundary Value Problems (Cont.);
Fourier Series (Cont.);
The Fourier Convergence Theorem

Class 22:
Even and Odd Functions;
Separation of Variables;
Solutions of Heat Conduction Problems

Class 23:
Separation of Variables (Cont.);
Solutions of Heat Conduction Problems (Cont.);
Laplace's Equation

Class 24:
The Wave Equation: Vibrations of an Elastic String;
Laplace's Equation (Cont.)

Class 25:
Wrap-up
Review for final exam

Final Exam (Cumulative): TBA