A. COURSE INFORMATION

Course number/section: MATH 3315.001
Class meeting time: MWF 9:00-9:50
Class location: OCNR-133
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Diane Denny
Office location: CI-313
Office hours: MW 2:00-4:15, F 11:00-12:30 or by appointment
Telephone: (361) 825-3485
e-mail: diane.denny@tamucc.edu
Appointments: request appointments from the instructor in person

C. COURSE DESCRIPTION

This course is an introduction to both theoretical and applied aspects of ordinary differential equations. Topics include: first-order equations, linear second-order equations, elementary numerical methods, and the Laplace transform.

D. PREREQUISITES AND COREQUISITES

A grade of C or better in MATH 2414

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES


F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.
Student Learning Outcomes:

1. Identify and classify differential equations (DE).
2. Solve first-order ordinary differential equations (ODE).
3. Solve second-order ODE in applications.
4. Solve higher-order ODE, including applications.
5. Find power series solutions to ODE.
7. Approximate a solution to ODE using numerical methods.
8. Solve system of ODE.

Course Competencies:

1. The student will be able to identify and classify differential equations (DE).
   (a) Classify a differential equation (DE) by type, order, and linearity.
   (b) Show that a given function is a solution to an ordinary differential equation.
   (c) Determine the existence of a unique solution to an ODE.
   (d) Construct ODEs as mathematical models.

2. The learner will be able to solve first-order ordinary differential equations (ODE).
   (a) Solve an ODE by separation of variables with or without an initial condition.
   (b) Determine if an ODE is exact and solve it if it is exact.
   (c) Find the general solution of a linear ODE with and without initial conditions.
   (d) Solve a homogeneous and Bernoulli ODE using a substitution.

3. The learner will be able to solve first-order ODE in applications.
   (a) Construct a linear ODE as a mathematical model.
   (b) Construct a non-linear ODE as a mathematical model.
   (c) Construct a system of linear ODEs as a mathematical model.

4. The learner will be able to solve higher-order ODE.
   (a) Solve a nth-order initial-value problem (IVP).
   (b) Solve a nth-order boundary-value problem (BVP).
   (c) Determine whether given functions are linearly independent or dependent.
   (d) Verify that given functions forms a fundamental set of solutions.
   (e) Solve ODEs using undetermined coefficients. (f) Solve ODEs by variation of parameters.
   (g) Solve a system of ODEs by systematic elimination or determinants.
   (h) Solve non-linear equations using a substitution.
(i) Construct ODEs as mathematical models to initial-value problems.

5. The learner will be able to find power series solutions to ODE.
   (a) Find the interval of convergence of a power series.
   (b) Solve ODEs using power series.

6. The learner will be able to solve ODE using the Laplace transform.
   (a) Find the Laplace transform of a given function.
   (b) Find the inverse Laplace transforms.
   (c) Solve ODEs using Laplace transforms.

7. The learner will be able to approximate a solution to ODE using numerical methods.
   (a) Create direction fields for ODEs.
   (b) Approximate a solution to a ODE using Euler’s and the improved Euler’s method.
   (c) Approximate a solution to an ODE using Runge-Kutta methods.

8. The learner will strengthen his or her general academic skills (critical thinking, writing, verbal explanation, working collaboratively, assuming responsibility, and use of technology).

9. The learner will develop a broad base of differential equations knowledge: Concepts, Basic skills, mathematical senses (quantitative, geometric, symbolic), and thinking process (problem solving, predicting, and generalizing).

G. INSTRUCTIONAL METHODS AND ACTIVITIES

Methods and activities for instruction include lectures.

H. MAJOR COURSE REQUIREMENTS AND GRADING

The student learning outcomes will be measured using exams, homework, and a cumulative final exam.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Exams</td>
<td>60%</td>
</tr>
<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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</tbody>
</table>
1. **COURSE CONTENT/SCHEDULE**
<table>
<thead>
<tr>
<th>DATE (BY WEEK)</th>
<th>TOPIC</th>
<th>CHAPTER(S)</th>
<th>ASSIGNMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initial-value problems</td>
<td>1.1, 1.2, 1.3</td>
<td>TBA</td>
</tr>
<tr>
<td>2</td>
<td>First-order equations; separable equations; linear equations</td>
<td>2.1, 2.2, 2.3</td>
<td>TBA</td>
</tr>
<tr>
<td>3</td>
<td>Exact equations; substitutions</td>
<td>2.4, 2.5</td>
<td>TBA</td>
</tr>
<tr>
<td>4</td>
<td>Higher-order equations</td>
<td>4.1 , Test 1</td>
<td>TBA</td>
</tr>
<tr>
<td>5</td>
<td>Reduction of order; constant coefficients; undetermined coefficients</td>
<td>4.2, 4.3, 4.4</td>
<td>TBA</td>
</tr>
<tr>
<td>6</td>
<td>Undetermined coefficients; variation of parameters; Cauchy-Euler equations</td>
<td>4.5, 4.6, 4.7</td>
<td>TBA</td>
</tr>
<tr>
<td>7</td>
<td>Green’s functions; elimination; nonlinear equations</td>
<td>4.8, 4.9, 4.10</td>
<td>TBA</td>
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<tr>
<td>8</td>
<td>Series solutions</td>
<td>6.1, Test 2</td>
<td>TBA</td>
</tr>
<tr>
<td>9</td>
<td>Series solutions, special functions</td>
<td>6.2, 6.3, 6.4</td>
<td>TBA</td>
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<tr>
<td>10</td>
<td>Laplace transform</td>
<td>7.1, 7.2, 7.3</td>
<td>TBA</td>
</tr>
<tr>
<td>11</td>
<td>Laplace transform, Dirac delta function; systems of equations</td>
<td>7.4, 7.5, 7.6</td>
<td>TBA</td>
</tr>
<tr>
<td>12</td>
<td>Systems of equations</td>
<td>8.1, Test 3</td>
<td>TBA</td>
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<tr>
<td>13</td>
<td>Systems of equations; matrix exponential</td>
<td>8.2, 8.3, 8.4</td>
<td>TBA</td>
</tr>
<tr>
<td>14</td>
<td>Numerical methods</td>
<td>9.1, 9.2</td>
<td>TBA</td>
</tr>
<tr>
<td>15</td>
<td>Numerical methods</td>
<td>9.3, 9.4</td>
<td>TBA</td>
</tr>
<tr>
<td>16</td>
<td>Final Exam (Dec. 9)</td>
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Note:
Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES
All questions concerning grades must be resolved within one week.

**Homework:**

Homework will be assigned every week, and is due at the start of class one week after the day the homework was assigned. Homework must be submitted on paper and in person to the Instructor.

**Late Work:**

Late homework will receive a 15% late penalty and will only be accepted if it is turned in before the start of class on the next class day after the day it was due; otherwise, late homework will not receive any credit.

**Missed Exam:**

If you have to miss an exam, it is your responsibility to contact me no later than the day after the exam. A valid written excuse is required in order to make up a missed exam. Any student missing the final exam for any reason will get a score of zero. Any excused absences from the final exam may be made up in the next long semester by eligible students.

**Grading Scale:**

- A = 90.00 -- 100%
- B = 80.00 -- 89.99%
- C = 70.00 -- 79.99%
- D = 60.00 -- 69.99%
- F = below 60%

**K. COLLEGE AND UNIVERSITY POLICIES**
• **Academic Integrity (University)**
University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

• **Classroom/Professional Behavior**
Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

• **Statement of Civility**
Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

• **Deadline for Dropping a Course with a Grade of W (University)**
I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. *Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.* Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

• **Grade Appeals (College of Science and Engineering)**
As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal
Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

I. **OTHER INFORMATION**

- **Academic Advising**
The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

GENERAL DISCLAIMER

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.