A. COURSE INFORMATION

Course Number/Section: MATH 3315-003
Class Meeting Time: TR 2:00 pm–3:15 pm
Class Location: CI 107
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Pritha Chakraborty
Office Location: CI 358
Office Hours: MW 12:00 pm–2:30 pm
Telephone: (361) 825-2819
E-mail: pritha.chakraborty@tamucc.edu
Appointments: e-mail

C. COURSE DESCRIPTION

Catalog Course Description: Standard types of ordinary differential equations are studied in this course. First, second, and higher order equations are examined. Students will be entertained with Laplace transforms, power series method and the basic theory of existence/ uniqueness.

Extended Course Description: The course is enhanced by the computational and graphical capabilities of MATLAB or other software.

This course utilizes differentiation and integration tools to solve ordinary differential equations arising in engineering, biological and physical sciences.

D. PREREQUISITES AND COREQUISITES

Prerequisites
MATH 2414 (Calculus II). May be taken concurrently with MATH 3470 (Calculus III). Students must know all derivative and integration techniques very well.

Co-requisites
None.

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Optional Textbook(s) or Other References
Will be provided as needed.

Supplies
None.
F. STUDENT LEARNING OUTCOMES AND COURSE COMPETENCIES

Student Learning Outcomes

Students will be able to

1. Identify and classify differential equations (DE).
2. Solve first-order ordinary differential equations (ODE).
3. Solve first-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 first order ODEs.

Course Competencies

1. The learner 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 ODE’s 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 ODE’s as a mathematical model.

4. The learner will be able to solve higher-order ODE.
   A. Solve a $n$th-order initial-value problem (IVP).
   B. Solve a $n$th-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 ODE’s using undetermined coefficients.
   F. Solve ODE’s by variation of parameters.
G. Solve a system of ODE’s by systematic elimination or determinants.
H. Solve non-linear equations using a substitution.
I. Construct ODE’s 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 ODE’s 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 ODE’s using Laplace transforms.

7. The learner will be able to approximate a solution to ODE using numerical methods.
   A. Create direction fields for ODE’s.
   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

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations. Most class meetings will be centered around lecture.

H. MAJOR COURSE REQUIREMENTS AND GRADING

The expected learning outcomes for the course will be assessed by homework assignments, three mid terms, and a comprehensive final exam.

Homework: Homework will be assigned weekly through WeBAssign. Students will be informed by the instructor and via email (on the @tamucc.edu address) about the homework, which should be completed before the given deadline (generally not more than a week). Clicking the WebAssign button on the top left of our Blackboard page should take you directly into WebAssign. You will either need the access code that comes with the book or will need to buy an access code online. There is an initial grace period, usually a week or two, during which you can use the system without an access code.

Final grade: Homework and tests are counted towards the final grade with weights as follows:

1. Homework - 25%,
2. Mid Terms - 45% (15% each), and
3. Final exam - 30%.

Raw score (including all the homeworks, exams and final):

1. Grade A: 90 - 100
2. Grade B: 80 - 90
3. Grade C: 70 - 80
4. Grade D: 60 - 70
5. Grade F: Below 60

I. COURSE CONTENT/ SCHEDULE

Important Dates:

- **Mid term I**: Tuesday, February 21
- **Spring Break**: Monday–Friday, March 13–17
- **Mid term II**: Tuesday, March 21
- Last day to drop a class: Friday, April 7
- **Mid term III**: Tuesday, April 18
- Last class day: Tuesday, May 2
- **Final Exam**: Thursday, May 04, 8:00 am–10:30 am

Tentative Schedule:

<table>
<thead>
<tr>
<th>Week of</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 16</td>
<td>Intro. to Differential Equations (DE): Classification, Solutions, Existence, and Models</td>
</tr>
<tr>
<td>Jan 23</td>
<td>First Order DE: Separation of variables and Exact equations</td>
</tr>
<tr>
<td>Jan 30</td>
<td>First Order DE: General solutions and Substitutions</td>
</tr>
<tr>
<td>Feb 6</td>
<td>Modeling with First Order DE: Linear, Non-linear and Systems</td>
</tr>
<tr>
<td>Feb 13</td>
<td>Higher Order DE: Initial and Boundary-value equations</td>
</tr>
<tr>
<td>Feb 20</td>
<td><strong>Mid term I</strong>: Tuesday, February 21</td>
</tr>
<tr>
<td>Feb 27</td>
<td>Higher Order DE: Linear Independence and Fundamental Set</td>
</tr>
<tr>
<td>Mar 6</td>
<td>Higher Order DE: Undetermined Coefficients and Variation of Parameters</td>
</tr>
<tr>
<td>Mar 13</td>
<td>Spring Break!</td>
</tr>
<tr>
<td>Mar 20</td>
<td><strong>Mid term II</strong>: Tuesday, March 21</td>
</tr>
<tr>
<td>Mar 27</td>
<td>Laplace Transform</td>
</tr>
<tr>
<td>Apr 3</td>
<td>Series solutions of linear DE</td>
</tr>
<tr>
<td>Apr 10</td>
<td>Systems of differential equations</td>
</tr>
<tr>
<td>Apr 17</td>
<td><strong>Mid term III</strong>: Tuesday, April 18</td>
</tr>
<tr>
<td>Apr 24</td>
<td>Numerical Methods of ODE</td>
</tr>
<tr>
<td>May 01</td>
<td>Review</td>
</tr>
</tbody>
</table>

**FINAL EXAM**: Tuesday, May 09, 1:45 pm–4:15 pm

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

This course moves very fast. If you fall behind, even by one section, you may not be able to catch up, since each section generally depends very heavily on the ones before. You must attend every class. If you miss a class, it is your responsibility to find out what you missed (announcements, assignments, notes, . . . ).

Attendance: Attendance is mandatory! Students with less/equal than 3 missed classes for the entire semester will receive a bonus of 3 points towards their final score in the course. Absences due to observation of religious holidays, officially approved trips and illness or death of close family will be handled separately in accordance with the university policies.

Late Work and Make-up Exams: Homework is not accepted after the deadline. There are no make ups for the in-class examinations, except for reasons of illness, stated in writing by the medical doctor, or observance of a religious holiday. Usually, no other reasons are accepted (events, plane tickets, weddings, etc. . . . ). If you have to miss an exam, it is your responsibility to contact me no later than the day of the exam. Failure to contact me on or before the exam day results in a grade of 0 points for the exam. This also applies to the final exam. For missed final exams due to an acceptable excuse, the university rules about I (Incomplete) grades apply and the make-up is at the instructor’s convenience early in the next long semester. Only extreme emergencies or official university business are acceptable reasons to miss exams and documentation will be required. Car trouble, routine doctor’s appointments, family reunions or graduations of siblings etc. are not valid reasons to miss exams. If your reason to miss the exam is not a valid one, your exam score is 0 points. Be sure to check before missing an exam whether your reason is acceptable.

Extra Credit: There is no extra credit in this class.

Calculator: Use of calculators and formula sheets in all the exams is not permitted. Electronic devices which can store formulas, including cell phones, should be turned off and stored during the exams.

Cell Phone Use: Cell phones and such must be turned of before class. If this happens multiple times with the same student, the student will be asked to leave the classroom.

Laptop Use: You may use a laptop to take notes during lecture. Distracting other students by surfing the web is not an acceptable behavior.

Food in Class: No food in class (except during the final).

Missed Exam: See “Late Work and Make-up Exams” above.

Grading: On mid terms and final, partial credit for correct steps will be awarded even if the final answer is wrong. Full credit will be given only if the final answer and all intermediate steps are correct. A correct final answer per se does not guarantee any credit.

Participation: Participation is not part of the grade, but you learn more by interacting, than by watching passively.

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 ones 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 commu-
nity, 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 instructors 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):** The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that must submitted. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar at [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.C.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.C.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](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](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/](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.

L. 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.