THEORY AND APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
MATH 5337.001
Department of Mathematics and Statistics
Fall 2019

A. COURSE INFORMATION

Course number/section:   MATH – 5337.001
Class meeting time:      TR 2:00 - 3:15 PM
Class location:          ECDC 219B
Course Website:          https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor:     Dr. D. Palaniappan (Dr. Pal)
Office location:  EN 211
Office hours:    MW 9:00 – 10:30 AM
                 TR 9:30 – 10:30 AM
Telephone:      825-2221
e-mail:         devanayagam.palaniappan@tamucc.edu
Appointments:   e-mail

C. COURSE DESCRIPTION

Catalog Course Description
The purpose of this course is to study the mathematical theory and real-world applications of the three major categories of partial differential equations: elliptic equations, parabolic equations, and hyperbolic equations. Specific topics to be covered include: first-order equations, second order elliptic equations, second-order parabolic equations, and second-order hyperbolic equations. There will be a focus on understanding the physical meaning and mathematical properties of solutions of elliptic, parabolic, and hyperbolic partial differential equations. Methods include fundamental solutions and transform methods for problems on the line, Green’s functions, and series solutions for problems in regions with boundary.

D. PREREQUISITES AND COREQUISITES

Prerequisites
MATH 4301, MATH 3311, MATH 3315, or by permission of instructor. A strong background in MATLAB (and its applications) is useful.

Co-requisites
None
E. **REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES**

**Required Textbook(s)**
Linear Partial Differential Equations for Scientists and Engineers by Tyn Myint-U Lokenath Debnath (Fourth Edition). Additional material will be provided as needed.

**Optional Textbook(s) or Other References**
Partial Differential Equations, An Introduction: by Walter A. Strauss textbook is recommended.

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.

By the end of this course students should be able to:
1. Solve general first-order equations, second-order elliptic equations, second order parabolic equations, and second-order hyperbolic equations, and understand the physical meaning and mathematical properties of these solutions.
2. Use methods such as fundamental solutions; transform methods, series solutions, Green’s functions, and computational techniques to solve problems. Prove key results from the theory of partial differential equations.
4. Make an oral presentation on the contents of a scientific research paper in the field of partial differential equations.

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, projects and presentations, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

H. **MAJOR COURSE REQUIREMENTS AND GRADING**

Homework will be assigned in class along with the due date. No credit for late homework. Quizzes will be given in class.

**Project:** Each student will select a topic to describe a practical problem. The problem should be such that its mathematical model use the concepts of this course. Oral presentation of the project is required. Project report should include the following:
a. Statement of the problem  
b. Its Mathematical Model  
c. Analytical/numerical results of the model  
d. Interpretation of the results  

Grades will be calculated based on the following  

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Exams</td>
<td>48%</td>
</tr>
<tr>
<td>Homework and Quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>Project Report</td>
<td>7%</td>
</tr>
<tr>
<td>Oral Presentation</td>
<td>5%</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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</tbody>
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Grading scale:  
A = 90% – 100%  
B = 80% - 89%  
C = 70% - 79%  
D = 60% - 69%  
F = Below 60%  

I. COURSE CONTENT/SCHEDULE  

<table>
<thead>
<tr>
<th>Week of</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Aug 26</td>
<td>Introduction and Examples of PDEs</td>
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<tr>
<td>Sep 02</td>
<td>First Order PDEs</td>
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<tr>
<td>Sep 09</td>
<td>Mathematical Models</td>
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<tr>
<td>Sep 16</td>
<td>Second Order PDEs</td>
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<td>Sep 23</td>
<td>Wave Equation</td>
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<td>Sep 30</td>
<td>Laplace equation</td>
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<tr>
<td>Oct 07</td>
<td>Test # 1, Fourier Series and Applications</td>
</tr>
<tr>
<td>Oct 14</td>
<td>Separation of variables</td>
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<tr>
<td>Oct 21</td>
<td>Boundary value Problems</td>
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<tr>
<td>Oct 28</td>
<td>Boundary value Problems</td>
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<tr>
<td>Nov 04</td>
<td>Green’s functions</td>
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<td>Nov 11</td>
<td>Integral transforms</td>
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<tr>
<td>Nov 18</td>
<td>Nonlinear equations</td>
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<tr>
<td>Nov 25</td>
<td>Test #2,</td>
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<tr>
<td>Dec 02</td>
<td>Oral Presentation, Project Report Due</td>
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<td></td>
<td>FINAL EXAM: Tuesday, Dec. 10, 1:45-4:15PM</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

Attendance/Tardiness
Attendance will be taken each class. Attending class is a faster way of learning the material than trying to catch up on missed material solely from the book. Tardiness is often disruptive to the whole class and is not appreciated. **Do not disrupt** the class. Any disruption will lead to heavy penalty decided by the instructor.

Late Work and Make-up Exams
Missed homework assignments cannot be made up. At most one make-up exam will be scheduled for each exam. Make-up exams tend to be harder than the original exam.

Extra Credit
There is no extra credit in this class.

Cell Phone Use
Cell phones and such must be turned off before class. Each time your phone rings during class, your course grade goes down by 1%

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

Food in Class
No food in class (except during the final, where non-noisy foods are OK).

Missed Exam
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 zero 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.
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 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/) 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.
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.