

Course Information

Course Number: MATH 412
Course Title: *Theory of PDEs*
Section: 502
Time: 15:55 — 17:10
Location: Bloc 160
Credit Hours: 3

Instructor Details

Instructor: *Jean-Luc Guermond*
Office: Bloc 507C
Phone:
E-Mail: guermond@tamu.edu
Office Hours: TR 12:50 — 14:00 and 17:20 — 18:30

Course Description

- Fundamental Theorem of Calculus, Divergence Theorem,
- Integration by parts, Leibniz rule, Chain rule, (all in multiple space dimensions)
- Energy method, a priori estimates
- The Laplace equation
- Eigenvalue problems
- The heat equation
- Separation of variables
- Fourier Series
- Fourier transform
- Green's function
- Fredholm alternative
- Wave equation
- Method of characteristics and first-order equations (nonlinear scalar conservation equations, Rankin-Hugoniot relation, entropy inequalities, Riemann problems).

Course Prerequisites

MATH 308. A **very good understanding** of the fundamental theorem of calculus, integration by parts and the chain rule are necessary to do well in this class

Course Learning Outcomes

The students will learn fundamental concepts about partial differential equations. The course is proof-based. The students are expected to learn proof-based argumentation. The course is not about showing proficiency at computing but demonstrating that abstract arguments are understood and mastered.

Additional assistance with learning outcomes is available through the Center for Teaching Excellence and the Office of Institutional Assessment.

Textbook and/or Resource Materials

- *Applied Partial Differential Equations with Fourier Series and Boundary Value Problems*, (Richard Haberman, 4th or 5th edition). The edition number does not matter. It is more important that you **take notes** in class and **practice all** the exercises assigned for the Quizzes and do as many past midterms and final exams as possible. Look at the answers only after you have spent a good amount of time trying to work on each problem. Practice is the keyword in this class.
- Class's website: math.tamu.edu/~guermond/M412_FALL_2023
- Homework is posted on the class's website every week. Homework is based on the material covered in class. It is recommended that you take notes in class.

Grading Policy

- 30% will be determined by the homework assignments (assignments turned in late will not be accepted). Homework papers are to be put on the desk of the instructor **at the beginning of class** at the assigned date. **Homework handed during class or at the end of class will not be graded.** It is **extremely important** that you **explain in mathematical terms what you do** when answering the questions. When you use a theorem or invoke fundamental result from the book or the class, you have to say it explicitly. It is the argumentation that is graded. Not the results. Computations with no explanations are not going to be graded.
- 23.33% will be determined by the two midterms and 23.33% by the final exam.
- Your **MINIMUM** grade will be A, B, C, or D, for averages of 90%, 75%, 60%, or 45%, respectively.

Late Work Policy

- Students must make arrangements in advance if they expect to miss an exam. Exam absences due to recognized University-related activities, religious holidays, verifiable illness, and family/medical emergencies will be dealt with on an individual basis. In all cases of absence from exams a written excuse is required. Ignorance of the time and place of an exam will not be accepted as an excuse for absence. Indicate whether or not the faculty member will accept late work.

Course Schedule

- Homework is posted on the class's website every week.
- Homework papers are to be put on the desk of the instructor **at the beginning of class** at the assigned date. **Homework papers returned during class or at the end of class will not be graded.**
- Due dates for Homework. HW1: Aug 29; HW2: Sept 5; HW3: Sept 12; HW4: Sept 28; HW5: Oct 5; HW6: Oct 17; HW7: Oct 31; HW8: Nov 7; HW9: Nov 14; HW10: Nov 21.
- Midterm 1: September 19 in class.

- *Midterm 2: October 24, in class.*
- *Final: Dec 5th in class.*

University Policies

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" ([Student Rule 7, Section 7.4.1](#)).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](#).)

Academic Integrity Statement and Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do."

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" ([Section 20.1.2.3, Student Rule 20](#)).

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You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact the Disability Resources office on your campus (resources listed below). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

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Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

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Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services \(CAPS\)](#).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-care by utilizing available resources and services on your campus

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Students who need someone to talk to can contact Counseling & Psychological Services (CAPS) or call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the 988 Suicide & Crisis Lifeline (988) or at [988lifeline.org](https://www.988lifeline.org).