

Math 4381/6357 – Nonlinear PDEs Spring 2022

CRN 33277/32228

Meeting times: T,Th 12:15 – 1:30 pm

Room: MCS 220

Instructor: Dr. Danny Arrigo

Website: www.danielarrigo.com

Office location: MCS 201

Office telephone No.: 450-5668

Office hours: MTWR 2:30-4:00pm,

Textbook: Analytical Techniques for Solving Nonlinear Partial Differential Equations by Daniel Arrigo. Morgan-Claypool Publishers

Use of cell phones (including texting), MP3 players, web browsers, ear buds/plugs is **NOT ALLOWED during class time.** **Cell phones must be turned off.** Instructor may also disallow use of any other technology not relevant to the instruction. Use of any type of laptop during class time requires consent of the instructor.

Prerequisites

Math 4315 PDEs (or its equivalent) or consent of instructor.

Introductory Remarks

This course is basically a course introducing a variety of techniques for solving a variety of nonlinear partial differential equations. Some of these equations naturally arise in fields such as, the geometry of surfaces, fluid mechanics, solid mechanics, quantum mechanics and minimal surfaces to name just a few.

Course Outline

- 1) Review- first order PDEs and the method of characteristics.
- 2) Nonlinear Topics
 - (i) Charpit's method,
 - (ii) Nonlinear Separability
 - (iii) Compatibility
 - (iv) Variable transformations and Burger's equation
 - (v) First integrals
 - (vi) Hodograph transformations
 - (vii) Point and contact transformations
 - (viii) Darboux transformations
 - (ix) Similarity transformations
 - (x) Bäcklund transformations (if time permits)

Grades

Your grade for this course will be determined by homework and a seminar. Your homework will be assigned every class and collected Friday's. The homework will count 80% of your final grade. The remaining 20% of your grade will be in the form of seminar. This is based on a

paper taken from the literature where the student(s) will understand the topic and present it in the form of a short seminar (about 10-15 minutes) given to the entire class.

| Grade | | Grade Scale | |
|-----------|-----|-------------|----|
| Homework: | 80% | 90% - 100% | A |
| Seminar: | 20% | 80% - 89% | B |
| | | 70% - 79% | C |
| | | 60% - 69% | D |
| | | 0% - 59% | F. |

Lecture Format

We have lectures scheduled from T,Th 12:15-1:30pm. We will typically have class for about 45-60 minutes with time for discussion afterward.

Attendance

Attendance is highly recommended. If you are absent for approximately 10% without a valid excuse, where appropriate, you will be dropped from the course. It is a good idea to form small groups to work together in doing homework problems. You will learn from each other and your progress will be more rapid. However, joint work (or copying) during tests and exams is forbidden – the University has an academic dishonesty policy that you can find in the student handbook. Severe penalties apply.

Face-Coverings

All students are expected to comply with the University policy regarding face coverings (see <https://uca.edu/coronavirus/students/>).

University policy on Academic Integrity and Academic Misconduct

The University of Central Arkansas affirms its commitment to academic integrity and expects all members of the university community to accept shared responsibility for maintaining academic integrity. Students in this course are subject to the provisions of the university's Academic Integrity Policy, approved by the Board of Trustees as Board Policy No. 709 on February 10, 2010, and published in the *Student Handbook*. Penalties for academic misconduct in this course may include a failing grade on an assignment, a failing grade in the course, or any other course-related sanction the instructor determines to be appropriate. Continued enrollment in this course affirms a student's acceptance of this university policy.

Plagiarism

Plagiarism can be defined as the use of someone else's words without proper acknowledgement of that use. If you use someone else's words or the written words of the instructor in the assignment, you must put them in quotations and provide a reference for the source. Paraphrasing the words of others by only changing a few words is also considered plagiarism. For more information about plagiarism, please see UCA's statement on plagiarism at <http://uca.edu/academicaffairs/files/2012/08/Plagiarism.pdf>. Plagiarism is academic misconduct and will result in appropriate disciplinary action.

The Americans with Disabilities Act statement

The University of Central Arkansas adheres to the requirements of the Americans with Disabilities Act. If you need an accommodation under this Act due to a disability, please contact the UCA Disability Resource Center, 450-3613. If the instructor of this class needs to be informed of your disability in order to assist with any appropriate accommodations, please contact the instructor during the first week of classes.

Building Emergency Plan statement

An Emergency Procedures Summary (EPS) for the building, in which this class is held, will be discussed during the first week of this course. EPS documents for most buildings on campus are available at <http://uca.edu/mysafety/bep>. Every student should be familiar with emergency procedures for any campus building in which he/she spends time for classes or other purposes.

The Title IX disclosure

If a student discloses an act of sexual harassment, discrimination, assault, or other sexual misconduct to a faculty member (as it relates to “student-on-student” or “employee-on-student”), the faculty member is encouraged to report the act to the Title IX coordinator, deputy coordinator, or employee with the authority to institute corrective measures on behalf of the University. An investigation of a formal complaint of Title IX Sexual Harassment will only be initiated when the Complainant (individual who suffers actual harm from the violation of the Title IX Sexual Harassment Policy) or the Title IX Coordinator signs a complaint. For further information, please visit: <https://uca.edu/titleix/>.

**Disclosure of sexual misconduct by a third party who is not a student and/or employee is also encouraged if the misconduct occurs when the third party is a participant in a university-sponsored program, event, or activity.*

Departmental Policy

Use of cell phones (including texting), MP3 players, web browsers, ear buds/plugs is NOT ALLOWED during class time. Cell phones must be set to silent/vibrant mode while in class. Instructors may also disallow use of any other technology not relevant to the instruction. Use of any type of laptop during class time requires consent of the instructor.

Other Policies

Students should familiarize themselves with all policies listed in the *UCA Student Handbook*, such as the Sexual Harassment Policy and Academic Policies.