
Ordinary Differential Equations II

Instructor and Class Information

Lecturer: Ovidiu Costin

Course Num.: 7412

Office: MW404

Lecture Room:

Phone: 2-7844

Lecture Times:

Email: costin.9@osu.edu

Office Hours:

About Course Goals

FORMAT

The course will meet three times a week for 55 minutes each meeting. Instructions will be mainly by lecture delivered by the instructor. It may also include occasional in-class discussion as well as short student presentations, particularly, by post-candidacy students.

DESCRIPTION & GOALS

The course will focus on: Topological and analytic equivalence of nonlinear systems; normal forms of Poincare-Dulac-Birkhoff; the Poincare-Dulac theorem; integrability and chaos; Painleve systems; the Riemann-Hilbert problem; solving integrable systems.

PREREQUISITES

Math 6451 or equivalent preparations in elementary theory of ODEs, real analysis, and complex analysis.

Textbook

MAIN REFERENCE

I will provide course notes for most topics, based on the additional references below.

ADDITIONAL REFERENCES

E.A. Coddington and N. Levinson: *"Theory of Ordinary Differential Equations"*, McGraw-Hill, New York, (1955).

V.I. Arnold: *"Geometrical Methods in the Theory of Ordinary Differential Equations"*, 2nd edition, Springer, (1996).

Assessments

HOMEWORK ASSIGNMENTS

There will be approximately 10 homework assignment sheets, which will typically contain several fully described problems. Due dates of assignments will announced and set typically a week after the assignments are published

FINAL PROJECT

The final project is a written assignment that will draw on techniques acquired throughout the semester. It will be published about two weeks before the end of classes and will be due at the

beginning of finals week.

CLASS PARTICIPATION AND ATTENDANCE

Although attendance is not regularly monitored frequent absences may factor into the grade in borderline cases.

Grading

COURSE SCORE

A course score will be computed from the above assessments. Homework assignments will count 70% towards the grade and the final project 30%.

LETTER GRADES

Letter grades will be determined based on the course score. The approximate minimum scores letter grades are 80% for an "A", 73% for an "A-", 67% for a "B+", 55% for a "B-", and 40% for a "C-". The exact cut-off scores may vary depending on the difficulty of assignments.

Weekly Schedule

Week 1	Review of properties of differential equation. Lower order systems, phase portraits.
Week 2	Singularities of the first and second kind. Overview of the theory of linear systems. Frobenius theory. Asymptotic solutions.
Week 3	Anosov and circle diffeomorphisms. Flows on the torus.
Week 4	Topological and analytic equivalence.
Week 5	KAM techniques. Homological equations. The Siegel and Brjuno conditions
Week 6	Equivalence to the linear part. The Poincare domain. Kolmogorov's iteration.
Week 7	Analysis of the iteration under the Siegel condition. The Poincare-Dulac theorem.
Week 8	Resonance and resonant monomials. The extended system.
Week 9	Applications and examples. Connection to the Frobenius theory.
Week 10	Integrable and chaotic systems. Criteria of solvability. The Painleve property.
Week 11	Local bifurcation theory.
Week 12	Topological dynamics; limit sets.
Week 13	Integrable systems. Painleve equations.
Week 14	The Riemann-Hilbert problem. Solving the Painleve equations.

General Policies

ACADEMIC MISCONDUCT

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student

Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

DISABILITY SERVICES

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.