Syllabus

Ordinary Differential Equations II

Instructor and Class Information

Lecturer: Ovidiu Costin Office: MW404 Phone: 2-7844 Email: costin.9@osu.edu Course Num.: 7412 Lecture Room: Lecture Times: 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

This section is open only to mathematics post-candidacy students and requires, in addition, the permission of the instructor. Expected preparations include 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

READING, PARTICIPATION, AND ATTENDANCE

Students are required to read scheduled textbook materials and actively participate in class room discussions that arise from lecture material. Students are expected to attend all classes.

Research Oriented Presentation

Post-candidacy students in this section are required to deliver a half hour presentation that both synthesizes lecture material and connects it to relevant research questions, more advanced

theoretical topics, or applications in other fields of mathematics. The topic and required independent reading will be determined by the instructor individually in negotiation with the student. Presentations may also be replaced by respective research papers upon the request of the student.

Grading

COURSE GRADE

The grades for this course section are "satisfactory" (S) or "unsatisfactory" (U). A satisfactory outcome requires continued active participation in class (weighed about 20%) and is further based on the student's performance during the presentation (weighed about 80%).

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/.