Instructor and Class Information

Lecturer: Ovidiu Costin
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Course Num.: 7412

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

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 for 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

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Review of properties of differential equation. Lower order systems, phase portraits.</th>
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<tbody>
<tr>
<td>Week 3</td>
<td>Anosov and circle diffeomorphisms. Flows on the torus.</td>
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<tr>
<td>Week 4</td>
<td>Topological and analytic equivalence.</td>
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<td>Week 5</td>
<td>KAM techniques. Homological equations. The Siegel and Brjuno conditions</td>
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<td>Week 6</td>
<td>Equivalence to the linear part. The Poincare domain. Kolmogorov’s iteration.</td>
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<td>Week 7</td>
<td>Analysis of the iteration under the Siegel condition. The Poincare-Dulac theorem.</td>
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<td>Week 8</td>
<td>Resonance and resonant monomials. The extended system.</td>
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<td>Week 9</td>
<td>Applications and examples. Connection to the Frobenius theory.</td>
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<td>Week 10</td>
<td>Integrable and chaotic systems. Criteria of solvability. The Painleve property.</td>
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<td>Week 11</td>
<td>Local bifurcation theory.</td>
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<td>Week 12</td>
<td>Topological dynamics; limit sets.</td>
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<td>Week 13</td>
<td>Integrable systems. Painleve equations.</td>
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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/.