

Differential Equations in the Complex Plane

MATH 5399-2

Spring 2014

Course instructor:

Dr. Alexander Solynin

CIVIL 9

TT

12:30 – 1:50 pm

Office hours:

WF 10:00-12:00 or by appointment

Office: MA 231

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TEXT: Your lecture notes.

Complementary text: **Nevanlinna Theory and Complex Differential**, de Gruyter Studies in Mathematics 15, 1993, by Ilpo Laine.

- **Course Description:** This is an introductory course on the theory of Ordinary Differential Equations (ODE's) in the Complex Plane. We will study local properties of solutions to certain ODE's, properties of solutions in the whole Complex Plane, and some properties of solutions in simply connected and multiply connected domains. First, we will discuss some general properties of linear differential equations and then some more specific questions concerning properties of solutions of hypergeometric equations. We will also briefly discuss some properties of solutions to Riccati's equation and Painlevé equations. One of the goals will be to discuss relation between geometric properties of solutions (integral curves) and properties of trajectory structure of corresponding quadratic differentials. We also will discuss few examples showing possible types of behavior of solutions to a first order ODE depending on a complex variable and possible types of behavior of solutions to a system of two real equations depending on two real variables. |

An undergraduate course of ODE's and a course of a complex variable are required..

Learning Outcomes: Upon completion *Differential Equations in the Complex Plane* students will master concepts and theories of linear and some non-linear differential equations depending on a complex variable. They will learn properties of some special functions and understand geometric structure of integral curves and corresponding quadratic differentials.

Methods for Assessment of Learning Outcomes: The expected learning outcomes for the course will be assessed through graded activities and ungraded activities. The graded activities include homework, quizzes, and research projects. The ungraded activities will be used to monitor your progress. A variety of these ungraded assessment techniques may be employed, including problems to be completed during class, direct questioning of students, answering students questions in class, one-minute classroom assessment techniques, and discussions during office hours.

Students with Disabilities: Any student who because of a disability may require special arrangements in order to meet course requirements should contact the instructor as soon as possible to make any necessary accommodations. Students should present appropriate verification from AccessTECH. No requirement exists that accommodations be made prior to completion of this approved university procedure.

Absence due to religious observance: The Texas Tech University Catalog states that a student who is absent from classes for the observance of a religious holy day will be allowed to take an examination or complete an assignment scheduled for that day within

a reasonable time after the absence. Notification must be made in writing and delivered in person no later than 15th class day of the semester.

Absence due to officially approved trips: The Texas Tech University Catalog states that the person responsible for a student missing class due to a trip should notify the instructor of the departure and return schedule in advance of the trip. The student may not be penalized and is responsible for the material missed.

Academic Integrity: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and a high standard of integrity. There will be no tolerance for cheating or plagiarism. Texas Tech University policies will be enforced in such cases.

STUDENT EVALUATION:

- Students will work on their research projects related to the theory of ODE's in the Complex Plane and present results upon completion.

◆ **Final Presentation /Final Project** **60 pts**

- **Midterm Presentation/Midterm Project:** **30 pts**
- **Homework** (Problems and Exercises): **30 pts**
- **MAXIMAL TOTAL:** **120 pts**

GRADING PROCEDURE:

A - 90 - 100%

B - 80 - 89%

C - 70 - 79%

D - 60 - 69%

F - ≤ 59%

Important Dates:

January 20 - Martin Luther King Jr. Day.

March 15-23 - Spring Vacation.

March 26 - Final day to drop a course.

April 21 - No Classes.

May 6 - Last Day of classes.

Tuesday, May 13 - 1:30 – 4:00 pm. Final Exam (Examinations will be given in the rooms in which the individual classes have been meeting unless otherwise announced).