

Lamar University

Department of Mathematics

MATH 4310 Complex Variables (3 hour course)

Fall 2017 Syllabus

Monday, Wednesday 1:50 – 3:10

Instructor: Dr. Valentin Andreev, Professor of Mathematics

Office: Lucas 202

Phone: 409-880-8693

Office Hours: M, W 1:15 – 1:45, 4:45 – 5:30, T, Th 4:45 – 5:30

Other times are available by appointment.

Text: The 2nd edition of Complex Variables by Stephen Fisher

Prerequisites: Grade of C or better in MATH 3435 or its equivalent.

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Catalog Description: Complex numbers, analytic functions, complex line integrals, Cauchy integral formula and applications.

MATH 4310 Learning Outcomes: Upon successful completion of this course, students will:

1. Work with the different forms of the complex numbers;
2. Identify some elementary complex valued functions and explain the basic ideas of Riemann surfaces;
3. State connection between the calculus of functions of two real variables and functions of a complex variable;
4. Define an analytic function;
5. State the Cauchy-Riemann equations and tell how they are related to the analyticity of a function.
6. Define a harmonic function and explain the relation to analytic functions;
7. List elementary properties of conformal mappings and, in particular, the basic properties of fractional linear transformations;
8. State the definition of a line integral of a complex valued function and know the Cauchy integral theorem;
9. State the Cauchy integral formula and tell how it relates to Taylor series or Laurent series;

10. State the maximum modulus principle and the Schwarz lemma;
11. Show a familiarity with the argument principle;
12. Explain the ideas of the calculus of residues and be able to apply some standard techniques to find real integrals;
13. State the Riemann mapping theorem.

Lectures/Discussions: This is a face to face course in which students are expected to participate on a regular basis. The development of thinking skills is crucial, which is best achieved by understanding and learning the concepts, and then attempting to solve/prove problems without the help of solution manuals, tutoring services, computers.

In order to make the class experience of students as productive as possible, a typical class will follow the following pattern: I will send a short summary of the material to be covered before the class meeting. At the beginning of the class we will discuss questions on the previous material. Then we will discuss the new material and then I will assign an open notes individual assignment. This will be followed by group work without the use of notes. Last, I will assign an open notes short individual quiz. The students who present the solutions of individual assignments on the board will receive extra credit. My goal is for the students to master most of the material in class and complete their assigned work on a regular basis without cramming prior to an exam.

The best way to prepare for exams and to minimize exam anxiety, in my opinion, is to study every day. First, you should pay attention in class, ask questions, respond to questions, be active, keep notes. Then go over everything after the class, make sure you understand everything and that you remember the new material. If you have questions, write them down and ask as soon as possible. Do the homework.

Finally, take a few problems that were not assigned but that are on the same topics as the homework, close the book and all notes (which will be the way you will take the graded assignments), and try to solve the problems. If you succeed, you are ready, if not, then try to figure out why, or ask for help. Furthermore, study with other students in the class.

Lectures/Discussions/Classwork/Homework Topics:

- 1.1 The complex Numbers and the Complex Plane
- 1.2 Some Geometry
- 1.5 The Exponential, Logarithmic, and Trigonometric Functions
- 1.6 Line Integrals and Green's Theorem
- 2.1 Analytic and Harmonic Functions; the Cauchy – Riemann equations

- 2.2 Power Series
- 2.3 Cauchy's Theorem and Cauchy's Formula
- 2.4 Consequences of Cauchy's Formula
- 2.4 Isolated Singularities
- 2.6 The Residue Theorem and Its Applications to the Evaluation of Definite Integrals
- 3.1 The Zeros of an analytic function
- 3.2 Maximum modulus and Mean Value
- 3.3 Linear Fractional Transformations
- 3.5 The Riemann Mapping Theorem

Grading Policies: Students are expected to be in class on time and to stay for the entire class period. Students are warned that excessive absences are not conducive to achievement.

There will be two exams, each worth 35% of the grade. Exams will be announced one week in advance. Homework will account for 10%. The group work - 10% of the grade. The quizzes will be worth 10%. I will drop the lowest quiz grade. I will give extra credit for problem presentations.

Final grades will be provided on Banner and will be based on the following scale: A-90%, B-80%, C-70%, D - 60%, F-below 60%. Makeups will be allowed only for exams. If a student has to miss an exam, the student must inform me as soon as possible. The makeup should be taken within ten days of the original testing date.

Attendance Policy: While roll will not be taken every class period, it is important for you to understand the value of class attendance and accept the personal responsibility involved. You are expected to be in class on time and stay for the entire period. Your final grade will be negatively affected if you miss class. As mentioned in the section above, late work will not be accepted and there will be no make-up quizzes, group work, or homeworks.

Final Exam: Monday, December 11, 1:50-3:10.

While I have made a sincere effort to ensure that this syllabus is correct, changes may be required. I will announce any substantive changes **during a regularly scheduled class**. If you find an error or omission, please advise me at once so that the other members of the class may be advise

Lamar University expressly prohibits intimidation and harassment of students, faculty, staff, or applicants. <http://students.lamar.edu/academic-support/code-of-conduct.html>

Drop Policy: Please make note of the three dates indicated in this drop policy. Any drop will be your responsibility; I will not drop a student from the course.

September 13, 2017: (Census Date-Six Drop Rule does not apply) A student may drop or withdraw without consulting with the instructor. The Six Drop Rule does not apply to a drop before 5:00 PM.

September 29, 2017: (Six Drop Rule applies) A student may drop or withdraw from the course without academic penalty and receive a Q, however, the Six Drop Rule applies. The student will consult with the instructor and the Records Office to initiate a drop.

November 3, 2017: (Six Drop Rule applies) Last day to drop or withdraw with academic penalty; the student must be passing the course at the time of the requested drop in order to receive a Q. The drop form, including all required signatures, must arrive in the Records Office by no later than 4:00 PM. No drop is allowed after this date except in extreme extenuating circumstances. Any "late drop" must be approved by the instructor, department chair, college dean, and provost.

Academic Integrity: Students are expected to maintain complete honesty and integrity in their academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. Students are specifically warned against all forms of cheating and plagiarism. The *Lamar University Student Handbook* clearly reads: "Any student found guilty of academic dishonesty in any phase of academic work will be subjected to disciplinary action. Punishable offenses include, but are not limited to, cheating on an examination or academic work which is to be submitted, plagiarism, collusion, and the abuse of source materials." One aspect of the *Handbook's* definition of cheating includes "purchasing or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm." Plagiarism is defined as "the appropriation and the unacknowledged incorporation of another's work or ideas into one's own and submitted for credit." Faculty members in the College of arts and Sciences investigate all cases of suspected plagiarism. Any student who is found cheating in this course will receive a course grade of F. <http://students.lamar.edu/student-handbook.html>

Accommodations through the Disability Resource Center: Lamar University is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is located in the Communications building room 105. Office staff collaborate with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at [409-880-8347](tel:409-880-8347) or drc@lamar.edu to arrange a confidential appointment with the Director of the DRC to explore possible options regarding equitable access and reasonable accommodations. If you are registered with DRC and have a current letter requesting reasonable accommodations, we encourage you to contact your instructor early in the semester to review how the accommodations will be applied in the course.

<http://www.lamar.edu/disability-resource-center/>

Incomplete Grades: The grade of "I" may be given when any requirement of the course, including the final examination, is not completed. Arrangements to complete deficiencies in a course should be made with the instructor prior to the end of the semester or term. Incomplete work must be finished during the next long semester or the Records Office will change the "I" to the grade of "F." While the extension may be granted by the instructor with the approval of his/her Department Chair and Academic Dean, once the "I" is changed to an "F" it cannot be changed back to an "I." In this case, either a "change of grade" procedure must be initiated or the course must then be repeated if credit is desired. The instructor may record the grade of "F" for a student who is absent from the final examinations and is not passing the course.

Campus Closure: In the event of an announced campus closure in excess of four days due to a

hurricane or other disaster, students are expected to login to Lamar University's website's homepage for instructions about continuing courses remotely. <http://lamar.edu>

Emergency Procedures: Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at:

<http://www.lamar.edu/about-lu/administration/risk-management/index.html>

Following are procedures for the first two:

Severe Weather:

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

Violence/Active Shooter:

- **CALL** - 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.
- **AVOID**- If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY**- Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.
- **DEFEND**- Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

Course Evaluations: You will have an opportunity to evaluate all aspects of this course in a formal process to be completed online near the end of the term. You will receive an email reminder through your LU account.