The University of Texas Rio Grande Valley

MATH 6339 – 01&90L (COMPLEX ANALYSIS)

Syllabus for FALL 2025

**Classroom**: EMAGC- Mathematics & Gen Clasr 1.410

**Time:** Tuesdays & Thursdays, 8:00pm – 9:15pm, September 2, 2025 – December 18, 2025

## Instructor:

Dr. Zhijun (George) Qiao

*Office: MAGC 3.722, Phone: 665-3406 (W), Email:* [*zhijun.qiao@utrgv.edu*](mailto:zhijun.qiao@utrgv.edu)

Webpage: [http://faculty.utrgv.edu/zhijun.qiao (Online](http://faculty.utrgv.edu/zhijun.qiao(Online) notes are available in the UTRGV Brightspace)

**Office hours**: T & R 5:15pm – 6:15pm (In Person at MAGC 3.722 or via Zoom at https://utrgv.zoom.us/my/zhijun.qiao) or by appointment.

**Required Textbook**

**Title Functions of One Complex Variable I, 2nd Edition Author** John B. Conway

**Publisher** Springer-Verlag

**Recommended Reference**

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| **Title** | **Complex Analysis, 3rd Edition** |
| **Author**  **Publisher** | Dennis G. Zill & Patrick D. Shanahan |
| Jones & Bartlett Learning |

# Course Description and Prerequisites

This course presents a rigorous introduction to the fundamentals complex analysis. Topics include:

* The algebra of complex numbers; fractional powers.
* Logarithm and power functions; exponential and trigonometric functions.
* Analyticity; Cauchy-Riemann equations.
* Integrals and Cauchy's Theorem and Formula
* Morera's theorem; maximum modulus theorem; Liouville's theorem; Fundamental Theorem of Algebra.
* Taylor and Laurent series; regions of convergence, absolute and uniform convergence; Identity Theorem
* The calculus of residues: isolated, removable, polar, and essential singularities; behavior of the function near an isolated singularity; calculating residues; evaluation of real integrals
* Conformal mappings: fractional linear transformations; the geometric nature of the power, exponential, and logarithmic maps; Riemann Mapping Theorem.
* Harmonic functions: Laplacian; relation to analytic functions; conjugate harmonic functions; Dirichlet problem; applications.
* Additional topics such as the Gamma and Zeta functions and the prime number theorem.

# Prerequisite: Familiarity with rigorous delta-epsilon proofs and other basic results from real analysis.

# Learning Objectives/Outcomes for the Course

After completing this course students will be able to

1. Explain the fundamental concepts of complex analysis and their role in modern mathematics and applied contexts.
2. Demonstrate accurate and efficient use of complex analysis techniques.
3. Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from complex analysis.
4. Apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.

# Tentative Calendar:

**Month 1:** Elementary Background, Metric Spaces, Triangle Inequality, nth roots; Limits; Topology, Continuity; Complex Logaithms, Exponentiation, Curves, and Contour Integrals, Analyticity.

**Month 2:** Cauchy-Riemann Equations, Harmonic Functions, Series, Radius of Convergence, Uniform Convergence, Weierstrass M-test, and applications, Cauchy’s Theorem, Independence of Path, Cauchy’s Integral Theorem.

**Month 3:** Taylor’s Theorem Morera’s Theorem, Cauchy’s Inequality, Liouville’s Theorem, Fundamental Theorem of Algebra, Gauss Mean Value Theorem, Maximum Modulus Principle, Singularities, Zeros, The Identity Theorem, Residues and the Residue Theorem, Application to real integrals.

**Month 4:** Laurent Series, Argument Principle, Fourier Series, Conformal Maps, Dirichlet’s Problem, Poisson Integral Formula, Riemann Mapping Theorem, Linear Fractional Transformations, and applications.

As time allows, we will cover more specific topics such as the Gamma function, Riemann Zeta function, the Weierstrass P-function, Mittag-Leffler expansions, and infinite products.

The lecture notes will be posted in the Brightspace, and all class students would get all of them from there.

## General Grade Policy

**Quizzes and Homework –** Homework assignment is assigned every class day through the Webwork and will consist of problems from the textbook and occasional handout. Quizzes and Tests are based on the homework problems. A quiz will be taken every one or two weeks. It is strongly recommended that students work on all those homework problems since quizzes and test scores are used to determine your grade. Completing the assignments is the ***single most important part*** of this course. You will be expected to spend on average about 4 hours each week completing the assignments. The assigned problems will be graded automatically through webwork system. They will form the basis for quizzes and the mid-term and final exams. No late re-quiz will be accepted.

**Tests –** there will be two 75-minute in-class tests. All tests must be taken during their scheduled times. The test time will be announced in advance (basically, a test will be given every ~1.5 months), and a short review will be given before each test. All students must show their work on the tests. Score will be provided to you separately. No retest opportunities.

**Final Exam –** The comprehensive final exam is tentatively scheduled on December 16 (Tuesday), 2025, 8:00pm – 9:45pm. All students must take the final exam at the scheduled time. A summary review will be given in the class before the final exam.

**Grading –** The course grade will be based on

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| Homework and Quizzes | 50 pts |
| Two projects at 25 pts each | 50 pts |
| Test 1 | 100 pts |
| Test 2 | 100 pts |
| Comprehensive Final Exam | 100 pts |
| Total | 400 pts |

The course grade will be assigned according to a scale no higher than A (85-100%), B (75-84%), C (60-74%), F (below 60%).

**THERE WILL BE NO MAKE-UP EXAMS GIVEN**.

If a student is absent during a scheduled major test and quiz, the student must go by the instructor’s office during the scheduled office hours to discuss the validity of the excuse.  In the case of a valid excuse, the missed test grade will be replaced by the final exam grade.    If a student does not have a valid excuse, the grade for the missed test is zero and cannot be replaced.  If you arrive late for a test, you will not be given additional time to complete the exam.  Anyone arriving at a test after somebody else who took the exam has left will not be allowed to take the exam. Students missing more than one exam may be dropped from the course. With an unexcused absence, a score of 0 will be recorded for the missed HW/Quiz or exam.

**Tutoring: You may use online resources as your own study for homework problem solving**.

***Classroom Behavior:***

* All beepers and cellular phones must be turned off before you enter the classroom.
* Once in class, a student is expected to remain in class for the duration of the class.  If a student needs to leave class early, then the student needs to discuss the situation with the instructor before class begins.
* During class students are expected to be courteous to the instructor and other classmates. Examples of discourteous behavior are unnecessary talking, sleeping, tardiness, leaving class while instructor is lecturing, sharpening pencils during the lecture, etc.
* No Food Allowed In Classroom.
* Chronic tardiness and discourteous behavior will not be tolerated and is the cause for a student's dismissal from class for the remainder of the semester.

**UTRGV Policy Statements**

UTRGV requires all electronic communication between the University and students be conducted through the official University supplied systems UTRGV-Mail. Please use your UTRGV-Mail account for all correspondence with me.

**Calculators, Cell Phones, and Other Electronic Equipment**

Calculators will be permitted for use on exams. Electronic equipment such as cell phones, pocket organizers, tablet or laptop computers, or electronic writing pads or pen-input devices will not be permitted during exams. Please make sure that cell phones are turned off and stored way during class.

**MANDATORY COURSE EVALUATION PERIOD:**

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account ([*https://my.utrgv.edu/home*](https://my.utrgv.edu/home)); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available: July 1 – 8 for summer I semester courses.

**ATTENDANCE:** Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV’s attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

**STUDENTS WITH DISABILITIES:**

If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodation, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodation can be provided at any time. **Brownsville Campus**: Student Accessibility Services is in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu). **Edinburg Campus:** Student Accessibility Services is in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at [ability@utrgv.edu](mailto:ability@utrgv.edu).

**SCHOLASTIC INTEGRITY:**

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

**SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE:**

In accordance with UT System regulations, your instructor is a “responsible employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student’s time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at [www.utrgv.edu/equity](http://www.utrgv.edu/equity), including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

**COURSE DROPS:** According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

**MATH 6339 Homework Assignments**

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