

# MAT 342: APPLIED COMPLEX ANALYSIS

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Stony Brook

Summer II 2020

**Description:** This is an introduction to the theory of functions of a complex variable. It is a mathematically rigorous course, and most statements will come with proofs. Topics covered include:

1. Complex numbers: complex conjugate, absolute value and the triangle inequality, exponential forms, algebraic properties, regions in the complex plane
2. Analytic functions: functions and mappings, limits involving the point at infinity, continuity and derivatives, the Cauchy-Riemann equations and analyticity, harmonic functions.
3. Examples of analytic functions: the exponential function, logarithm, trig functions, hyperbolic trig functions
4. Integrals: Contour integrals, the Cauchy-Goursat theorem, simply and multiply connected domains, Liouville's theorem and the fundamental theorem of algebra
5. Series: Taylor series and Taylor's theorem, power series and its domain of convergence, Laurent series
6. Residues and poles: Cauchy residue theorem, types of isolated singular points, zeros and poles
7. Additional topics as time permits

**Textbook:** *Complex Variables and Applications*, by Brown and Ruel V. Churchill, 9th Edition.

**Prerequisite:** C or higher in the following: MAT 203 or MAT 220 or MAT 307 or AMS 261  
Advisory Prerequisite: MAT 200 or MAT 250

**Instructor:** Willie Rush Lim  
Math Tower S-240A  
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**Schedule:** Class on TuTh at 1:30-4:45 pm EST live via zoom  
Office Hours on Wed 2:00-3:00 pm EST via zoom, or by appointment.

**Grading:** Homework 40%, Midterm 20%, Final 40%

**Homework:** Homework is a fundamental part of this course, and you will have to work hard on the assigned problems in order to succeed. Homework will be assigned weekly and submitted in the Assignments section of Blackboard. Unassigned problem sets and solutions will also be provided for your own practice.

**Exams:** There will be a midterm and final examination for this course and both are to be done at home and submitted in the Assignments section of Blackboard. You are allowed to consult textbooks, homework, and lecture material, but you are expected not to discuss the exam problems with anyone digitally or in-person. Offering and accepting solutions from others is an act of plagiarism, which is a serious offense and all involved parties will be penalized according to the Academic Integrity Policy.

**Class Schedule (tentative):**

No.	Date	Contents	Deadlines
1	7/7	Complex numbers, Euler's formula, complex roots	
2	7/9	Functions, limits, continuity and differentiability	HW1 due 7/10
3	7/14	Analytic functions and harmonic functions	
4	7/16	Branch cuts and contour integrals	HW2 due 7/17
5	7/21	Cauchy Goursat, Cauchy Integral	
6	7/23	Liouville, FT of algebra and maximum modulus	HW3 due 7/24
7	7/28	Taylor and Laurent series	
8	7/30	Zeros and poles, types of singularities	Midterm due 7/31
9	8/4	Residue theory	
10	8/6	Applications of residues	HW4 due 8/7
11	8/11	Mobius transformations	
12	8/13	Review	Exam due 8/14

**Student Accessibility Support Center Statement**

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation are confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to the following website: <http://www.sunysb.edu/ehs/fire/disabilities.shtml>

**Academic Integrity Statement**

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at [http://www.stonybrook.edu/commcms/academic\\_integrity/index.html](http://www.stonybrook.edu/commcms/academic_integrity/index.html)

**Critical Incident Management**

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.