MAT 342: APPLIED COMPLEX ANALYSIS

Willie Rush Lim   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. <u>Complex numbers</u>: basic properties, polar forms, complex roots, regions in the complex plane
2. <u>Holomorphic functions</u>: limits, continuity and derivatives, holomorphic functions, the Cauchy-Riemann equations, harmonic functions.
3. <u>Examples of holomorphic functions</u>: exponentials, logarithm and branch cuts, power functions, trigonometric and hyperbolic functions and their inverses
4. <u>Integrals</u>: contour integrals, primitives, the Cauchy-Goursat theorem, Cauchy's integral formula, Liouville's theorem and the fundamental theorem of algebra
5. <u>Series</u>: Taylor series and Taylor's theorem, power series and its domain of convergence, Laurent series
6. <u>Residues and poles:</u> Cauchy residue theorem, types of isolated singular points, zeros and poles
7. <u>Additional topics as time permits</u>

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 Fri 10:00–11:00 am EST via zoom, or by appointment.
MLC Hours on MW 2:00–3:00 pm EST

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 problems 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:

No.	Date	Contents	Deadlines
1	7/7	Complex numbers, polar form, complex roots, regions	
2	7/9	Limits, holomorphic functions, and CR equations	HW1 due 7/12
3	7/14	Exponentials, trigonometric, branch cuts	
4	7/16	Contour integrals, Primitives, Cauchy-Goursat	HW2 due 7/19
5	7/21	Cauchy Integrals and applications	
6	7/23	FT of algebra and maximum modulus	HW3 due 7/26
7	7/28	Taylor and Laurent series	
8	7/30	Zeros and poles, types of singularities	Midterm due 7/31 HW4 due 8/2
9	8/4	Residue theory	
10	8/6	Applications of residues	HW5 due 8/9
11	8/11	Harmonic functions	
12	8/13	Mobius Transformations	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 the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or via e-mail at: sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

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

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.