King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
Syllabus-Math 430 (*Introduction to Complex Variables*)
2015 (T-142)
Instructor: Dr. M. A. Bokhari

Textbook: E.B. Saff, A.D. Snider, *Fundamentals of Complex Analysis* (3rd ed.), Prentice Hall, 2003.

Prerequisites: Familiarity with the concepts from MATH 101, Math 102 & Math 201 will help the students to follow the course easily, e.g.,

polar coordinates in $\mathbb{R}^2$,
chain rule,
Arc length,
Taylor series,
partial derivatives,
level curves and gradients,
convergence criteria for sequences and series,
directional derivatives

Course Learning Outcomes: By the end of the course, students should be able to:

1. Perform basic arithmetic and algebraic operations (including powers and roots) with complex numbers.
2. Work with complex numbers in both rectangular and polar form.
3. Identify subsets of the complex plane and their geometric and topological properties (open, closed, connected).
4. Determine basic mapping properties of elementary functions, including how functions transform simple shapes.
5. Show knowledge of whether a complex function is differentiable and use the Cauchy-Riemann equations to calculate the derivative.
6. Determine if a function is harmonic and find a harmonic conjugate via the Cauchy-Riemann equations.
7. Describe the extensions of elementary functions (including polynomial, reciprocal, exponential, trigonometric, and logarithmic) to complex numbers, and perform basic computations involving these functions.
8. Compute complex contour integrals in several ways: directly using parameterization, using the Cauchy's integral formula and deformation of contour.
9. Find Taylor and Laurent series for a complex function, classification of isolated singularities.
10. Evaluate complex integrals using the residue theorem.
11. Rouche's theorem and the fundamental theorem of algebra.

Policies

Grading policy:

Homework: 15%,	Computer-based HW: 5%
Exam 1, 2, 3: 18 % each	Final Exam (Comprehensive): 30%

Homework:

Section-wise Homework Problems will be posted on the KFUPM Black Board. Students are advised to solve HW problems after the completion of relevant Text section. The only way to *learn* the course material is to *attempt* the HW problems with self-effort.

The homework assignments ***will be collected*** on the due date ***in the class.*** Late homework will be accepted with a ***25% reduction*** of points ***for each day of delay***.

If you plan to miss the class, drop the homework in my office prior to the due date.

Copying/Cheating

Students are advised to refrain from copying the HW solution or cheating in the exams. Copying/cheating cases will be dealt with strictly according to the KFUPM policy

Attendance:

A **DN** ***grade*** will be given to all students as soon as a student accumulates ***9*** unexcused ***absences*.**

[*Official Excuse for any absence must be stamped either from the KFUPM Clinic or the Deanship of Student Affairs*]

Missing an Exam:

If a student misses an Exam due to a legitimate reason (medical emergency etc.), he must present an official excuse as early as possible. The make-up exam will be given within 10 days from the exam date.

Guidance/Additional Help:

The students are welcomed to visit my office to seek guidance on the course material, homework and study habits. To discuss a homework problem, the student must come up with the partial solution/attempt.

Office Hrs:

UTR: 10-1050 am; 2:10-3:00 pm. Also by appointment

Contact me

Off. Ph: 2112, e-mail: mbokhari@kfupm.edu.sa, WhatsApp:050-898-3765 (No mob calls please)

Office Location:

Bld. 5, R. 411,

Pace of coverage

Wk	Date	Section	Topics	HW*
1	Jan. 27-29	1.1 1.2 1.3	The algebra of complex numbers Representation of complex numbers Vectors and Polar Forms	
2	Feb 1-5	1.4 1.5	The Complex Exponential Powers and Roots	1: Sec. 1.1-1.3
3	Feb 8-12	1.6 1.7	Planar Sets The Riemann Sphere	
4	Feb 15-19	2.1 2.2	Functions of a Complex Variable Limits and Continuity	2: Sec. 1.4-1.7
5	Feb 22-26	2.3 2.4 2.5	Analyticity The Cauchy-Riemann Equations Harmonic Functions	
Exam 1: Feb 26 (1.1-2.2)				
6	Mar 1-5	3.1 3.2 3.3	Polynomial & Rational Functions Exp. & Trig. Functions. The Logarithmic Function.	3: Sec. 2.3-2.5
7	Mar 8-12	3.5 4.1 4.2	Power and Inverse Trig. Functions Contours Contour Integrals	
8	Mar 15-19	4.3 4.4	Independence of Path Cauchy's Integral Theorem	4: Sec. 3.1-4.2
Mid-term Vacations				
9	Mar 29-Apr 2	4.5 4.6	Cauchy Formula & Consequences Bounds for Higher Derivatives	5(i): Sec. 4.3-4.4
Exam 2: Apr 2 (2.3-4.4)				
10	Apr 5-9	5.1 5.4 5.2	Sequences and Series Convergence Taylor Sequences	5(ii): Sec. 4.5-4.6
11	Apr 12-16	5.3 5.5	Power Sequences Laurent Series	
12	Apr 19-23	5.6 5.7 6.1	Zeros and Singularities The Point at Infinity The Residue Theorem	6: Sec. 5.1-5.5
13	Apr 26-30	6.3 6.2 6.4	Improper Integrals over $\mathbb{R}$ Trig. integrals over $[0,2\pi]$ Improper Integrals with Trig. Func.	7(i): Sec. 5.6-6.1
Exam 3: Apr 28 (4.5-6.1)				
14	May 3-7	6.7	Rouche's Theorem	7(ii): Sec. 6.3-6.4
15	May 10-14		Review of the material	

Final Exam: May 21, 2015

- Section-wise Homework Problems will be posted on the Black Board.