King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics Syllabus-
Math 430 (*Introduction to Complex Variables*)
2017 (T-162)
Instructor: Dr. Izhar Ahmad

Textbook: J. W. Brown/ R.V. Churchill, **Complex Variables and Applications** (9th ed.*), MCGraw-Hill International Edition 2014*.

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

Learning Outcomes

Upon completion of this course, students should be able to

- Explain the geometry of the complex plane
- Explain the main properties and examples of analytic functions;
- Explain the relationship between complex function theory and the theory of functions of a real variable
- Compute line integrals using parameterization of path
- Compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues;
- Use Residue Theorem to evaluate integrals and series.
- Explain conformal mappings.

Policies

Grading policy:

Homework: 15 %,	Computer-based HW: 4 %
Exam 1, 2, 3: 17 % 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: 11:00am -11:55 am. Also by appointment

Contact me

Off. Ph: 7767, e-mail: drizhar@kfupm.edu.sa, WhatsApp:0551374781 (No mob calls please)

Office Location:

Bld. 5, R. 327,

Pace of Coverage

Wk	Date	Chapter	Topics
1	Feb. 5-9	Ch-01	Sums and Products, Basic Algebraic Properties, Further Algebraic Properties, Vectors and Moduli, Triangular Inequality, Complex Conjugate
2	Feb. 12-16	Ch-01	Exponential Form., Products and Powers in Exponential Form, Arguments of products and Quotients, Roots of Complex Numbers, Regions in the Complex Plane
3	Feb. 19-23	Ch-02	Functions and Mappings, The Mapping w = z^2, Limits, Theorems on Limits, Continuity, Derivatives, Rules for Differentiation,
4	Feb 26-Mar.02	Ch-02	Cauchy-Riemann Eqs., Sufficient Conditions for Differentiability, Polar Coordinates, Analytic Functions, Harmonic Functions, Reflection Principle
5	Mar.05-09	Ch-03	The Exponential and Logarithmic Functions, Branches and Derivatives, Some Identities involving Logarithms, The Power Function
Exam 1: March 08, 2017			
6	Mar.12-16	Ch-03	Trigonometric Functions, Zeros and Singularities of Trigonometric Functions, Hyperbolic Functions, Inverse Trigonometric and Hyperbolic Functions
7	Mar.19-23	Ch-04	Derivative and Definite Integrals of Functions w(t), Contours, Contour Integrals, Upper Bounds for Moduli of Contour Integrals, Antiderivative, Cauchy-Goursat Theorem,
8	Mar.26-30	Ch-04	Simply connected Domains, Multiple Connected Domains, Cauchy Integral Formula and its Extension, Liouville's Theorem and the Fundamental Theorem of Algebra, Maximum Modulus Principle
Mid-term Vacations (April 02-06)			
9	Apr 9-13	Ch-05	Convergence of Sequences and Series, Taylor Series, Negative Powers of (z – z_0), Laurent Series

Exam 2: April 15 , 2017

10	Apr 16-20	Ch-05	Absolute and Uniform Convergence of Power Series, Continuity of Sums of Power Series, Integration and Differentiation of Power Series, Uniqueness of Series Representations, Multiplication and Division of Power Series
11	Apr 23-27	Ch-06	Isolated Singular Points, Residues,, Cauchy's Residue Theorem, Three Types of Isolated Singular Points, Residues at Poles, Zeros and Poles
12	Apr 30-May 4	Ch-07	Evaluation of Improper Integrals, isImproper Integrals from Fourier Analysis, Jordan's Lemma, An Indented Path, Definite Integrals Involving Sines and Cosines, Argument Principle, Rouche's Theorem
13	May 7-11	Ch-08	Linear Transformations, The Transformation w = 1/z, Mappings by 1/z, Linear Fractional Transformations, An Implicit Form, Mapping of the Upper Half Plane, Mapping by the Exponential Function, Mapping Vertical and Horizontal lines Segments by w= sin z

Exam 3: May 06 , 2017

14	May 14-18	Ch-09	Conformal Mapping
15	May 21-25		Review of the material

Final Exam: May 29, 2017

Page-wise Homework Problems will be posted on the Blackboard 9.1.