ÇANKAYA UNIVERSITY
Faculty of Arts and Sciences
Course Definition Form

Part I. Basic Course Information

Department Name	MATHEMATICS					**Dept. Numeric Code**	27
Course Code	MATH352	**Number of Weekly Lecture Hours**	3	**Number of Weekly Lab/Tutorial Hours**	2	**Number of Credit Hours**	4
Course Web Site	http://math352.cankaya.edu.tr					**ECTS Credit**	07

Course Name *This information will appear in the printed catalogs and on the web online catalog.*	
English Name	Complex Calculus
Turkish Name	Kompleks Analiz

Course Description
Provide a brief overview of what is covered during the semester. This information will appear in the printed catalogs and on the web online catalog. Maximum 60 words.

Complex numbers. Complex functions and linear mappings of regions. Limits and continuity. Branches of functions. Differentiable and analytic functions. Harmonic, Elementary functions. Contours and contour integrals. The Cauchy-Goursat theorem. Cauchy integral formula. Taylor and Laurent series representations. Singularities, zeros, and poles. The residue theorem and its applications to evaluation of trigonometric and improper integrals. The argument principle and Rouché's theorem.

Prerequisites (if any) *Give course codes and check all that are applicable.*	1st	2nd	3rd	4th
	☐ Consent of the Instructor	☐ Senior Standing	☐ Give others, if any.	
Co-requisites (if any)	1st	2nd	3rd	4th
Course Type *Check all that are applicable*	☒ Must course for dept.	☐ Must course for other dept.(s)	☐ Elective course for dept.	☐ Elective course for other dept.(s)

Course Classification
Give the appropriate percentage for each category.

Category	Mathematics & Natural Sciences	Engineering & Architectural Sciences			
Percentage	90	10			

Part II. Detailed Course Information

Course Objectives
Maximum 100 words.

The course aims to provide an understanding of the basic facts of complex analysis and the principal techniques and methods of analytic function theory. This is quite different from real analysis and has much more geometric emphasis.

Learning Outcomes
Explain the learning outcomes of the course. Maximum 10 items.

1) The students will be able to apply the principal techniques and methods of analytic function theory for solving both complex and real analytic problems.
2) The students will be able to apply the principal techniques and methods of analytic function theory for solving some problems in Physics and Engineering.

Textbook(s)
List the textbook(s), if any, and other related main course material.

Author(s)	Title	Publisher	Publication Year	ISBN
J.H. Mathews and R.W. Howell	Complex Analysis for Mathematics and Engineering, 5th ed.	Jones and Bartlett	2006	9780763737481

Reference Books
List, if any, other reference books to be used as supplementary material.

Author(s)	Title	Publisher	Publication Year	ISBN
R. V. Churchill and J. W. Brown	Complex Variables and Applications, 7th ed.	McGraw-Hill	2003	9780072872521
J. Bak and D.J. Newman	Complex Analysis, 2nd ed.	Springer	1999	9780387947563

Teaching Policy
Explain how you will organize the course (lectures, laboratories, tutorials, studio work, seminars, etc.)

5 hours of lecturing per week. Attendance to the lectures is compulsory.

Laboratory/Studio Work
Give the number of laboratory/studio hours required per week, if any, to do supervised laboratory/studio work and list the names of the laboratories/studios in which these sessions will be conducted.

Computer Usage
Briefly describe the computer usage and the hardware/software requirements for the course.

Course Outline
List the weekly topics to be covered.

Week	Topic(s)
1	The Algebra of Complex Numbers; The Geometry of Complex Numbers; The Topology of Complex Numbers.
2	Functions and Linear Mappings; The Mappings $w=z^n$ and $w=z^{1/n}$; Limits and Continuity; Branches of Functions; The Reciprocal Transformation $w=1/z$.
3	Differentiable and Analytic Functions; The Cauchy-Riemann Equations; Harmonic Functions.
4	Sequences and Series; Geometric Series and Convergence Theorems; Power Series Functions.
5	The Complex Exponential Function; The Complex Logarithm; Complex Exponents.
6	Trigonometric and Hyperbolic Functions; Inverse Trigonometric and Hyperbolic Functions.
7	Complex Integrals; Contours and Contour Integrals; The Cauchy-Goursat Theorem.
8	The Fundamental Theorems of Integration; Integral Representations for Analytic Functions; The Theorems of Morera and Liouville, and Extensions.
9	Uniform Convergence; Taylor Series Representations; Laurent Series Representations.
10	Singularities, Zeros, and Poles; Applications of Taylor and Laurent Series.
11	The Residue Theorem; Trigonometric Integrals.
12	Improper Integrals of Rational Functions; Intended Contour Integrals.
13	Integrands with Branch Points; The Argument Principle and Rouché's Theorem.
14	Applications to Evaluating of Sums of Series. Inverse Laplace Transforms.

Grading Policy
List the assessment tools and their percentages that may give an idea about their relative importance to the end-of-semester grade.

Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage
Homework			Case Study			Attendance		
Quiz(es)	4	10	Lab Work			Field Study		
Midterm Exam	2	50	Classroom Participation			Project		
Term Paper			Oral Presentation			Final Exam	1	40

ECTS Workload
List all the activities considered under the ECTS.

Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (*weekly basis*)	14	3	42
Attending Labs/Recitations (*weekly basis*)	14	2	28
Compilation and finalization of course/lecture notes (*weekly basis*)	14	1	14
Collection and selection of relevant material (*once*)	1	14	14
Self study of relevant material (*weekly basis*)	14	1	14
Take-home assignments			
Preparation for quizzes	4	1,5	6
Preparation for mid-term exams (*including the duration of the exams*)	2	16	32
Preparation of term paper/case-study report (*including oral presentation*)			
Preparation of term project/field study report (*including oral presentation*)			
Preparation for final exam (*including the duration of the exam*)	1	25	25
		TOTAL WORKLOAD / 25	175/25
		ECTS Credit	**7**

Total Workloads are calculated automatically by formulas. To update all the formulas in the document first press CTRL+A and then press F9.

Program Qualifications vs. Learning Outcomes *Consider the program qualifications given below as determined in terms of learning outcomes and acquisition of capabilities for all the courses in the curriculum. Look at the learning outcomes of this course given above. Relate these two using the Likert Scale by marking with X in one of the five choices at the right.*

No	Program Qualifications	Contribution				
		0	1	2	3	4
1	Adequate knowledge in mathematics; ability to use applied and theoretical information in these areas to solve pure and applied mathematics problems.					X
2	Ability to use modern computational tools to analyze an abstract or real life problem				X	
3	Adequate knowledge in theoretical and historical background in mathematics				X	
4	Ability to work individually and in teams efficiently, ability to collaborate effectively in teams to analyze complex systems from intra-disciplinary and multi-disciplinary areas				X	
5	Ability to communicate effectively in English about technical subjects, both orally and in writing				X	
6	Ability to use, develop and implement new experiments and algorithms to solve scientific, engineering and financial problems				X	
7	Ability to analyze a mathematical problem using both analytical and numerical methods; use and compare theoretical and simulational methods to gain deeper insight				X	
8	Ability to report the findings, conclusions and interpretations related to a project in the area of pure and applied mathematics, ability to write technical reports, to prepare and conduct effective presentations				X	
9	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to keep continuous self improvement				X	
10	Awareness of professional and ethical responsibility issues and their legal consequences					X

Scale for contribution to a qualification: **0**-none, **1**-little, **2**-moderate, **3**-considerable, **4**-highest