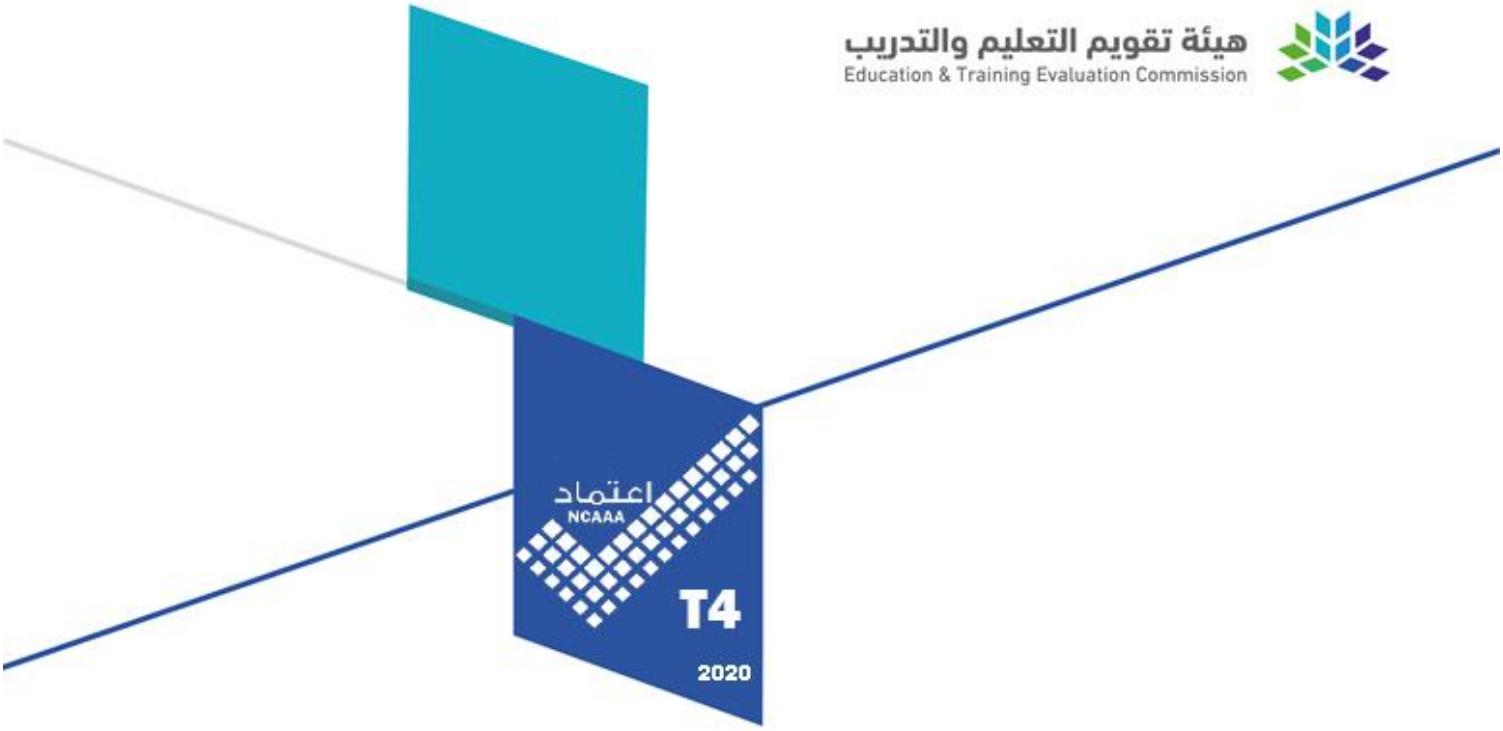
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	COMPLEX ANALYSIS
Course Code:	MATH 4350
Program:	BACHELOR OF SCIENCE IN MATHEMATICS
Department:	MATHEMATICS
College:	COLLEGE OF SCIENCE AND HUMANITIES ALKHARJ
Institution:	PRINCE SATTAM BIN ABDUALZIZ UNIVERSITY

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A. Course Identification

1. Credit hours: 04
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☐ Elective ☑
3. Level/year at which this course is offered: Level 12
4. Pre-requisites for this course (if any)**:** Math 3320, and Math 3330
5. Co-requisites for this course (if any)**:** None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	4 hours a week	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	48
2	**Laboratory/Studio**	-
3	**Tutorial**	0
4	**Others** (specify) – 5 office hours a week	60
	Total	108

B. Course Objectives and Learning Outcomes

1. Course Description

Complex Algebra and Functions – Algebra of Complex Numbers – Complex Plane – Polar Form – Geometric Series – Functions of Complex Variable – Analyticity – Cauchy- Riemann Conditions – Harmonic Functions – Complex Exponential – Complex Trigonometric and Hyperbolic Functions – Complex Logarithm – Complex Powers – Inverse Trig. Functions – Complex Integration – Contour Integration – Path Independence – Cauchy's Integral Theorem – Cauchy's Integral Formula – Higher Derivatives – Bounds – Liouville's Theorem – Maximum Modulus Principle – Mean value Theorems – Fundamental Theorem of Algebra – Radius of Convergence of Taylor Series – Residue Calculus – Laurent Series – Poles – Essential Singularities – Point at Infinity – Residue Theorem – Integrals around Unit Circle – Real Integrals From - ∞ to +∞. Contours. Singularity on Path of Integration – Principal Values – Integrals involving Multivalued Functions – Conformal Mapping – Inversion Mappings – BiLinear/Mobius Transformations.

2. Course Main Objective

- The Objective is to make the students understand the concept of Complex Numbers and Complex Functions , their properties, associated theories and applications

- Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field). Not at present

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Acquire broad knowledge about complex and multi valued functions	K1
1.2	Learn and reproduce elementary theorems such as Cauchy theorem, Liouville's theorem etc.	K2
1.3	Describe suitable methods to solve problems on complex variables	K4
2	**Skills :**	
2.2	Compute the derivative of complex function	S2
2.3	Derive Cauchy-Reimann equation for a complex differentiable function	S1
2.3	Sketch curves	S3
3	**Values:**	
3.1	Appreciate the relationship of mathematics to other fields	V1
3.2	Take up new responsibilities and acquire leadership traits	V2

C. Course Content

No	List of Topics	Contact Hours
1	Review of Complex Algebra – Complex Plane – Polar Form	4
2	Functions of Complex Variables – Analyticity – Cauchy Reimann Conditions	4
3	Harmonic Functions	4
4	Complex Exponential, Trigonometric and Hyperbolic functions	4
5	Complex Logarithm – Complex Powers	4
6	Inverse Trig Functions – Complex Integration	4
7	Path Independence – Cauchy Integral Theorem & Integral Formula	3
8	Higher Derivatives – Bounds – Liouville's Theorem	3
9	Maximum Modulus Principle – MVT – Fundamental Theorem of Algebra	3
10	Radius of Convergence of Taylor Series – Residue Calculus – Laurent Series	3
11	Poles – Essential Singularities – Point at Infinity – Residue Theorem	3
12	Integrals around Unit Circle – Real Integrals From - ∞ to +∞. Contours	3
13	Singularity on Path of Integration – Principal Values – Integrals involving Multivalued Functions	3
14	Conformal Mapping – Inversion Mappings – BiLinear/Mobius Transformations	3
Total		48

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Acquire broad knowledge about complex and multi valued functions	1. Class Room Lectures 2. Interactive sessions 3. Exclusive Office hours for clearing doubts in small groups	1. Two Internal Exams 2. At least two Quiz 3. End Semester Exam
1.2	Learn and reproduce elementary theorems such as Cauchy theorem, Liouville's theorem etc.		
1.3	Describe suitable methods to solve problems on complex variables		
2.0	**Skills**		
2.2	Compute the derivative of complex function	1. Class Room Lectures 2. Interactive sessions 3. Exclusive Office hours for clearing doubts in small groups	1. Two Internal Exams 2. At least two Quiz 3. End Semester Exam
2.3	Derive Cauchy-Reimann equation for a complex differentiable function		
2.3	Sketch curves		
3.0	**Values**		
3.1	Appreciate the relationship of mathematics to other fields	1.Group Discussion during lectures and Interactive Session 2. Exercises during Lecture and Tutorials	1. Homework to be given so that the students discuss among themselves or refer materials from textbook to find solution 2. Group Exercise 3. Presentations
3.2	Take up new responsibilities and acquire leadership traits		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Mid Term Exam I	6	20%
2	Quiz	4 & 10	5%
3	Mid Term Exam II	13	20%
4	Continuous Assessment – Homework, Assignment, Attendance etc.	--	5%
5	End Semester Exam	15	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Exclusive Office Hours – 5 Hours per week

Academic Advising for Students – 1 Hour per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	-Saff Edward B. and Arthur David Snider, "Fundamentals of Complex Analysis with Applications to Engineering Science and Mathematics", 3rd ed. Upper Saddle River - NJ: Prentice Hall, (2002), ISBN: 0139078746 -An introduction to complex for engineers, Michael D. Alder, June 3, 1997. -A first course in Complex analysis, version 1.24, Matthias Beck, Gerald Marchesi, and Dennis Pixton, Copyright 2002-2009
Essential References Materials	NIL
Electronic Materials	NIL
Other Learning Materials	Lecture Notes Prepared by the Department of Mathematics

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with Smart boards with seating facilities for at least 30 students
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart board, Internet Connection for Blackboard
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NIL

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes,	Quality Assurance Committee	Course Evaluation
effectiveness of Classroom teaching strategies from students through interactions	Senior Faculty Members / HoD	Peer Review
Effectiveness of teaching and assessment	University	End Semester online survey

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	