Course Specifications

Course Title:	**Complex Analysis**
Course Code:	**476 Math-3**
Program:	**Mathematics**
Department:	**Mathematics**
College:	**Sciences and Arts**
Institution:	**Najran University**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☑ Others ☐	
b. Required ☑ Elective ☐	
3. Level/year at which this course is offered: 7 / 4	
4. Pre-requisites for this course (if any): Real Analysis(1) - 371 Math-3	
5. Co-requisites for this course (if any): **Non**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	٣	١٠٠ %
2	Blended	----	----
3	E-learning	----	----
4	Correspondence	----	----
5	Other	----	----

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	45
2	Laboratory/Studio	----
3	Tutorial	----
4	Others (Exams)	4
	Total	49
Other Learning Hours*		
1	Study	30
2	Assignments	10
3	Library	10
4	Projects/Research Essays/Theses	----
5	Office Others	10
	Total	109

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers the basic principles of differentiable complex-valued functions of a single complex variable. Topics include the complex number system, De Moivre's Theorem, analytic functions and their properties, Cauchy-Riemann conditions, exponential, Log, basis ,trigonometric and hyperbolic functions of a complex variable; Complex integration and line integrals, Cauchy - Goursat Theorem, Integral Cauchy formulas , Taylor and Laurent Series expansions, Residues theorem and various applications.

2. Course Main Objective

The main objective of this course is to identify complex number system, Analytic functions and theorems on complex integration.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Define complex numbers and basics of complex variable functions	
1.2	Recognize the analytic function, Cauchy-Riemann equations and continuity, differentiability of a complex function.	
1.3	Write series representation of analytic functions	
1.4	State theorems on complex integration.	
2	**Skills :**	
2.1	Find different forms of complex number.	
2.2	Explain the analytic functions.	
2.3	Evaluate integrals of complex functions.	
2...	Apply the Cauchy-Goursat theorem, Cauchy formulas and Residue theorem.	
3	**Competence:**	
3.1	Work as part of a team and independently.	
3.2	Take responsibility to solve problems.	

C. Course Content

No	List of Topics	Contact Hours
1	Complex Number: Algebraic, Polar and Exponential Formulas of Complex Number, Geometric Representation(Argand Diagram), De Moivre's Theorem, Roots of complex Numbers.	١٢
2	Complex Function: Limits and continuity, Analytical Functions, Cauchy-Riemann equations, harmonic functions, exponential, logarithmic and Complex Exponent, trigonometric and hyperbolic functions.	9
3	Complex and Line Integrals, Cauchy - Goursat Theorem, Cauchy Integral Formulas and its results.	١٢
4	Representation of Analytical Functions in Series, Taylor and Laurent Series, Different types of singularities, zeros and poles, Residue Theorem and its applications.	12
	Total	٤٥

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**		
1.1	Define complex numbers and basics of complex variable functions	- Lecture - Discussion - Self-study	- Written Tests - Quiz
1.2	Recognize the analytic function, Cauchy-Riemann equations and continuity, differentiability of a complex function.		
1.3	Write series representation of analytic functions		
1.4	State theorems on complex integration.		
2.0	**Skills**		
2.1	Find different forms of complex number.	- Lecture - Discussion - Self-study – Problem solving	- Written Tests - Homework - Quiz
2.2	Explain the analytic functions.		
2.3	Evaluate integrals of complex functions.		
2.4	Apply the Cauchy-Goursat theorem, Cauchy formulas and Residue theorem.		
3.0	**Competence**		
3.1	Work as part of a team and independently.	- Self-study – Problem solving	- Homework - Projects
3.2	Take responsibility to solve problems.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises, Homework& Assignments	Open	5%
2	Quiz	Open	5%
3	Written Test(1)	7th Week	20%
4	Written Test(2)	13th Week	20%
5	Final Exam	End of Semester	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 :

- Academic guidance during the week.
- Eight office hours per week.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Mahmoud Kutkut, Fundamentals of Complex Analysis, Al Hilal House and Library (Beirut), Dar Al Shorouk (Jeddah), 2008.
Essential References Materials	James Ward Brown and Ruel V. Churchill; Complex Variables and Applications. 8th Edition, McGraw Hill, Higher Education, 2004.
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	A maximum of 30 seats in the classroom.
Technology Resources (AV, data show, Smart Board, software, etc.)	- Datashow - Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student course evaluation survey at the end of semester.	Students	Questionnaire
Effectiveness of teaching and assessment	Peer Reviewer	Rubrics

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	