DE LA SALLE UNIVERSITY
College of Science
Department of Mathematics

COMANAL – *Complex Analysis*
Prerequisite: ADVACA1 *Prerequisite to:*

Instructor: _____ **Contact details:** _____
Consultation Hours: _____ **Class Schedule and Room:** _____

Course Description

A course covering De Moivre's theorem, analytic functions of complex variables, harmonic functions, multiple-valued functions, contour integration, the Jordan Curve Theorem, the Cauchy Integral Theorem, Taylor Series, Laurent Series, residues and poles and conformal mappings.

Learning Outcomes

On completion of this course, the student is expected to present the following learning outcomes in line with the Expected Lasallian Graduate Attributes (ELGA)

ELGA	Learning Outcome
Critical and Creative Thinker Effective Communicator Reflective Lifelong Learner Service-driven Citizen	At the end of the course, the student will apply appropriate mathematical concepts, thinking processes, and tools in the solution to various conceptual or real-world problems.

Final Course Output

As evidence of attaining the above learning outcomes, the student is required to do and submit the following during the indicated dates of the term.

Learning Outcome	Required Output	Due Date
At the end of the course, the student will apply appropriate mathematical concepts, thinking processes, and tools in the solution to various conceptual or real-world problems.	Compilation of solved problems (problem sets) that will manifest the application of the concepts learned	Week 13

Rubric for assessment

CRITERIA	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Understanding of mathematical concepts (25%)	Shows complete understanding of the underlying mathematical concepts and principles needed to solve the problem.	Shows nearly complete understanding of the problem's mathematical concepts and principles.	Shows some understanding of the mathematical concepts and principles needed to solve the problem.	Shows very limited understanding of the problem's mathematical concepts and principles.
Clarity of Explanation (25%)	Explanation is well-written, complete and unambiguous. Terminologies and symbols are used correctly.	Explanation is clear but few simple details are missed. Terminologies and symbols are used appropriately.	Explanation is little difficult to understand. Some symbols and notations are used inappropriately.	Explanation is difficult to understand.
Accuracy of Computations (25%)	Computations are correct and the final answer is arrived at.	Computations are correct except for some minor errors.	Computations have some major errors.	Incorrect computations.
Understanding of methods of proof (25%)	Shows correct understanding of the method of proof. Statements are logical and the desired conclusion is arrived at.	Shows correct understanding of the method of proof. The proof proceeded logically except for a few minor errors.	Shows correct understanding of the method of proof but there are major errors in reasoning.	Lacks understanding of the method of proof but an attempt to solve the problem is evident.

Grading System

	FOR EXEMPTED STUDENTS (w/out Final Exam)	FOR STUDENTS with FINAL EXAM	
		with no missed quizzes	*with one missed quiz*
Average of quizzes	95%	60%	50%
Other requirements	5%	10%	10%
Final exam	-	30 %	40%

Scale:

95-100%	4.0
89-94%	3.5
83-88%	3.0
78-82%	2.5
72-77%	2.0
66-71%	1.5
60-65%	1.0
<60%	0.0

Learning Plan

LEARNING OUTCOME	TOPIC	WEEK NO.	LEARNING ACTIVITIES
At the end of the course, the student will apply appropriate mathematical concepts, thinking processes, and tools in the solution to various conceptual or real-world problems.	**I. THE COMPLEX NUMBER FIELD** 1.1. Complex Numbers as Ordered Pairs 1.2. The Rectangular Form of a Complex Number 1.3. The Polar and Exponential Forms 1.4. Powers and Roots of Complex Numbers 1.5. The Extended Complex Plane, Stereographic Projection	Week 1-2 (6 HRS)	• Library work • Cooperative Learning • Skills exercises • Student self-assessment and reflection • Quizzes • Seatworks
	QUIZ 1	1 HR	
	II. FUNCTIONS OF A COMPLEX VARIABLE 1.1. Functions as Mappings 1.2. Limits of Functions 1.3. Continuous Functions 1.4. Differentiation of Functions 1.5. Cauchy-Riemann Conditions for Analyticity 1.6. Harmonic Functions	Week 3-5 (7 HRS)	
	III. THE ELEMENTARY FUNCTIONS AND THEIR PROPERTIES 1.1. The Exponential Function 1.2. The Trigonometric Functions 1.3. The Hyperbolic Functions 1.4. Inverse Relations/ Functions 1.5. The Complex Logarithmic Function	Week 5-7 (5 HRS)	
	QUIZ 2	1 HR	
	V. INTEGRALS 1.1. Definition and General Properties of the Integral 1.2. Contour Integrals 1.3. The Cauchy-Goursat Integral Theorem	Week 8-9 (7 HRS)	

	1.4. The Cauchy Integral Formula 1.5. Morera's Theorem		
	V. SEQUENCES AND SERIES 1.1. Definition and General Properties 1.2. Power Series, Region of Convergence 1.3. Functions as Power Series – Taylor's Series, Laurent's Series	Week 10-12 (8 HRS	
	VI. THEORY OF RESIDUES 1.1. Definition of Residues and Poles 1.2. The Residue Theorem	Week 13 (3 HRS)	
	QUIZ 4	1 HR	
	1.3. Residues at Poles 1.4. Improper Integrals		
	Final Examination	2 HRS	

References

Pennisi L.L. (1976) Elements of Complex Variables (2nd Edition). Manila: National Bookstore
Ahlfors L.V. (1979) Complex Analysis (3rd Edition). NY: McGraw-Hill
Conway J.H. and Howell R.W. (2006) Complex Analysis for Mathematics and Engineering (5th Edition)
Andreescu, T.(2005) Complex Numbers from A to Z, Birkhauser
Cohen, H. (2008) Complex Analysis with Applications in Science & Engineering (2nd Edition). Springer
Eiderman, V.Y. and Samokhin, M.V.(2005). Selected Topics in Complex Analysis, Birkhauser
Gilman, J.P.(2008) Complex Analysis, Springer

Online Resources

http://www.umn.edu/~arnold/502.597/complex.pdf.
http://www.math.ucla.ed/%7ETao/resource/general/132.100w/
http://www.math.lsu.ed/`neubrand/notes.pdf

Class Policies

1. The required minimum number of quizzes for a 3-unit course is 3, and 4 for 4-unit course. No part of the final exam may be considered as one quiz.
2. Cancellation of the lowest quiz is not allowed even if the number of quizzes exceeds the required minimum number of quizzes.
3. As a general policy, no special or make-up tests for missed exams other than the final examination will be given. However, a faculty member may give special exams for
   A. approved absences (where the student concerned officially represented the University at some function or activity).
   B. absences due to serious illness which require hospitalization, death in the family and other reasons which the faculty member deems meritorious.
4. If a student missed two (2) examinations, then he/she will be required to take a make up for the second missed examination.
5. If the student has no valid reason for missing an exam (for example, the student was not prepared to take the exam) then the student receives 0% for the missed quiz.
6. Students who get at least 89% in every quiz are exempted from taking the final examination. Their final grade will be based on the average of their quizzes and other prefinal course requirements. The final grade of exempted students who opt to take the final examination will be based on the prescribed computation of final grades inclusive of a final examination. Students who missed and/or took any special/make-up quiz will not be eligible for exemption.
7. Learning outputs are required and not optional to pass the course.
8. Mobile phones and other forms of communication devices should be on silent mode or turned off during class.

9. Students are expected to be attentive and exhibit the behavior of a mature and responsible individual during class. They are also expected to come to class on time and prepared.
10. Sleeping, bringing in food and drinks, and wearing a cap and sunglasses in class are not allowed.
11. Students who wish to go to the washroom must politely ask permission and, if given such, they should be back in class within 5 minutes. Only one student at a time may be allowed to leave the classroom for this purpose.
12. Students who are absent from the class for more than 5 meetings will get a final grade of 0.0 in the course.
13. Only students who are officially enrolled in the course are allowed to attend the class meetings.

Approved by:

DR. ARTURO Y. PACIFICADOR, JR.
Chair, Department of Mathematics