****

**Department of Mathematics**

**College of Education**

**University of Salahaddin**

**Subject: Advanced Complex analysis**

**Course Book – Postgraduate\Doctoral**

**Lecturer's name: Dr. Fryad Husein Abdulqadr**

**Academic Year: 2023-2024**

**Course Book**

|  |  |  |
| --- | --- | --- |
| **1. Course name** | **Complex analysis** | |
| **2. Lecturer in charge** | Dr. Fryad H. Abdulqadr | |
| **3. Department/ College** | Mathematics\ Education College | |
| **4. Contact** | e-mail: fryad.abdulqadr@su.edu.krd  Tel: 7504627615 | |
| **5. Time (in hours) per week** | 3 hours | |
| **6. Office hours** | Tuesday: 11:30-2:30 | |
| **7. Course code** |  | |
| **8. Teacher's academic profile** | 1. B.Sc. in Mathematics, 1998, Salahaddin University-Erbil 2. M.Sc. in Functional Complex Analysis, 2002, Salahaddin University-Erbil 3. PhD in Algebraic Graph Theory, 2015, University of Mosul-Iraq. | |
| **9. Keywords** | Complex numbers, complex functions and analytic functions. | |
| **10. Course overview:**  **Complex Analysis** is a subject which has something for all mathematicians. In addition to having applications to other parts of analysis, it can rightly claim to be an ancestor of many areas of mathematics and physics. In 1960 Churchil, R. V. mentioned the harmonic function as a physical application of complex analysis.  In the first chapter, we give the definition of complex numbers and some of its properties.  Second chapter is about complex valued functions with explaining their limit, continuity and derivative.  Regarding the third chapter, Students will give elementary such as: Triangular functions m exponential functions and logarithmic functions.  Chapter four deals with the convergence of complex sequence and series.  In chapter five, the complex integrations will be considered. We will give the complex integral formulas. | | |
| 11. Course objective:  The objective of this course is to introduce the fundamental ideas of the functions of complex variables and developing a clear understanding of the fundamental concepts of Complex Analysis such as analytic functions, complex integrals and a range of skills which will allow students to work effectively with the concepts.  The first objective of this course is to develop those parts of the theory that are  prominent in applications of the subject. The second objective is to furnish an introduction to applications of residues and conformal mapping. With regard to residues, special emphasis is given to their use in evaluating real improper integrals, finding inverse Laplace transforms, and locating zeros of functions. As for conformal mapping, considerable attention is paid to its use in solving boundary value problems that arise in studies of heat conduction and fluid flow. Hence the book may be considered as a companion volume to the authors’ text “Fourier Series and Boundary Value Problems,” where another classical method for solving boundary value problems in partial differential equations is developed. | | |
| **12. Student's obligation**  The student are obliged to attend to the class room. Student also enforced to make examination ,prepare reports and presentation. | | |
| **13. Forms of teaching**  The kind of teaching method includes the board and reports. | | |
| **14. Assessment scheme**   1. There examinations will be given, each 30% 2. Daily activities (Home work, reporting, Quiz) 10% 3. Final exam 60%‌ | | |
| **15. Student learning outcome:** The student will be familiar with main topics in Mathematics such as: Complex numbers and analytic functions. | | |
| **16. Course Reading List and References‌:**  1. **Churchil, R. V.**; “*Complex Variables and Applications*” , 2Ed , McGraw-Hill Book Company, Inc. New York,(1960).  2. **Marsedn, J. E.** ; “*Basic Complex Analysis*”, W. H. Freeman and Company, Inc. New York,(1973).  3. متغيرات معقدة وتطبيقاتها، ر. شرشل | | |
| **17. The Topics:** | | **Lecturer's name** |
| **Course Program**  Week1-2: Foundation of complex analysis  Week3-4: Series representation of complex functions.  Classification of singular points  Week5: The Residue of singular points  Week6: Residue and poles with their applications  Week7: Examinaiton  Week8: Conformal mapping  The Schwarz–Christoffel Transformation  Week9-10: Multivalued functions and Reimann surface Week11-12: Properties of the solutions of Laplace partial differential equations.  Week13-14: Differential and integral equations on complex domain | | Dr. Fryad H. Abdulqadr  (3 hrs) |
| **18. Practical Topics (If there is any)** | |  |
| In this section the lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture | |  |
| **19. Extra notes:**  No more notes | | |
| **20. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ**  This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.  *(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*  ئه‌م کۆرسبووکه‌ ده‌بێت له‌لایه‌ن هاوه‌ڵێکی ئه‌کادیمیه‌وه‌ سه‌یر بکرێت و ناوه‌ڕۆکی بابه‌ته‌کانی کۆرسه‌که‌ په‌سه‌ند بکات و جه‌ند ووشه‌یه‌ک بنووسێت له‌سه‌ر شیاوی ناوه‌ڕۆکی کۆرسه‌که و واژووی له‌سه‌ر بکات.  هاوه‌ڵ ئه‌و که‌سه‌یه‌ که‌ زانیاری هه‌بێت له‌سه‌ر کۆرسه‌که‌ و ده‌بیت پله‌ی زانستی له‌ مامۆستا که‌متر نه‌بێت.‌‌ | | |