School of Mathematics

Course 414 — Complex Analysis 1999-2000
(Optional JS & SS Mathematics, SS Two-subject Moderatorship)

Lecturer: Branka Pavlović

Requirements/prerequisites: 221

Duration: 21 weeks.

Number of lectures per week: 3

Assessment: Regular assignments.

End-of-year Examination: One 3-hour examination

Description:

1. Review of the definition of analytic functions, the Cauchy-Riemann equations, differentiation of power series, and contour integrals. Various forms of Cauchy's theorem and the Cauchy integral formula; winding numbers and homotopy.

2. Logarithms, simple connectedness and antiderivatives.

3. Identity theorem for analytic functions, maximum modulus theorem.

4. Open mapping theorem, argument principle, inverses of analytic functions and Rouché's theorem. Removable singularities, Casorati-Weierstrass theorem, Residue theorem.

5. Metric space structures on $H(G)$ and $C(G)$. Boundedness and compactness in $H(G)$.

6. Normal families; metric space structure of $M(G)$.

7. Continuous linear operators and dual spaces. Hahn-Banach theorem (without proof) and applications. Runge's theorem.

8. Hurwitz's theorem, the Schwarz lemma, the Riemann mapping theorem.

Objectives: This course will build on material covered in 221. Initially it will cover some familiar material in greater detail and then continue on to cover basic material in complex analysis. Some functional analytic techniques will be developed and applied to prove results in complex analysis.

Textbooks:

[1] L. V. Ahlfors, *Complex Analysis,* Third Edition, McGraw-Hill, New York, 1978.

[2] John B. Conway, *Functions of One Complex Variable,* Second Edition, Graduate Texts in Mathematics 11, Springer-Verlag, New York, 1978.

[3] Reinhold Remmert, *Theory of Complex Functions,* Graduate Texts in Mathematics 122, Springer-Verlag, New York, 1991.

[4] W. Rudin, *Real and Complex Analysis,* Second Edition, McGraw-Hill, New York, 1974.

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