Complex methods

Analytic functions

Definition of an analytic function. Cauchy-Riemann equations. Analytic functions as conformal mappings; examples. Application to the solutions of Laplace's equations in various domains. Discussion of $\log z$ and z^n.

Contour integration and Cauchy theorem

[Proofs of theorems in this section will not be examined]
Contours, Contour integrals. Cauchy's theorem and Cauchy's integral formula. Taylor and Laurent series. Zeros, poles and essential singularities.

Residue calculus

Residue theorem, calculus of residues, Jordan's lemma. Evaluation of definite integrals by contour integration.

Fourier and Laplace transforms

Laplace transform: definition and basic propteries; inversion theorem (proof not required); convolution theorem. Examples of inversion of fourier and Laplace transform by contour integration. Applications to differential equations.

Appropriate Books

Daniel Zill (First Course in (Complex Analysis)

Appropriate books

M.J Ablowitz and A S Folcas Complex variables: Introduction and applications CUP 2003

G.B Arfken, H.J Weber & F.E Harris Mathematical Methods for Physicsists Elsevier 2013

G J.O Jameson A First Course in Complex Functions CRC 1970

T Needham Visual complex analysis Clarendon 1998

† H.A Priestley Introduction to Complex Analysis Clarendon 1990

† K.F Riley, M.P Hobson and S.J Bence Mathematical Methods for Physicts and Engineering : a Comprehensive guide. CUP 2002