MSM2B Complex Variable Theory

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This course comprises twenty-one lectures and five back-up sessions and is concerned with the foundational theory and applications of complex variable theory. The lectures take place in Arts Lecture room 6 on Tuesdays $15-16pm$ and in LRA on Fridays $16-17pm$. The first back up session is on *Tuesday 25th January 15 - 16pm* in Arts lecture room 6. The lecture scheduled for that time will take place on Thursday 27th January at 2pm in LRA (i.e. the two events are swapped). The other four back up sessions are on odd week Thursdays as originally timetabled (i.e. 2pm, starting on February 10th, then February 24th etc.).

Syllabus

- Functions, Limits and Continuity: functions of a complex variable, domains, limits, Riemann Sphere, continuity, bounded functions.
- Derivatives and Analytic Functions: derivatives, Cauchy-Riemann equations, analytic functions, harmonic functions.
- Transcendental Functions: trigonometric functions, logarithms, branch cuts.
- Contour Integration and Cauchy's Theorem: paths and contours, integrals on paths, ML-result, Cauchy's Theorem, Cauchy's Integral Formula.
- Series Expansions of a Function of a Complex Variable: Taylor and Laurent expansions, techniques for obtaining Taylor and Laurent Series.
- Cauchy's Residue Theorem: singularities, residues and Cauchy's Residue Theorem.
- Evaluation of Real Integrals: four types of real integrals that can be evaluated using the Residue Theorem, Jordan's Lemma.

Assessment

The course is assessed both continually and by final examination. The continuous part of the assessment will be based on your performance on the work handed in from the example sheets and will contribute 20% to your final grade. The final examination will take two hours and contribute 80% to your final grade.

Texts

The material in this course is covered by

1. *Complex Analysis* by J. M Howie, Springer.
2. *Complex Variables and Applications* by J. W. Brown and R. V. Churchill, 6th edition, McGraw-Hill.
3. *Complex Analysis and Applications* by A. David Wunsch, 2nd edition Addison Wesley.
4. *Complex Variables and their applications* by Anthony D. Osborne, Addison Wesley.
5. *Complex Variables* by M. Ya. Antimirov, A. A. Kolyshkin and Rémi Vaillancourt, Academic Press.
6. *Introduction to Complex Analysis* by H. A. Priestley, Clarendon Press.
7. *Advanced Engineering Mathematics* by E. Kreyzig, Wiley - 7th edition.
8. *Advanced Engineering Mathematics* by O'Neil, Wadsworth- 3rd edition.

None of the above books is identical to the course being given. The closest is probably Brown & Churchill and there are copies of this book available in the short loan collection in the library. This book will also be of use for the Further Complex Variable Course which runs in semester 5.

Some of the course material will be available online via
`http://web.mat.bham.ac.uk/D.Osthus/complex.html`