MATH V3007 Complex Variables (13394) Spring 2015

Class information.
Class times: MW, 4:10-5:25PM, 717 Hamilton Hall.
Instructor: Sachin Gautam.
Office: 413 Mathematics Building.
Office Hours: MW 12-1PM.
Email: sachin@math.columbia.edu
Webpage: `http://www.math.columbia.edu/~sachin/S15/CA/complex.html`

Help Room. The help room is located in Math 406. Schedule is available at
`http://www.math.columbia.edu/general-information/help-rooms/406-math`

Exam dates. There will be two mid terms on **February 18** (Wednesday) and **April 1** (Wednesday) during the class time. The final exam schedule will be out shortly. The projected date is **May 11** (Monday) 4:10PM. You can check the final exam schedule at
`http://registrar.columbia.edu/content/final-exam-schedule`

Grading policy.
The homework will make up 30% of the course grade. Each mid term will be worth 20% of the course grade. The final exam will constitute 30% of your grade.

Textbook.
The course will be based entirely on lecture notes. If you miss a class (not recommended) you can download the notes from the course homepage.
`http://www.math.columbia.edu/~sachin/S15/CA/notes.html`

Homework.
Homework will be assigned every Wednesday (except for the first day) and will be due a week after (see the course schedule on page 2 for the full list). **Late homework will not be accepted.** You will drop the homework, on the day it is due, in the mailbox located opposite to my office (413 Math) by 6PM. The mailbox is labelled "Complex Variables, Sachin Gautam, 717 Hamilton".

Homework is an absolutely essential component of the course. If you are having trouble with some of the problems, you should go to the help room (Math 406) or come to my office hours.

Format.
The structure of this course will be different from some of the previous mathematics courses you may have encountered, in that this course will be more conceptual than computational. The style of the course will be

$$\text{Definitions} \to \text{Examples} \to \text{Theorems} \to \text{Proofs} \to \text{Applications}$$

This is in contrast with typical calculus courses, but similar to other upper–level undergraduate courses, *e.g,* elementary number theory, modern algebra, analysis et cetra.

Prerequisites.
Calculus IV (or Honors Math B) is a prerequisite for this course. I will review the relevant concepts (convergence of sequences, limits, continuity, derivative, Riemann integral and techniques of integration) during the lectures. However, prior familiarity with these will be highly beneficial for understanding the material.

Course schedule

Homework assignments (and solutions) will be posted on the course homepage:
`http://www.math.columbia.edu/~sachin/S15/CA/homework.html`

Date	Topic	Homework deadline
01/21 W 01/26 M 01/28 W	Definition of complex numbers Functions of a complex variable Differentiation	Homework 1 due on 02/04
02/02 M 02/04 W	Complex integration Cauchy's theorem	Homework 2 due on 02/11
02/09 M 02/11 W	Liouville's theorem and Fundamental Theorem of Algebra Rational functions	Homework 3 due on 02/25
02/16 M 02/18 W	Review I **Mid Term I**	
02/24 T: Last day to drop the class		
02/23 M 02/25 W	Sequences and series Uniform convergences - differentiating and integrating power series	Homework 4 due on 03/04
03/02 M 03/04 W	Identity theorem and classification of singularities Laurent series and Cauchy's Residue Theorem	Homework 5 due on 03/11
03/09 M 03/11 W	Winding number, index function and null–homologous paths Cauchy's principal value	Homework 6 due on 03/25
03/16 M 03/18 W	Spring break	
03/23 M 03/25 W	Functions defined by integrals, Plemelj formula Some integral transforms	Homework 7 due on 04/08
03/26 R: Last day to swith to pass/fail		
03/30 M 04/01 W	Review II **Mid Term II**	
04/06 M 04/08 W	Infinite product expansions Euler's Γ function	Homework 8 due on 04/15
04/13 M 04/15 W	Ordinary differential equations in complex plane ODE's with singularities	Homework 9 due on 04/22
04/20 M 04/22 W	Doubly–periodic functions Weierstrass' $\wp$ function	Homework 10 due on 04/29
04/27 M 04/29 W	Theta function I Theta function II	Homework 11 due on 05/04 (will be assigned on 04/27)
05/04 M 05/11 M	Final Review **Final exam**	

Disclaimer. The course schedule above is subject to change (though highly unlikely). If this happens you will be notified by email. Most recent version of this syllabus will be available at the course homepage

`http://www.math.columbia.edu/~sachin/S15/CA/syllabus.pdf`