MATH 380 : INTRODUCTION TO COMPLEX DYNAMICS
AUTUMN 2016

bharali@math.iisc.ernet.in
http://math.iisc.ac.in/∼bharali/teaching.htm

Instructor: GAUTAM BHARALI

Course summary: This course is devoted to holomorphic dynamics in one (complex) dimension. The word "dynamics" refers, in this case, to the dynamical systems that arise when iterating a holomorphic self-map of a Riemann surface. The course will be largely self-contained. Most of the course will be devoted to the dynamics of the iterates of a rational map on the Riemann sphere. However:

- A rigorous justification will be given as to why — in one dimension and with the underlying state-space taken to be compact — **most** non-trivial phenomena in iterative dynamics arise in the above setting.

- To the extent possible, connections with the wider realm of (discrete-time) dynamical systems will be established.

The topics covered will have have a non-trivial overlap with all six chapters of Milnor's book (see (1) below). However, the last one-third of the course will be devoted to constructing an explicit invariant measure for a rational map on the Riemann sphere. If time permits, we shall look at some ergodic properties of this measure.

Textbooks: Your class notes, and your own solutions to homework problems (provided they are clearly and systematically written!) will form the core of the knowledge acquired from this course. The first two-thirds of this course will be strongly influenced by Milnor's book. Here are some useful references:

1) J. Milnor, *Dynamics in One Complex Variable*, Annals of Mathematics Studies no. 160, Princeton University Press, 2006.
   (Useful if you are interested in problem-solving)

2) A.F. Beardon, *Iteration of Rational Functions: Complex Analytic Dynamical Systems*, Graduate Texts in Mathematics no. 132, Springer-Verlag 1991.

Assessment: If you are crediting the course, your assessment will be based on:

- *Homework:* Four or five assignments will be given. You are certainly allowed to discuss the homework problems among yourselves (or with me, after you have made a reasonable attempt at the problem in question), but each submission **must be an individual effort.**

- *Final examination:* This will be held during the final-examination week. Date and time will be decided at an appropriate time.

Grading: As this is a topics course, the only reasonable grades are S, A or B — **PROVIDED** you make it a point to turn in a significant fraction of your homework assignments.