Math 413, Spring 2016
SYLLABUS

Textbook: Jiri Lebl: Basic Analysis. Custom Pitt edition.

Prerequisites: The course covers the foundations of theoretical mathematics and analysis. The principal topics of the course include fundamentals of logic, sets, functions, number systems, order completeness of the real numbers and its consequences, and convergence of sequences and series of real numbers. Successful completion of Math 0230 (Calculus II) or equivalent is required to follow this course. If you do not feel comfortable with the prerequisite material, please contact the instructor in the beginning of the course.

Grades: Your final grade depends on your performance on the final exam as well as on your total grade. Grades will be based on homework (40%), one midterm (20%) and the final (40%). There will be no make up midterm exams. If you miss the midterm exam for a *documented* medical reason, your grade on it will be the prorated grade of your final exam. Incompletes will almost never be given, and only for cases of extreme personal tragedy.

Homework: Homework will be assigned each Wednesday (starting in the second week of the semester), and it will be due the following Wednesday at the beginning of class. Late homework will not be accepted. The lowest homework grade will be dropped. The solution of each exercise will be evaluated in the scale 0-5 points, taking into account the correctness, clarity and neatness of presentation. You may collaborate and discuss the problems with each other but should write up solutions independently.

Core topics: 1. Logic, proofs and quantifiers. Basic set theory. Functions. Equivalence relations.

2. Elementary properties of the natural numbers; induction.

3. Axiomatic introduction to the ordered fields of numbers ($\mathbb{Q}$ and $\mathbb{R}$.

4. Elementary inequalities.

5. The Completeness Axiom; Archimedean Property of the real numbers; density of the rational and irrational numbers in the real numbers.

6. Countability of the rationals; decimal expansions of real numbers; uncountability of the real numbers.

7. Sequences and an introduction to series; the geometric series; limits.

8. The Monotone Convergence Theorem.

9. The Bolzano-Weierstrass Theorem.

10. Cauchy sequences; Cauchy completeness of the real numbers; series.