



National Taiwan University of Science and Technology

2016 Summer Program

MATH 111 Calculus 1

Course Outline

Course Code: MATH 111

Instructor: Ivan Matic

Home Institution: Duke University

Office Hours: TBA and by appointment

Email: matic@math.duke.edu

Class Hours: According to the regulations of Minister of Education, R.O.C, 18 class hours could be counted as 1 academic credit in all universities in Taiwan. This course will have 72 class hours, including 40 lecture hours, professor 10 office hours, 10-hour TA discussion sessions, 2-hour review sessions, 10-hour extra classes.

Course Description:

This is the first course in calculus for engineers, physicists, computer scientists, and mathematicians.

The goal is for students to build a solid understanding of fundamental concepts such as sequences,

functions, limits, continuity, differentiability, and basics of integration.

Calculus studies the limiting behavior of functions. Functions themselves are among the most

important discoveries in history, because they describe the dependence of objects and phenomena in

nature. Most functions of interest exhibit a rather regular behavior which makes it possible to

understand their infinitesimal properties. This enables us to describe the nature and predict



its

behavior.

The proper understanding of calculus plays a crucial role in careers of mathematicians, physicists, economists, engineers, programmers, and in recent years biologists and other life scientists.

This

course will teach students how to think and to understand the reasons behind formulas. The calculus

will give meaning to the future courses and life.

Required Textbooks:

Stewart: Calculus – Early Transcendentals

Grading & Evaluation:

Homework and quizzes: 20%

Midterm: 30%

Final: 50%

Course Schedule:

Week 1:

Session 1: Functions (definitions and representations, mathematical models, elementary

functions, composition of functions)

Sessions2: Limits of functions (definition, asymptotes, rules for calculating the limits); Limits

of functions (precise definition, continuity, rates of change)

Session 3: Derivatives (derivative as a limit: precise definition and properties)

Week 2:

Session 1: Session 2: Differentiation Formulas, Derivatives of polynomials and trigonometric functions.



Session 2: The Chain Rule, Implicit Differentiation, Derivatives of logarithmic and exponential functions.

Session 3:

Week 3:

Session 1: Higher Derivatives, Linear Approximation and Differentials

Session 2: Applications of Differentiation: Maximum and minimum values

Session 3: Mean Value Theorem, L'Hopital's Theorem, Curve Sketching

Week 4:

Session 1: Optimization Problems. Taylor and MacLaurin formulas.

Session 2: Integrals: Anti-derivatives

Session 3: Areas and definite integrals

Week 5:

Session 1: The Fundamental Theorem of Calculus

Session 2: Substitution Rule

Session 3: Applications (Areas between curves, volumes)