

## MATH 1.4: CALCULUS I

### I. Course description:

1. **Credit points:** 3 ECTS

2. **Time commitment:**

Items	Lecture	Tutorial	Practical	Total
No. of hours	20	20	0	36

3. **Prerequisites:** High School Math.

4. **Recommended background knowledge:** N/A.

5. **Subject description:**

The first part of the course is a continuation of pre-calculus class in high school. This course will concentrate on single-variable calculus.

6. **Objectives & Outcome:**

The students will learn the following concepts:

- Mean Value Theorem, implicit differentiation, L'Hospital's rule, Taylor polynomials, Newton's method. Definite and improper integrals, Fundamental Theorem of Calculus.

7. **Assessment/ Evaluation**

Component	Attendance + Tutorials	Exercises	Assignments	Reports	Midterm	Final
Percentage %	20	0	0	0	30	50

8. **Prescribed Textbook(s):**

[1] Stewart James, CALCULUS, Early Transcendentals, 7<sup>th</sup> Edition, Thomson Books/Cole, 2012.

[2] Giáo trình Toán cao cấp I, II, III, Nguyễn Đình Trí, NXB Giáo dục 2005.

### II. Course content & schedule:

1. Limits of sequences

- Preliminaries : real number, complex number, sequences
- Limits of sequences : definition, convergence, monotonic sequences.

2. Single-variable functions

- Concepts

- Limits of function
- The continuity of function

### 3. Differentiation

- Basic differentiation rule and rate of changes
- Product and quotient rules
- High-order derivative, Leibnitz formula
- Chain rule
- Implicit differentiation
- Newton's method

### 4. Application of differentiation

- Extrema of function
- Mean Value Theorem
- Fermat, Rolle, Cauchy, Lagrange's theorems
- L'Hospital rule, Taylor's formula
- Increasing and decreasing functions
- Concavity

### 5. Integration

- Antiderivatives and Indefinite integration
- Riemann sum and definite integration
- The fundamental theorem of calculus
- Numerical integration
- Improper integration

### 6. Series

- Series and Convergence
- Integral test and p-series
- Comparison of series
- Alternating series
- The ratio and root test
- Taylor's polynomials and approximation
- Power series, Maclaurin's series

### **III. Reference Literature:**

[1]. Stewart James, CALCULUS, Early Transcendentals, 7th Edition, Thomson Books/Cole, 2012.

[2]. James C. Robinson, An introduction to Ordinary Differential Equations, Cambridge Univ. Press, 2004.