7. Calculus 1 (MA001IU)

Course designation	*This course equips students with basic concepts of calculus: limits, continuity, differentiation, and integration. Applications of these concepts are extensively discussed.*
Semester(s) in which the course is taught	1, 2, summer semester
Person responsible for the course	Assoc. Prof. Mai Duc Thanh, Assoc. Prof. Tran Vu Khanh, Dr.Nguyen Minh Quan, Dr. Nguyen Anh Tu, Dr. Ta Quoc Bao.
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lectures, assignments
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 170 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 50 (lectures) Private study including examination preparation, specified in hours: 120
Credit points/ECTS	4 credits/6.16 ECTS
Required and recommended prerequisites for joining the course	None

Course learning outcomes	Upon the successful completion of this course students will be able to:	
	Competency level	**Course learning outcome (CLO)**
	Knowledge	CLO1. Have basic knowledge of limits and derivatives (Program outcomes: a) CLO2. Have basic knowledge of definite/indefinite integrals (Program outcomes: a)
	Skill	CLO3. Can compute often used limits, can define and compute derivatives (Program outcomes: a, j) CLO4. Can compute standard types of integrals. Use integrals in practical situations (Program outcomes: a, j)
	Attitude	CLO5. Confident when dealing with derivatives and integrals. Comfortable with using derivatives and integrals in practical situations. (Program outcome: j, k)

Content	*The description of the contents should clearly indicate the weighting of the content and the level.*
	Weight: lecture session (4 hours)
	Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Functions and Graphs, Inverse Functions, Exponential and Logarithmic Functions	1	I, T
Parametric Curves, Limit. One-sided Limits Laws of Limits.	1	I, T
Evaluating Limits. The Squeeze Theorem. Continuity. The Intermediate Value Theorem	1	T, U
Tangent Lines and Velocity Problems. Rates of Change, Derivative.	1	T, U
Higher-Order Derivatives, Rules of Differentiation. Rates of Change in the Natural and Social Sciences	1	T, U
Implicit Differentiation, Differentiation of Inverse Functions,	1	T, U
Logarithmic Differentiation, Linear Approximations. Differentials.	1	T, U
Related Rates, Maxima and Minima. Critical Point, The Mean Value Theorem.	1	T, U
The First and Second Derivative Test, Concavity. Shapes of Curves, Curve Sketching	1	T, U
Indeterminate Forms and l'Hôpital's Rules, Maxima and Minima Problems, Newton's Method	1	T, U
Anti-derivatives and Indefinite Integrals, The Definite Integral	1	I, T
Properties of the Definite Integral. The Fundamental Theorem of Calculus, Integration by Substitution	1	I, T, U
Integration by Parts, Partial Fractions, Numerical Integration,	1	T, U
Improper Integrals, Areas between Curves Areas Enclosed by Parametric Curves	1	T, U
Volumes, Arc Length, Applications to Engineering, Economics and Science	1	T, U

Examination forms	Written examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	J. Stewart, *Calculus*, Cengage Learning, 7th edition, 2010.