

Course Syllabus 2301107 Calculus I

1. **Course Number:** 2301107
2. **Course Credit:** 3 credits
3. **Course Title:** Calculus I
4. **Faculty of Science:** Department of Mathematics
5. **Semester:** First
6. **Academic Year:** 2009
7. **Instructors:** 1. Krung Sinapiromsaran, Ph. D., Chem II 213, ☎02-218-5225
2. Chotiros Surapholchai, Chem II 203, ☎02-218-5218
3. Tuangrat Chaichana, Ph. D., Math 409.01, ☎02-218-5162

8. Condition

- 8.1. **Prerequisite:** 2301011 or Consent of Faculty
- 8.2. **Corequisite:** -
- 8.3. **Concurrent:** -
9. **Status:** Required
10. **Curriculum:** International Program in Engineering
11. **Degree:** Bachelor of Engineering (International Program)
12. **Hours/Week:** 3

13. Course Description:

Limits; continuity; differentiation; applications of differentiation; integration; applications of the definite integrals; transcendental functions; techniques of integration; improper integrals.

14. Course Outline

- 14.1. Behavioral objectives:** After finishing this course, students should be able to
1. find limits and verify continuity of given functions;
 2. find derivatives of given functions using formulas and the chain rule;
 3. find higher-order derivatives;
 4. find derivatives of implicit functions;
 5. use differentials to estimate values of functions;
 6. find extrema of functions and solve extrema problems;
 7. sketch graphs of functions using first- and second-order derivatives;
 8. solve related rate problems;
 9. find indefinite and definite integrals of given functions;
 10. calculate areas between curves;
 11. volumes of solid objects;
 12. calculate length of 2-D curves;
 13. area of surfaces of revolution;
 14. apply various techniques of integration to compute indefinite and definite integrals;
 15. verify the convergence of given improper integrals;
 16. find the limit of functions in the indeterminate forms.

14.2. Learning Contents:

1. Limits and continuity (2.1-2.5) 3 hours
 - 1.1. Limits
 - 1.2. Continuity
2. Derivatives (3.1-3.10) 9 hours
 - 2.1. The derivatives
 - 2.2. Differentiation formulas
 - 2.3. Rates of change
 - 2.4. Derivatives of transcendental functions and inverse trigonometric function
Hyperbolic function (self-study)
 - 2.5. The chain rule
 - 2.6. Implicit differentiation
 - 2.7. Higher derivatives
 - 2.8. Related rates
 - 2.9. Linear approximations and differentials
3. Applications of differentiation (4.1-4.10, 7.7) 9 hours
 - 3.1. Maximum and minimum values
 - 3.2. The Mean Value theorem
 - 3.3. How derivatives affect the shape of a graph
 - 3.4. Limits at infinity
 - 3.5. Curve sketching
 - 3.6. Optimization problems
 - 3.7. Newton's method (Self-study)
 - 3.8. Antiderivatives
 - 3.9. L'Hopital's rule
4. Integrals (5.1-5.5) 9 hours
 - 4.1. Areas and distances
 - 4.2. The definite integrals
 - 4.3. The Fundamental theorem of calculus
 - 4.4. Indefinite integrals
 - 4.5. The substitution rule
 - 4.6. Integral of transcendental functions
5. Applications of the integration (6.1-6.3) 4 hours
 - 5.1. Area between curves
 - 5.2. Volumes
 - 5.3. Volumes by cylindrical shells
6. Techniques of integration (8.1-8.8) 7 hours
 - 6.1. Integration by parts
 - 6.2. Trigonometric integrals
 - 6.3. Trigonometric substitution
 - 6.4. Integration of rational functions by partial fractions
 - 6.5. Improper integrals
7. Applications of the integrations (9.1 – 9.3) 4 hours
 - 7.1. Length of 2-D curves
 - 7.2. Areas of surfaces of revolution

14.3.Method:

Lecture 3 hours/week

Section 1: Tuesday 10:30–12:00, Thursday 13:00–14:30 ENG2 302 (Krung)

Section 2: Monday 10:00–11:30, Thursday 13:00–14:30 ENG2 304/2 (Chotiros)

Section 3: Monday 8:30–10:00 ENG2 304/2, Tuesday 8:00-9:30 ENG2 303/2 (Tuangrat)

14.4.Media: Black board, transparencies and opaque sheets, presentation files and computer with LCD

14.5.Assignment through Network System Via Blackboard system at <http://blackboard.it.chula.ac.th/>

14.6.Evaluation

14.6.1.Assessment of academic knowledge

10% Assignment due on Monday at noon

45% Midterm on Monday 28 September 2009, 8:30 – 11:30

45% Final on Monday 30 November 2009, 8:30 – 11:30

14.6.2.Assessment of work or classroom activities -

14.6.3.Assessment of the assigned tasks -

15. Reading List

15.1.Required Text: James Stewart, Calculus 5e, Brooks/Cole Thomson Learning 2003.

15.2.Supplementary Texts:

- David Dwyer and Mark Gruenwald, Precalculus, Thomson Learning inc., 2004
- Howard Anton, et al., Calculus with Analytic Geometry, 7nd edition, John Wiley & Sons, 2002
- Henry Edwards and David penney, Calculus with Analytic Geometry, 6th edition, Prentice Hall 2002.
- Thomas and Finney, Calculus and Analytic Geometry, 9th edition, Addition-Wesley, 1996.

15.3.Research Articles / Academic Articles -

15.4.Electronic Media or Websites All related websites

<http://blackboard.it.chula.ac.th>

<http://pioneer.netserv.chula.ac.th/~skrung>

16. Teacher Evaluation

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<i>Week</i>	<i>Date</i>	<i>Content</i>
1	10 – 14 August 2009	Limits and continuity
2	17 – 21 August 2009	The derivatives, differentiation formulas, rates of change Homework 1: Due at noon on Monday 24 August 2009
3	24 – 28 August 2009	Derivatives of transcendental function and inverse trigonometric function, the chain rule, implicit differentiation, higher derivatives,
4	31 August – 4 September 2009	Related rates, linear approximations and differentials Homework 2: Due at noon on Monday 7 September 2009
5	7 – 11 September 2009	Maximum and minimum values, the Mean Value theorem
6	14 – 18 September 2009	Limits at infinity, curve sketching, optimization problems Homework 3: Due at noon on Monday 21 September 2009
7	21 – 25 September 2009	Antiderivatives and L' Hopital's Rule
8	28 September – 2 October 2009	Midterm exam: Monday 28 September 2009, 8:30 – 11:30 am.
9	5 – 9 October 2009	Areas and distances, the definite integrals
10	12 – 16 October 2009	Fundamental theorem of Calculus and indefinite integrals Homework 4: Due at noon on Monday 19 October 2009
11	19 – 22 October 2009	Substitution rule and integral of transcendental functions
12	26 – 30 October 2009	Area between curves, Volumes, Volumes by cylindrical shells Homework 5: Due at noon on Monday 2 November 2009
13	2 – 6 November 2009	Integration by parts, trigonometric integrals
14	9 – 13 November 2009	Trigonometric substitution, integration of rational functions by partial fractions Homework 6: Due at noon on Monday 16 November 2009
15	16 – 20 November 2009	Improper integrals, length of 2-D curves
16	23 – 27 November 2009	Length of 2-D curves (cont.) and areas of surfaces of revolution
17	30 November – 4 December 2009	Final exam: Monday 30 November 2009, 8:30 – 11:30 am.