Syllabus – Calculus 1

Kode Mata Kuliah (*Course Code*): **TIF102**	**Nama Mata Kuliah** (*Course Name*): **Calculus 1**		
Program Studi (*Study Program*): **Informatics**	**Fakultas** (*Faculty*): **Engineering and Computer Science**		
Mata Kuliah Pra-Syarat (*Course Pre-requisite*): –	**Kredit** (*Credit*): **2**		
	Kuliah (*Lecture*): **2**	**Tutorial**: –	**Praktikum** (*Practicum*): –
Revisi (*Revision Status*): **2.0**	**Semester**: Ganjil/Odd **Tahun Akademik**: 2016/2017		
Lecturer's Name: Irwan Prasetya Gunawan			

COURSE DESCRIPTION

This course will cover the beginner-level calculus materials: an introduction to analytic geometry, differentiation of algebraic and transcendental functions, applications of differentiation, introduction to integration, techniques of integration, and applications of definite integrals.

COURSE OBJECTIVES

The objectives of this course are as follows:

- Understand the concept of inverse functions and related techniques.
- Understand the concept of limits and its related topics such as continuity. Then understanding the concept of derivative as a consequence of applying the limit as a tool in solving the problem of finding the instantaneous rate of change. Then learn the techniques of differentiation of functions such as trigonometric, inverse trigonometric, exponential, and logarithmic function.
- Understand the behavior of the function through exploring its first and second derivatives.
- Understand the concept of integration as a tool in solving the problem of finding the area under the curve of a function.

Upon completion of this course, the student should be able to:

1. Use techniques to compute limits of various kinds of functions.
2. Relate the concepts of limit and continuity and apply some consequences of continuity such as the Intermediate Value Theorem.
3. Recognize the existence of the vertical, horizontal, or slant asymptotes.
4. Use the techniques of computing limits to define the derivative of a function at some point as the instantaneous rate of change.
5. Derive the rules of differentiation and use them to find the derivatives of various kinds of functions of single variable.
6. Apply the Mean value Theorems.
7. Use the first and the second derivatives to: find the minimum and the maximum values of a function, find the intervals of increasing and decreasing, and find the intervals of concavity. Then using this information to draw a sketch of the curve of the given function.
8. Use the techniques of computing limits to define the integration of a function as the area under its curve.
9. Learn the Fundamental Theorem of calculus and use it to define the definite integral as the anti-derivate.
10. Integrate various kinds of functions by using the rules of integration and the substitution as first technique of substitution.

METHODS OF INSTRUCTIONS

Classroom instruction consists of lectures and practical problem solving, supplemented by visual aids designed to assist the student to successfully meet the courses learning objectives.

It is imperative that students take an active interest in the course. To succeed in this course, students must read, think, and write in a critical and analytical manner and this takes time and practice. Such practice can only be achieved by working exercises. When troubles arise, and they will, the student must ask questions which may be directed to the instructor or other students in a variety of ways.

Students are also encouraged to work together on problem sets as part of their exercises. However, individual must ultimately demonstrate the understanding of the material by writing up his/her own solutions without the help of other students or their written work.

On average students need to spend roughly, at least, 6 hours of study and preparation per week for this course.

ATTENDANCE REQUIREMENT

Comply with academic rules. Punctuality and regular attendance in classes is of prime importance for successful completion of this course. Students will be expected to arrive for class on time and to remain in class until the end of the class session.

Absence from lectures shall not exceed 22%. Students who exceed the 22% limit without a medical or emergency excuse acceptable to and approved by the Dean of the Faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course.

ASSESSMENT

Coursework evaluation will be weighted as follows:

- Mid Semester Test: 30%
- Final Semester Test: 40%
- Others (class participation, Assignments/quiz/pretest): 30%

MATERIAL REFERENCES AND REQUIRED SUPPLIES

Textbooks:

[1] George B. Thomas, Maurice D. Weir, Joel R. Hass; Thomas Calculus 12th Ed.; Pearson Education, Inc., 2010.
[2] James B. Stewart, Calculus : Early Transcendental, 4th Ed, Brooks Cole, 1999.

COURSE OUTLINE

Note: all materials are delivered by means of in-class lectures and class room discussions.

Session	Topics & Sub-Topics	Methods	References	Assignment
1	Number systems: (a) Natural Numbers (b) Integer Numbers (c) Whole Numbers (d) Rational Numbers (e) Irrational Numbers (f) Complex Numbers	Lecture, Discussion	[1] AP-1, [2] Ch. 1	Chapter problems (even)
1	Lines: (a) Gradient (b) Line equation (c) Parallel lines (d) Perpendicular lines	Lecture, Discussion	[1] AP-1, [2] Ch. 1	Chapter problems (even)

1	Distance, circles, and paraboles: (a) The formula for the distance of two points in the field (b) Equation of a circle with center $(0, 0)$ (c) Equation of a circle with center (a, b) (d) General equation of a circle (e) General equation of parabole (f) Drawing parabole	Lecture, Discussion	[1] AP-1, [2] Ch. 1	Chapter problems (even)
2	Functions: (a) The concept of function (b) Floor and ceiling functions (c) Constant function (d) Linear function (e) Odd and even functions (f) Combination function (g) Composition of functions (h) Trigonometry Functions	Lecture, Discussion	[1] Ch. 1, [2] Ch. 1	Chapter problems (even)
3	Limit: (a) The concept of limit (b) Limit definition (c) One-Sided Limit: left-side & right-side limit (d) Limit rules (e) Limit of algebraic functions (f) Limit of trigonometric functions	Lecture, Discussion	[1] Ch. 2, [2] Ch. 2	Chapter problems (even)
4	Continuity, tangents, and derivatives : (a) Definition of continuity at a point (b) Continuity tests (c) Continuous function (d) Slope and tangent line	Lecture, Discussion	[1] Ch. 2, [2] Ch. 2	Chapter problems (even)
5	Derivatives of algebraic functions: (a) Derivation rules (b) Chain rules (c) Implicit differentiation	Lecture, Discussion	[1] Ch. 3, [2] Ch. 3	Chapter problems (even)
6	Applications of Derivatives: (a) Trig functions and their derivatives (b) Inverse functions and their derivatives (c) Natural logarithmic function and its derivatives (d) Logarithmic function and its derivatives (e) Exponential functions and its derivatives (f) The function of rank (a^x) and its derivatives	Lecture, Discussion	[1] Ch. 4, [2] Ch. 3	Chapter problems (even)
7	Applications of Derivatives (con'td): (a) Maximum (b) Minimum (c) Monotonicity (d) Concavity (e) Mean value	Lecture, Discussion	[1] Ch. 4, [2] Ch. 4	Chapter problems (even)
MID SEMESTER TEST				
8	Integral: (a) Lower sum approach (b) Upper sum approach (c) Mid point approach	Lecture, Discussion	[1] Ch. 5, [2] Ch. 5	Chapter problems (even)
9	Riemann Integral: (a) Riemann sum (b) Integral Notation (c) Concept of Riemann integral	Lecture, Discussion	[1] Ch. 5, [2] Ch. 5	Chapter problems (even)

10	Basic integration of algebraic and trigonometric functions: (a) Integral formulae for basic algebraic functions (b) Integral formulae for trigonometric functions	Lecture, Discussion	[1] Ch. 7, [2] Ch. 7	Chapter problems (even)
11	Integrals of transcendental functions: (a) Integrals of natural logarithmic functions (b) Integrals of logarithmic functions (c) Integrals of exponential functions (d) Integrals of function of rank	Lecture, Discussion	[1] Ch. 7	Chapter problems (even)
12	Techniques of integration: (a) Substitution (b) Partial Integral formulae (c) Partial Integral with tabulation	Lecture, Discussion	[1] Ch. 8, [2] Ch. 7	Chapter problems (even)
13	Techniques of integration: (a) Trigonometric substitution (b) Integration of rational functions	Lecture, Discussion	[1] Ch. 8, [2] Ch. 7	Chapter problems (even)
14	Applications of definite integrals: (a) Areas under the curve (b) Volumes under the curve (c) Areas between curves (d) Volumes between curves	Lecture, Discussion	[1] Ch. 6, [2] Ch. 6	Chapter problems (even)
FINAL SEMESTER TEST				

Prepared by:
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Position: Lecturer
Date: April 2, 2016

Certified by:
Name: Hoga Saragih
Position: Head of Department
Date