

SYLLABUS

Date/ Revision	23 May 2015
Faculty	Engineering
Approval	Dean of Engineering Faculty

SUBJECT : CALCULUS AND LINEAR ALGEBRA 1

1. Identification of Subject:

Name of Subject	:Calculus and Linear Algebra 1
Code of Subject	:MATH-1110
SKS / ECTS	:3/5
Semester	:1
Study Program	:B-AVE, B-EE, B-MTE, B-MEE, B-INE
Lecturer	:Yusak Kosasih, PhD

2. Competency

After having the course, students are expected to:

- Evaluate the limits of a function as x approaches a value (or approaches positive/negative infinity) numerically, graphically, and analytically.
- Define and evaluate a function for Continuity, Compute the derivative of a function using the Limit Definition, Differentiate Algebraic, Trigonometric, Inverse Trigonometric, Exponential and Logarithmic functions using appropriate derivative rules such as; constant, power, product, quotient, and chain rules,
- Recognize Indeterminate forms when taking a limit and apply L'Hopital's Rule when appropriate; Calculate higher order derivatives;
- Evaluate the derivatives of implicit functions.; Apply derivatives to applications, such as; slope of a tangent line, velocity and acceleration, curve sketching, related rates problems, and optimization problems; State and apply the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem;
- Calculate differentials and apply them to compute error propagation;
- Calculate Antiderivatives and Indefinite Integration;
- Calculate series expansion of functions and apply series concept in engineering problems.

3. Description of Subject:

The course is designed to challenge students to further develop and extend their critical thinking skills by applying strategies which will help them interpret, analyze, evaluate, infer, and synthesize concepts studied in this course and develop greater knowledge and understanding of mathematics and to attain the skills necessary for success in the study of higher mathematics.

4. Learning Approach

Approach : Combination of Expository - inquiry and collaborative
 Method : Discussion, question answer, sample problem, group work
 Student Task : Home work, presentation
 Media : LCD projector, film.

5. Evaluation

- a) Absence maximum : 25%
- b) Participation in discussion : 5 points
- c) Homework, Classwork : 5 points
- d) Presentation, Simulation : 10 points
- e) Daily Quiz : 20 points
- f) Final Examination : 60 points

Total : 100 points

6. Contents/ Topics of Lecturing:

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1-2	Preliminaries / Review of Algebra: <ul style="list-style-type: none"> • Polynomials and Rational Functions • Graphing Calculators and Computer Algebra Systems • Inverse Functions • Trigonometric and Inverse Trigonometric Functions • Exponential and Logarithmic Functions • Transformation of Functions 	Ch01	
3-4	Limits and Continuity: <ul style="list-style-type: none"> • A brief Preview of Calculus: Tangent Lines and the Length of a Curve • The concept of Limits • Computation of Limits • Continuity and its Consequences • Limit involving Infinity; Asymptotes • Formal definition of limit • Limit and Loss-of-Significance Errors 	Ch2	Quiz
5-6	Differentiation: <ul style="list-style-type: none"> • Tangent Lines and Velocity • The derivative • Computation of Derivatives: The Power Rule • The Product and Quotient Rules • The Chain Rule • Derivatives of Trigonometric Functions • Derivatives of Exponential and Logarithmic Functions • Implicit Differentiation and Inverse Trigonometric Functions • The Hyperbolic Functions • The Mean Value Theorem 	Ch2	Quiz

7	Application of Derivative: <ul style="list-style-type: none"> • Linear Approximations and Newton's Method • Indeterminate Forms and L'Hopital's Rule • Maximum and Minimum Values • Increasing and Decreasing Functions • Concavity and the Second Derivative Test • Overview of Curve Sketching • Optimization • Related Rates • Rates of Change in Economics and the Sciences 	Ch3	
8	MIDTERM SEMESTER BREAK		
9-10	Integration: <ul style="list-style-type: none"> • Reading and writing – great ideas • Antiderivatives • Sums and Sigma Notation • Area • The Definite Integral • The Fundamental Theorem of Calculus • Integration by Substitution • Numerical Integration • The Natural Logarithm as an Integral 	Ch4	Quiz
11	Application of the Definite Integral: <ul style="list-style-type: none"> • Reading and writing – career change • Area Between Curves • Volume: Slicing, Disks and Washers • Volumes by Cylindrical Shells • Arc Length and Surface Area • Projectile Motion • Applications of Integration to Physics and Engineering • Probability 	Ch5	
12-13	Integration Techniques: <ul style="list-style-type: none"> • Reading and writing –corporate entertaining • Review of Formulas and Techniques • Integration by Parts • Trigonometric Techniques of Integration • Integration of Rational Functions Using Partial Fractions • Integration Tables and Computer Algebra Systems • Improper Integrals 	Ch6	Quiz
14-15	Complex Number: <ul style="list-style-type: none"> • Complex Number and their geometric representation • Complex numbers and Function, Complex differentiation • Polar form of Complex Numbers, Powers and Roots • Derivative, Analytic Function 	Ch9	
16	Final Examination		

7. Book Reference:

- a) **Main Text Book:** “Calculus: Early Transcendental Functions”, **Author:** Robert T. Smith
Roland Minton, **Publisher:** McGraw Hill – Higher Education; **ISBN:** 0 07353232 0.
- b) Supplement Text Book:
- “Advanced Engineering Mathematics, 10th_Edition”, **Author:** Erwin Kreyzig,
Publisher: John Wiley, **ISBN:** 978-0-470-45836-5
 - “Mathematik fuer Ingenieur Und Naturwissenschatler, Band 2”, **Author:** Lothar
Popula, **Publisher:** Viewegs Fachbuecher der Technik, **ISBN:**978-3-8348-0304-7