Course	Course Name	: Mathematics 1
	Course Code	: KM184101
	Credit	: 3
	Semester	: 1

COURSE DESCRIPTION
Students learn concepts of matrices, determinants, and linear equation systems as mathematical foundations to solve manipulation problems, modelling, and other engineering problems related to differential equations. Focus of this course is at the techniques to solve real problems that can be formulated into one independent variable function. This course include: matrix and determinant, solution of linear equations system, real number systems (ordered set, absolute value), complex numbers with algebra operation, polar forms of complex number function and limit, derivative and its application, and indefinite integral.

COURSE GRADUATE LEARNING OUTCOME
1. Able to understand, analyze, and solve mathematical problems. 2. Able to analyze and solve the phenomenon using mathematical model. 3. Able to implement mathematical thinking framework to solve optimization problem both analytically and empirically. 4. Able to interpret the basic concepts of mathematics and compose arguments through direct or indirect mathematical inductions. 5. Able to identify simple problems, build, and solve mathematical model. 6. Competent in understanding standard methods in mathematics. 7. Competent in understanding mathematics fundamental theory that include concepts of sets, functions, differential, integral, space, and mathematical structure.

COURSE LEARNING OUTCOME
1. Able to understand matrix and determinant and its characteristics, and able to solve linear equations system, find eigen value and eigen vector. 2. Able to understand real number system, decimal form of real number, real coordinate, ordered character, definition of absolute value, inequality, cartesian coordinate, line, length of two points, circle, and parabola. 3. Able to understand complex number and algebra operation of complex number, polar form of complex number, and find the solution of roots equation in complex number. 4. Able to understand and calculate limit function and determine continuity of simple functions. 5. Able to differentiate explicit and implicit functions, apply chain rule. 6. Able to draw the graphic, using differential test to determine extreme point, up or down function, concavity, and apply it to solve the function optimization problem, Taylor/Maclaurin theorem and able to determine indefinite limit. 7. Able to solve the integral by using the fundamental theorem of calculus.

TOPICS
1. Fundamental concept of matrix algebra, determinant characteristic, elementary row operations, linear equations system, linear transformation, eigen value and eigen vector. 2. Fundamental concept of real number, definition of real number system, decimal form of real number, real coordinate, ordered set, definition of absolute value, inequality, cartesian coordinate, line, length of two points, circle, and parabola. 3. Fundamental concept of complex numbers: sum, multiplication, quotient, polar form of complex number and its algebra operation, and find the solution of roots equation in complex number. 4. Concepts of function, limits: domain, range, linear function, quadratic and trigonometry, and transcendent, graphic function, limit function and continuity. 5. Differential: definition of differential, rules of differential (for polynomial function, trigonometry, transcendental), chain rule and differential of implicit function. 6. Application of differential: up or down interval, concavity, drawing graphic that have asymptote and apex, extreme value and applications of optimization problem, L'Hospital's theorem and Taylor/Maclaurin Theorem. 7. Indefinite integral: derivative and anti-derivative, indefinite integral, characteristic of indefinite integral linear, fundamental formula of indefinite integral, and indefinite integral with substitution.
REFERENCES
Main references : 1. Tim Dosen Jurusan Matematika ITS, *Buku Ajar Kalkulus I* , Edisi ke-4 Jurusan Matematika ITS, 2012 2. Anton, H. dkk, *Calculus,* 10-th edition, John Wiley & Sons, New York, 2012 Supporting references 1. Kreyzig, E, *Advanced Engineering Mathematics*, 10-th edition, John Wiley & Sons, Singapore, 2011 2. Purcell, J, E, Rigdon, S., E., *Calculus,* 9-th edition, Prentice-Hall, New Jersey, 2006 3. James Stewart , *Calculus*, ed.7, Brooks/cole-Cengage Learning, Canada,2012
PREREQUISITE
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