

## SYLLABUS

Name of Course : Foundation of Mathematics

Course Code / credits : MAT101 / 3 (2-2)

Semester : 1 (first)

Prerequisite : None

Brief Description : In this course discuss the basic concepts of mathematics including concepts of inequality and absolute values, functions and models, limits and continuity, derivative functions, integral functions, matrices and systems of linear equations with more emphasis on the calculation aspects.

Learning Outcomes : 1) Capable to explain basic mathematical concepts (intervals, inequalities and absolute values; functions; limit and continuity of functions; derivative functions; integral functions; matrices; and systems of linear equations).

2) Capable to use basic mathematical techniques to solve simple mathematical problems.

3) Capable to apply basic mathematical concepts and techniques to solve applied problems.

Division: Pure Mathematics

Lecturer: Lecture Staff of Department of Mathematics, IPB

### The Learning Plan

WEEK-	EXPECTED END OF CAPABILITIES	BOOK OF DISCUSSION (Learning material)	LEARNING FORM	ASSESSMENT CRITERIA (INDICATORS)
(1)	(2)	(3)	(4)	(5)
1	Able to explain the meaning of intervals, determine the set of inequality solutions and absolute values.	Learning Contract Interval, Inequality, and Absolute Value 1. Interval 2. Inequality 3. Absolute Value	Lectures, exercises, discussions, assignments, and practicums	The truth and accuracy in explaining the meaning of the hose, determine set of inequality resolutions, and absolute values.
2-5	Able to explain the meaning of functions, types of functions, algebraic functions, composition of functions, and applied functions	Functions and Models 1. Function 2. Types of Functions 3. New Functions of Old Functions 4. Mathematical Model	Lectures, exercises, discussions, assignments, and practicums	Functions and Models 1. Function 2. Types of Functions 3. New Functions of Old Functions 4. Mathematical Model

<b>WEEK-</b>	<b>EXPECTED END OF CAPABILITIES</b>	<b>BOOK OF DISCUSSION (Learning material)</b>	<b>LEARNING FORM</b>	<b>ASSESSMENT CRITERIA (INDICATORS)</b>
(1)	(2)	(3)	(4)	(5)
	(mathematical models). Able to explain limit function, law limit, and continuity of functions.	Limit and Continuity 1. Limit Function 2. Main Limit Theorem and Substitution Theorem 3. Limit One Side 4. Infinite Limit and Limit on Infinite 5. Rules of Limit 6. Continuity of Function continuity at a point and continuity at an interval.		Limit and Continuity 1. Limit Function 2. Main Limit Theorem and Substitution Theorem 3. Limit One Side 4. Infinite Limit and Limit on Infinity 5. Rule of Limits 6. Continuity of Function continuity at point and interval.
6-9	Able to explain derivative concepts, derivatives as the rate of momentary change, derivative formulas, chain rules, implicit derivatives, associated rates, maximum / minimum values, and derivative applications (optimization problems).	Derivative 1. Derivatives of Functions and Interpretations 2. Derivatives formulas 3. Chain Rules 4. Transcendent Function Derivatives 5. Implicit derivatives 6. Related Rate  Applied Derivatives 1. Maximum and Minimum Value 2. Optimization Problems	Lectures, exercises, discussions, assignments, and drills	Truth and accuracy in: 1. explain the concept of derivative, 2. describes the derivative relationship with the rate of change for a moment, 3. determine the derivative of a function, 4. resolve the related rate problem, 5. determine the maximum and minimum values of a function, and 6. solve optimization problems using derivative concepts.
<b>Mid Semester Exam (UTS)</b>				

<b>WEEK-</b>	<b>EXPECTED END OF CAPABILITIES</b>	<b>BOOK OF DISCUSSION (Learning material)</b>	<b>LEARNING FORM</b>	<b>ASSESSMENT CRITERIA (INDICATORS)</b>
(1)	(2)	(3)	(4)	(5)
10-12	Able to explain indefinite and definite integral concepts, using methods of integration techniques, substitution, integration by parts and fractional decomposition, area of plain region, and differential equations.	Integral <ol style="list-style-type: none"> <li>1. Indefinite Integral</li> <li>2. Definite Integral</li> <li>3. Calculus Basic Theorems</li> <li>4. Substitution Rules</li> <li>5. Integration by Parts</li> <li>6. Fractional Decomposition</li> <li>7. Area of Region</li> <li>8. Differential Equations</li> </ol>	Lectures, exercises, discussions, assignments, and drills	Truth and accuracy to: <ol style="list-style-type: none"> <li>1. determine integral indefinite and definite integrals, using methods of integration techniques, substitution, integration by parts and fractional decomposition, and Calculus basic theorems,</li> <li>2. to determine the area of plain region</li> <li>3. to determine the solution of differential equations.</li> </ol>
13-14	Able to explain definition of matrix, operation of matrix, elementary row operations, determinant of matrix, rank of matrix, and inverse of matrix, and application of linear equation systems.	Matrix <ol style="list-style-type: none"> <li>1. Operation of Matrix</li> <li>2. Determinant of Matrix</li> <li>3. Inverse of Matrix</li> <li>4. Elementary Row Operations</li> <li>5. Rank Matrix</li> </ol> Linear Equation Systems (LES) <ol style="list-style-type: none"> <li>1. Consistency of LES</li> <li>2. Solution of LES</li> <li>3. Application of LES</li> </ol>	Lectures, exercises, discussions, assignments, and drills	Truth and accuracy to: <p>:</p> <ol style="list-style-type: none"> <li>1. explain definition of matrix,</li> <li>2. conduct operation on matrix,</li> <li>3. find determinant of matrix,</li> <li>4. find inverse of matrix,</li> <li>6. carry out Elementary Row Operations (ERO) on matrix,</li> <li>5. find rank of matrix,</li> <li>6. assess consistency of LES,</li> </ol>

WEEK-	EXPECTED END OF CAPABILITIES	BOOK OF DISCUSSION (Learning material)	LEARNING FORM	ASSESSMENT CRITERIA (INDICATORS)
(1)	(2)	(3)	(4)	(5)
				7. determine the solution of LES 8. formulate into LES form and determine the solution.
		<b>Final Exam (UAS)</b>		

### Time Structure of Homework

Week Intervals	Homework No.	Purposes	Description	Marking Criteria
1-4	1	Drill students to achieve capabilities within learning material 1 and 2	List of Problems for learning material 1 and 2	Completeness, truth, and accuracy of answers
5-7	2	Drill students to achieve capabilities within learning material 3 and 4	List of Problems for learning material 3 and 4	Completeness, truth, and accuracy of answers
8-12	3	Drill students to achieve capabilities within learning material 5 and 6	List of Problems for learning material 5 and 6	Completeness, truth, and accuracy of answers
13-14	4	Drill students to achieve capabilities within learning material 7	List of Problems for learning material 7	Completeness, truth, and accuracy of answers

### Marking Structure

Learning Outcomes	Quiz No.-		Midterm	Final
	1	2		
1. Capable to explain basic concepts includes: intervals, inequalities and absolute values; function; limit and continuity of function; derivative of function; integral; matrix; and linear equation systems.	√	√	√	√
2. Capable to use basic techniques in mathematics to solve simple mathematical problems.	√	√	√	√
3. Capable to apply concepts and basis techniques to solve simple mathematical problems.	√	√	√	√

## Weight of Values

Marking Criteria	Mark Intervals	Percentage (%)	Remarks
Structural Homework	0 – 100		
Quiz	0 – 100	10	Personal Score
UTS	0 – 100	45	Personal Score
UAS	0 – 100	45	Personal Score
Final Score (FS)		100	

### Remarks:

- The homework will be conducted twice, prior to UTS and UAS exams. The homework scores would be considered for the border-line case, when the Final Score (FS) falls in one of the following values 19, 39.5, 59.2, 74.8.
- The Quiz will be conducted twice, each prior to UTS and UAS exams. The highest score of both Quiz will be used to determine the Final Score (FS).

Final Score (FS)	Qualitative Band	Remark
$FS \geq 75$	A	Pass
$70 \leq FS < 75$	AB	Pass, repetition not allowed
$60 \leq FS < 70$	B	Pass, repetition not allowed
$50 \leq FS < 60$	BC	Pass, repetition not allowed
$40 \leq FS < 50$	C	Pass, repetition not allowed
$20 \leq FS < 40$	D	Pass, repetition allowed
$FS < 20$	E	Fail

## References

- Tim Penulis. Diktat Kuliah Landasan Matematika. Departemen Matematika FMIPA IPB, Bogor, 2017.
- Varberg D, Purcell EJ, Rigdon SE. 2011. Kalkulus. Ed ke-9. Jilid 1. Susila IN, penerjemah. Jakarta (ID): Penerbit Erlangga. Terjemahan dari: Calculus. 9th Ed.
- Stewart J. 2002. Kalkulus. Ed ke-4. Jilid 1. Susila IN, Gunawan H, penerjemah. Jakarta (ID): Penerbit Erlangga. Terjemahan dari: Calculus. 4th Ed.