

CALCULUS 3

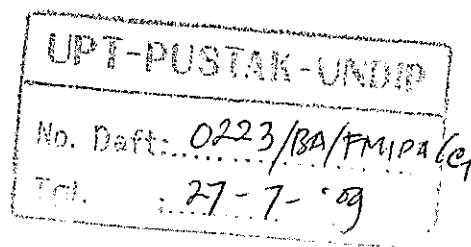
COURSE CODE: PAM 300

3 SCU

SEMESTER III



BY:



**MATHEMATICS STUDY PROGRAM
MATHEMATICS AND NATURAL SCIENCES FACULTY
DIPONEGORO UNIVERSITY
SEMARANG**

LEARNING PROGRAM OUTLINE

TITLE OF COURSE : CALCULUS 3

CODE NUMBER/CREDIT : PAM 301 / 3

SHORT DESCRIPTION :

This course represent the course SI Program Study Mathematics semester 3 which studying concepts which related to function of scalar multivariable and its application as a form mathematics model of is problems of reality in Science area and Technology, Industrial and Life of Social.

GENERAL INSTRUCTIONAL AIM :

After studying this course, student of Graduate Program Study Mathematics will be able to apply function calculus concepts of scalar multivariable in solving of the problem of reality in Science area and Technology, Industrial and Life of Social.

No	Spesific Instructional Aim	Subject	Sub Subject	Time Estimation	References
1.	Given by general description [common/ public] picture about Calculus 3, student of PS Mathematics 3 th semester will be able to explain solution substantiation and its relation with Calculus 1.	Introduction: Course description, rule of lecturing.	<ul style="list-style-type: none"> - Course description - Explaining of general and spesific instructional aim. 	150 Minutes	Lecturing Book
2	Given definition of multivariable scalar function, hence student of Graduate PS Mathematics 3 th semester will be able to explain congeniality of multivariable scalar function and its interpretation as model of real problem minimize 90 % correctness.	Multivariale scalar function.	<ul style="list-style-type: none"> - Definition of Multivariale scalar function. - Multivariale scalar function as a mathematic model. 	150 Minutes	Lecturing Book References
3	Given definition of coordinate system in three dimension, hence student of Graduate PS Mathematics 3 th semester will be able to make sketch of graphic of surface and height of curve minimize 90 % correctness.	Multivariale scalar function.	<ul style="list-style-type: none"> - coordinate system in three dimension - Sketch of Surface - height of curve height of curve 	150 Minutes	Lecturing Book

4	Given definition of limit and continuity concept, hence student of Graduate PS Mathematics 3 th semester will be able to prove existence limit unction and to prove continuity of multivariate scalar function minimize 90 % correctness.	Multivariate scalar function.	- Limit and continity of multivarible scalar function.	150 Minutes	Lecturing Book References
5	Given definition and interpretation of partial derivative, hence student of Graduate PS Mathematics 3 th semester will be able to calculate anf to interpretate partial derivative geometrically minimize 90 % correctness.	Derivative Concept of Multivariate scalar function	- Definition and interpretation of Partial derivative. - Rules in Partial derivative - Total derivative	150 Minutes	Lecturing Book References
6	Given definition of direction derivative, Gradient and Tangent Plane, hence student of Graduate PS Mathematics 3 th semester will be able to calculate max/min rate of change and determining equation of tangent plane minimize 90 % correctness.	Derivative Concept of Multivariate scalar function	- Direction Derivative - Gradient - Tangent Plane	150 Minutes	Lecturing Book References
7	Given concepts and methods to calculate max/min Multivariate scalar function, hence student of Graduate PS Mathematics 3 th semester will be able to find max/min Multivariate scalar function minimize 90 % correctness.	Max/min concept of Multivariate scalar function	- Max/min concept of Multivariate scalar function without constraint - Max/min concept of Multivariate scalar function	150 Minutes	Lecturing Book References
8	After studying this subject from from 1 th -7 th lecturing, hence student of Graduate PS Mathematics 3 th semester will be able to solve mid exam test minimize 80% correctness	MID Exam	Subject from 1 th -7 th lecturing	150 Minutes	Lecturing Book Buku refeensi
9	After given concept of double integral, hence student of Graduate PS Mathematics 3 th semester will be able to explain and to calculate double integral minimize 80% correctness.	Concept of double integral.	- Definition of double integral - Calculating Rule in doule integral.	150 Minutes	Lecturing Book References
10	After given concept of double integral, hence student of Graduate PS Mathematics 3 th semester will be able to explain and to calculate Area of flat plane, Volume under surface, Area of surface, Centroid of non homogen plate minimize 80% correctness.	Application of doule integral	- Area of flat plane. - Volume under surface. - Area of surface - Centroid of non homogen plate	150 Minutes	Lecturing Book References
11	After given concept of double	Concept of triple	- Definition of	150	Lecturing

	integral, hence student of Graduate PS Mathematics 3 th semester will be able to explain and to calculate triple integral minimize 80% correctness.	integral	triple integral - Rule to calculation in triple integral	Minutes	Book References
12	After given concept way of to transformation Cartesian coordinate into cylinder and sphere coordinate, hence student of Graduate PS Mathematics 3 th semester will be able to calculate triple integral in polar coordinate system minimize 80% correctness.	Concept of triple integral	- triple integral in cylinder coordinate - triple integral in sphere coordinate	150 Minutes	Lecturing Book References
13	After given methods to calculation triple integral, hence student of Graduate PS Mathematics 3 th semester will be able to calculate centroid of volum and volume of solid goods minimize 80% correctness	Application of triple integral	- volum of solid goods - centroid of volum	150 Minutes	Lecturing Book References
14	After given training about application of software Maple to computation Calculus 3, hence student of Graduate PS Mathematics 3 th semester will be able to operating Maple to explore multivariale scalar function minimize 80% correctness .	Exploration Calculus 3 with software Maple.	- Introduction software Maple. - Exploration Calculus 3 with software Maple	2 x 150 Minutes	Lecturing Book
15	After given subject from 9 th -13 th lecturing, hence student of Graduate PS Mathematics 3 th semester will be able to finishing test of final exam minimize 80% correctness .	Final Exam	- Subject from 9 th -13 th lecturing.	150 Minutes	Lecturing Book References

References:

1. Budnick, F.S, *Applied Mathematics for Busines, Economics and Social Sciences*, Third edition, McGraw-Hill, Singapore, 1988
2. Holder, De Franca, Pasachoff, *Multivariable Calculus*, 2th edition, ITP, California, 1995.
3. Kartono, Solikhin Zaki, *Kalkulus Peubah Banyak*, Lecturing Book, Jurusan Matematika FMIPA UNDIP, Semarang, 2004.
4. Kreyszig, E, and E.J. Norminton, *Advanced Engineering Mathematics – Maple Computer Manual*, 7th edition, John Wiley & Sons, Inc, Canada, 1994

5. Stewart, J, *Calculus*, 4th edition, ITP, Singapore, 1999.

LEARNING UNIT PROGRAM (SAP)

Name of Course : Calculus 3
 Code of Course / Credit : PAM301 / 3 SKS
 Time of Lecturing : 150 Minutes
 Lecturing : 1st

A. Instructional Aim

1. General

After studying this course, student of Graduate Program Study Mathematics will be able to apply function calculus concepts of scalar multivariable in solving of the problem of reality in Science area and Technology, Industrial and Life of Social.

2. Specific

Given by general description [common/ public] picture about Calculus 3, student of Graduate PS Mathematics 3th semester will be able to explain solution substantiation and its relation with Calculus 1.

B. SUBJECT: Introduction, Course description, Instructional Aim.

C. Sub SUBJECT:

- Course description
- General & Specific Instructional Aim, Contract of Lecturing.

D. Lecturing Activity:

Step	Lecturer Activity	Student Activity	Media & Equipment
Introduction	Asking to student about experience learn Calculus 1.	Explaining	
Presentation	1. Explaining short description of Calculus 3 . 2. Explaining relation between keterkaitan Calculus 3 and Calculus 1. 3. Explaining General & Specific Instructional Aim	Paying Attention and writing Paying Attention and writing Paying Attention and writing	Blackboard. Atau OHP/LCD
Closing	1. Making handsout of solution. 2. Giving introduction to next lecturing.	Paying Attention and writing Doin and discussing	Blackboard. assignment book

E. Evaluation:

F. References :

1. Kartono, Solikhin Zaki, *Kalkulus Peubah Banyak*, Lecturing Book, Jurusan Matematika FMIPA UNDIP, Semarang, 2004.
2. Stewart, J, *Calculus*, 4th edition, ITP, Singapore, 1999.

LEARNING UNIT PROGRAM (SAP)

Name of Course : Calculus 3

Code of Course / SKS : PAM301 / 3 SKS

Time of Lecturing : 150 Minutes

Lecturing : 2nd

A. Instructional Aim

1. General

After studying this course, student of Graduate Program Study Mathematics will be able to apply function calculus concepts of scalar multivariable in solving of the problem of reality in Science area and Technology, Industrial and Life of Social.

2. Specific

Given definition of multivariable scalar function, hence student of Graduate PS Mathematics 3th semester will be able to explain congeniality of multivariable scalar function and its interpretation as model of real problem of minimize 90 % correctness.

B. SUBJECT: multivariable scalar function

C. Sub SUBJECT:

- Definition of Multivariable scalar function.
- Multivariable scalar function as a mathematic model.

D. Lecturing Activity:

Step	Lecturer Activity	Student Activity	Media & Equipment
Introduction	Reviewing important of Calculus 3 in solution real problem.	Paying attention and writing	Blackboard, OHP/LCD
Presentation	<ol style="list-style-type: none"> 1. Explaining definition and domain Multivariable scalar function. 2. Explaining interpretation of Multivariable scalar function as one of problems of mathematics model. 3. Showing some of examples Multivariable scalar function as model of real problem mathematics model. 	Paying attention and writing. Paying attention and writing. Giving idea.	Blackboard. Atau OHP/LCD
Closing	<ol style="list-style-type: none"> 1. Making handout of solution. 2. Giving group assignment, finding 5 examples multivariable scalar function as mathematics model to difference real problem. 3. Giving introduction to next lecturing. 	Paying attention and writing. Doing exercises and discussing. Paying attention	Blackboard. assignment book

E. Evaluation:

Used instrument: list check to assess result of collected team-work at next week.

F. References :

1. Holder, De Franca, Pasachoff, *Multivariable Calculus*, 2th edition, ITP, California, 1995.

2. Kartono, Solikhin Zaki, *Kalkulus Peubah Banyak*, Lecturing Book, Jurusan Matematika FMIPA UNDIP, Semarang, 2004.
3. Stewart, J, *Calculus*, 4th edition, ITP, Singapore, 1999.

CONTRACT OF LECTURING

NAME OF COURSE : **CALCULUS 3**
KODE OF COURSE : **PAM 301**
LECTURE : **Drs. KARTONO, MSi**
SEMESTER : **3**
DAY/TIME :
PLACE : **Room**

1. Utility of Course

Phenomenons in life of reality often in functional relation between dependent and independent variable. An phenomenon can represent relation depending among one independent variable with more dependent variable (multi variabel). Calculus 3 useful to be able to explain, depicting graph, analysing the nature of and behavior of the phenomenon which expressed as multivariable function. Therefore, this Course is obliged to be gone through by student of Graduate PS Mathematics as continuation of Calculus of 1 which only studying about function one variable and as basis for go through next course which related to solution of multivariable function.

2. Lecturing Description

Contents of Calculus 3 is definition of multivariable function and its graphics, concept and definition of partial derivative and differentiability that introduce with concept of limit and continuity and its application to solving optimization problem, concept and understanding also method of calculation double and triple integral with its application. At the end of lecturing will be teaching about introduction of application software to supporting computation and visualization.

3. Instructional Aim

GENERAL INSTRUCTIONAL AIM

Setelah menyelesaikan Name of Course ini, mahasiswa S1 Program Studi Matematika akan dapat menerapkan konsep-konsep kalkulus fungsi scalar variabel

banyak dalam penyelesaian masalah nyata di bidang Ilmu Pengetahuan dan Teknologi, Industri dan Kehidupan Sosial.

SPECIFIC INSTRUCTIONAL AIM

After following this Course, Student of Graduate PS Mathematics semester 3th will be able to.:

1. explain solution substantiation and its relation with Calculus 1.
2. explain congeniality of multivariable scalar function and its interpretation as model of real problem
3. make sketch of graphic of surface and height of curve.
4. prove existence limit uncton and to prove continuity of multivariale scalar function
5. calculate and to interpretate partial derivative geometrically.
6. calculate max/min rate of change and determining equation of tangent plane
7. find max/min multivariale scalar function
8. explain and to calculate double integral
9. explain and to calculate Area of flat plane, Volume under surface , Area of surface , Centroid of non homogen plate
10. explain and to calculate triple integral.
11. calculate triple integral in polar and sphere coordinate system.
12. calculate centroid of volum and volume of solid goods.
13. operating Maple to explore multivariale scalar function

4. Subject Organization.

Ordered of subject solution

1. Course description, Explaining of general and spesific instructional aim
2. Definition of multivariable scalar function as model mathematic, coordinate system in three dimension, Sketch of Surface, height of curve height of curve
3. Limit and continity of multivarible scalar function.
4. Definition and interpretation of Partial derivative, Rules in Partial derivative, Total derivative.

5. Direction Derivative, Gradient, Tangent Plane.
6. Max/min concept of Multivariate scalar function without constraint, Max/min concept of Multivariate scalar function..
7. Definition of double integral, Calculating Rule in double integral..
8. Area of flat plane, Volume under surface, Area of surface, Centroid of non homogen plate.
9. Definition of triple integral, Rule to calculation in triple integral
10. triple integral in cylinder coordinate, triple integral in sphere coordinate
11. volum of solid goods, centroid of volum.
12. Introduction software Maple, Exploration Calculus 3 with software Maple.

5. Strategy of Lecturing.

In the early lecturing will be given lecturing description with examples in daily living and instructional aim also short decomposition to build student frame of thinking. To entangle student actively in lecturing course and reaching conclusion of group, used discussion method, where lecturer as fasilitator and student and given exercise to find examples in environment that interconnected with this course. Then, student will be given formatif test. Lecturer identify difficulty faced in workmanship of test and give re-clarification subject not yet been understood .

One this topic of lecturing will be passed to all student, some student presenting and studied with in lecturing.

6. References

Buku bacaan sebagai References antara lain:

1. Budnick, F.S, *Applied Mathematics for Busines, Economics and Social Sciences*, Third edition, McGraw-Hill, Singapore, 1988
2. Holder, De Franca, Pasachoff, *Multivariable Calculus*, 2th edition, ITP, California, 1995.
3. Kartono, Solikhin Zaki, *Kalkulus Peubah Banyak*, Lecturing Book, Jurusan Matematika FMIPA UNDIP, Semarang, 2004.
4. Kreyszig, E, and E.J. Norminton, *Advanced Engineering Mathematics – Maple Computer Manual*, 7th edition, John Wiley & Sons, Inc, Canada, 1994

5. Stewart, J, *Calculus*, 4th edition, ITP, Singapore, 1999.

From other side books of references, will be alloted articles or assignation teasing of material via internet.

7. Assignments

1. Before lecturing started, student have read topic to be studied and prepare some example [of] in everyday life as according to this topic.
2. Every finishing lecturing, student given practice and collected in the early next lecturing. After corrected lecturer, its result returned to student.
3. Individual assignment that is searching problem of applying of concept which have been studied solving of the real problem, written in report format and every student have to differ. Intention of this assignmment is student can train collective and personal responsibility. Because have to differ hence expected to happened discussion among student to each to presenting its assignmment in order not to be imitated by its friend. The same assignmment will be expressed be dropped
4. By the end of lecturing 4th and 12nd performed a by quiz. Target of this quiz for knowing of is readiness of student to middle test and also final test.
5. Middle test will be performed at lecturing 8th with material from lecturing 1st-7th.

8. Criterion of Assessment

Assessment to be done by lecturer use normal reference combination and directive. Boundary pass with value of C [is] value 55, later then by normal reference to distribute value above 55 with value of A, AB, B, BC and under 55 with value of CD, D, E

In determing final value, will be used [by] the following way.

Individual assignment	: 10 %
Quiz	: 10 %
Middle test	: 40 %
Final test	: 40 %
Presention	: 0 %

9. Schedule of Lecturing

Lecturing	Subject	Dosen
1	- Course description - Explaining of general and spesific instructional aim.	Kartono
2	- Definition of Multivariale scalar function. - Multivariale scalar function as a mathematic model.	Kartono
3	- coordinate system in three dimension - Sketch of Surface - height of curve height of curve	dosen ke 2
4	- Limit and continity of multivarible scalar function. - Quiz	Kartono
5	- Definition and interpretation of Partial derivative. - Rules in Partial derivative - Total derivative	Kartono
6	- Direction Derivative - Gradient - Tangent Plane	Dosen ke 2
7	- Max/min concept of Multivariale scalar function without constraint - Max/min concept of Multivariale scalar function	Dosen ke 2
8	Final Exam with material lexturing 1 st -7 th	Tim
9	- Definition of double integral - Calculating Rule in doule integral.	Kartono
10	- Area of flat plane. - Volume under surface. - Area of surface - Centroid of non homogen plate	Dosen ke 2
11	- Definition of triple integral - Rule to calculation in triple integral	Kartono
12	- triple integral in cylinder coordinate - triple integral in sphere coordinate - quiz	Dosen ke 2
13	- volum of solid goods - centroid of volum	Dosen ke 2
14, 15	- Introduction software Maple. - Exploration Calculus 3 with software Maple	Tim
16	Final Exam with material lecturing 9 th -13 th	Tim