UNESA	**Universitas Negeri Surabaya** **Faculty of Mathematics and Natural Sciences** **Data Science Undergraduate Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Basic Calculus	4920203002		**T=3**	**P=0**	**ECTS=4.77**	1	April 26, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**

Program Learning Outcomes (PLO)

PLO study program which is charged to the course

PLO-17	Mastering mathematical and statistical theories related to data science

Program Objectives (PO)

PO - 1	Able to demonstrate knowledge and insight into differentials and integrals as they relate to data science
PO - 2	Able to design solutions to problems regarding differentials and integrals using technological assistance
PO - 3	Able to solve problems regarding differential and integral independently

PLO-PO Matrix

P.O	PLO-17
PO-1	
PO-2	
PO-3	

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PO-1																
PO-2																
PO-3																

Short Course Description

Examining the real number system, real functions, limits and continuity, derivatives of real functions and their uses, transcendent functions and their derivatives, limits of indeterminate forms, Taylor and Mac Laurin series, applying these concepts to maximum problems- minimum as well as determining the sequence and sequence of a function through active learning with a combination of discussion, question and answer methods and giving assignments in the form of ICT-assisted practicums

References

Main :

1. Stewart, J. 2016. Calculus: Early Transcendental 8th Edition . Belmont: Brooks/Cole
2. Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley
3. Purcell, E. J. et al. 2010. Kalkulus Jilid 1 Edisi Kedelapan (Terjemahan) . Jakarta: Erlangga
4. Abadi, & Wintarti, A. 2014. Kalkulus, Buku 1 (in press). Surabaya
5. Moesono, D. 1994. Kalkulus I (Edisi Revisi) . Surabaya: University Press Surabaya.
6. Tim Dosen Kalkulus Diferensial. 2015. Modul Praktikum Kalkulus Diferensial (in press) . Surabaya

Supporters:

Supporting lecturer

Dr. Atik Wintarti, M.Kom.
Hasanuddin Al-Habib, M.Si.
Riskyana Dewi Intan Puspitasari, M.Kom.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Understand the real number system and inequalities, .	1. Explain the properties of real numbers. 2. Solve inequalities and get solutions on the set of real numbers.	**Criteria:** Question and answer **Form of Assessment** : Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 3 X 50	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 3 x 50	**Material:** Real Number System **References:** *Stewart, J. 2016. Calculus: Early Transcendental 8th Edition . Belmont: Brooks/Cole*	2%
2	Understanding Real Functions, Domains and Ranges of Functions, Function Graphs, Composition and Inverse Functions.	1. Determining the Function Domain and Range 2. Types and Operation of Functions 3. Drawing Function Graphs 4. Find the condition that two functions are mutually inverse 5. Transforming functions through function composition 6. Use Maple to determine domains, ranges of functions, graphs, composition and inverse functions.	**Criteria:** Performance and Tests **Form of Assessment** : Participatory Activities, Practice/Performance	Collaborative approach (discussion and expository) 3 X 50	Collaborative approach (discussion and expository) Asynchronous or Synchronus Discussion forum Practical assignments 3 x 50	**Material:** • Real Functions • Function Domains and Ranges • Function Types and Operations • Function Graphs • Function Composition • Function Inverses • Function Transformations **References:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	2%
3	1. Demonstrate knowledge and insight about Function Limits and Continuity of a function at a point 2. Designing problem solving regarding Function Limits and Continuity of a function at a point in problem solving activities using technology	1. Determining the limit of the function at a point 2. Determining whether a function is continuous or discontinuous at a point c 3. Defines a new function for a discontinuous function that can be eliminated 4. • Using technology to solve limit and continuity problems of a function	**Criteria:** Oral test **Form of Assessment** : Participatory Activities	Collaborative approach (discussion and expository) Discussion 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum	**Material:** Function limits around point c **Reference:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	2%
4	1. Demonstrate knowledge and insight into Derivatives of Functions 2. Designing problem solving regarding Function Derivatives in problem solving activities using technology	1. Determining the limit of the function at a point. 2. Determining whether a function is continuous or discontinuous at a point. 3. Defines a new function for a discontinuous function that can be eliminated. 4. Using applications to determine the limits and continuity of a function	**Criteria:** Quantitative and Test **Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	Collaborative approach (discussion and expository) 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum 3 x 50	**Material:** Function Limits **Library:** *Abadi, & Wintarti, A. 2014. Calculus, Book 1 (in press). Surabaya*	5%

5	Understanding Function Limits and Continuity of a function at a point	1. Determining the limit of the function at a point. 2. Determining whether a function is continuous or discontinuous at a point. 3. Defines a new function for a discontinuous function that can be eliminated. 4. Using Maple to determine the limits and continuity of a function	**Criteria:** Quantitative and Test **Form of Assessment** : Participatory Activities, Practice/Performance	Collaborative approach (discussion and expository) Problem solving assignments in 3 X 50 Student Worksheets	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum	**Material:** Derivatives and their applications **References:** *Purcell, EJ et al. 2010. Calculus Volume 1 Eighth Edition (Translation). Jakarta: Erlangga*	2%
6	1. Demonstrate knowledge and insight about critical points, extreme points and inflection points and be able to solve maximum/minimum problems 2. Designing problem solving regarding critical points, extreme points and turning points and being able to solve maximum/minimum problems in problem solving activities using technology	1. Determining the critical point of the function 2. Determine extreme points and turning points 3. Can determine rising curves, falling curves and concavity of functions through first and second derivative tests 4. • Model and solve max/min problems and function derivative applications using technology	**Criteria:** Quantitative and Test **Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum 3 X 50	**Material:** • Interval end points, stationary points, and singular points as critical points. • Extreme points and inflection points • Rising curves, falling curves, and concavities • Modeling and solving maximum/minimum problems. **Bibliography:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	5%
7	1. Demonstrate knowledge and insight into Limits of Indefinite Forms and L'Hôpital's Theorem 2. Designing problem solving regarding Limits of Indeterminate Forms and L'Hôpital's Theorem in problem solving activities using technology	1. Solving derivative problems of various functions including implicit functions. 2. Can use the chain rule to solve derivatives of functions.	**Criteria:** Quantitative and Test **Form of Assessment** : Participatory Activities, Practice/Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum 3 x 50	**Material:** • Taylor series of a function, • Mac Laurin series of a function, **Reference:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	2%
8	Midterm exam	Midterm exam	**Criteria:** writing test **Form of Assessment** : Participatory Activities, Tests	Midterm Exam 3 X 50	Midterm Exam 3 x 50	**Material:** - **Bibliography:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	20%

9	Understand critical points, extreme points and turning points and be able to solve maximum/minimum problems	1. Determining the critical point of the function 2. Determine extreme points and turning points 3. Can determine rising curves, falling curves and concavity of functions through first and second derivative tests 4. Modeling and solving max/min problems 5. Using Maple to determine the limits and continuity of a function	**Criteria:** Quantitative and Test **Form of Assessment** : Participatory Activities	Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum 1 x 50	**Material:** Indefinite Intergral **Reference:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	2%
10	Understand critical points, extreme points and turning points and be able to solve maximum/minimum problems	1. Determining the critical point of the function 2. Determine extreme points and turning points 3. Can determine rising curves, falling curves and concavity of functions through first and second derivative tests 4. Modeling and solving max/min problems 5. Using applications to determine the limits and continuity of a function	**Criteria:** Quantitative and Test **Form of Assessment** : Participatory Activities, Practice/Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) 4 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum	**Material:** Integral necessarily **References:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	5%
11	Understand critical points, extreme points and turning points and be able to solve maximum/minimum problems	1. Determining the critical point of the function 2. Determine extreme points and turning points 3. Can determine rising curves, falling curves and concavity of functions through first and second derivative tests 4. Modeling and solving max/min problems 5. Using applications to determine the limits and continuity of a function	**Criteria:** Question and answer **Form of Assessment** : Participatory Activities, Practice/Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) 4 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum	**Material:** Integral necessarily **References:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley*	2%

12	Limits of indefinite forms and L'hôpital's Theorem	1.• Determine the area above the coordinate axes 2.• Determine the area under the coordinate axes 3.• Determine the area between two curves. 4.• Solve problems that involve critical thinking skills related to the area under the curve	**Criteria:** Solve problems related to definite integrals **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) 4 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum	**Material:** Problems related to definite integrals **References:** *Differential Calculus Lecturer Team. 2015. Differential Calculus Practical Module (in press). Surabaya*	6%
13	Limits of indefinite forms and L'hôpital's Theorem	1.• Determine the area above the coordinate axes 2.• Determine the area under the coordinate axes 3.• Determine the area between two curves. 4.• Solve problems that involve critical thinking skills related to the area under the curve	**Criteria:** Solve problems related to definite integrals **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum 3 x 50	**Material:** Problems related to definite integrals **References:** *Differential Calculus Lecturer Team. 2015. Differential Calculus Practical Module (in press). Surabaya*	5%
14	Designing problem solving regarding integrals to determine the center of mass in problem solving activities using technology	1.• Determine the area above the coordinate axes 2.• Determine the area under the coordinate axes 3.• Determine the area between two curves. 4.• Solve problems that involve critical thinking skills related to the area under the curve	**Criteria:** Solve problems related to definite integrals **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) Problem Based Learning 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum 3 x 50	**Material:** Problems related to definite integrals **References:** *Differential Calculus Lecturer Team. 2015. Differential Calculus Practical Module (in press). Surabaya*	5%
15	Designing problem solving regarding integrals to determine the center of mass in problem solving activities using technology	1.• Determine the area above the coordinate axes 2.• Determine the area under the coordinate axes 3.• Determine the area between two curves. 4.• Solve problems that involve critical thinking skills related to the area under the curve	**Criteria:** Solve problems related to definite integrals **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Collaborative Learning Approach (Lecture, discussion and question and answer) Problem Based Learning 3 X 50	Collaborative approach (discussion and expository) Asynchronus or Synchronus Discussion forum 3 x 50	**Material:** Problems related to definite integrals **References:** *Differential Calculus Lecturer Team. 2015. Differential Calculus Practical Module (in press). Surabaya*	5%

16	Present the results of work on solving problems related to integrals	Presentation and question and answer	**Criteria:** Presentation and question and answer **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment	Presentation 3 X 50	Presentation 3 x 50	**Material:** Application of integrals **References:** *Thomas Jr., G., et. al. 2014. Thomas 19 Calculus Early Transcendental 13th Edition . Boston: Addison-Wesley* **Material:** Application of integrals **References:** *Abadi, & Wintarti, A. 2014. Calculus, Book 1 (in press). Surabaya*	30%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	42.85%
2.	Project Results Assessment / Product Assessment	17.01%
3.	Portfolio Assessment	10%
4.	Practical Assessment	3.34%
5.	Practice / Performance	16.85%
6.	Test	10%
		100%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.