	Universitas Negeri Surabaya **Faculty of Mathematics and Natural Sciences** **Bachelor of Mathematics Education Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
REALISTIC MATHEMATICS EDUCATION	8420202004	Realistic Mathematics & Socio-cultural Mathematics Education	**T=2**	**P=0**	**ECTS=3.18**	3	February 28, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	PLO-5	Demonstrate a scientific, critical and innovative attitude in teaching and learning mathematics and professional tasks
	PLO-8	Designing, implementing and evaluating mathematics learning using IT
	PLO-10	Make decisions based on data/information in completing assignments that are the student's responsibility and evaluate the work that has been done
	Program Objectives (PO)	
	PO - 1	Explains the principles and characteristics of Realistic Mathematics Education (RME) as a learning approach as well as the types of context, and its application in the learning process.
	PO - 2	Explaining hypothetical learning trajectories with a realistic mathematics learning approach.
	PO - 3	Designing hypothetical learning trajectories and evaluating mathematics learning with a realistic mathematics approach in primary and secondary schools through ICT-assisted presentations
	PO - 4	Communicate ideas and research results on realistic mathematics learning from scientific sources effectively, verbally and in writing.
	PO - 5	Determine the type of context related to life phenomena related to numbers, algebra, measurement and geometry, probability and statistics, calculus and combinatorics and their application in elementary and middle schools.
	PO - 6	Criticize realistic mathematics learning which is developed based on its principles and characteristics.
	PLO-PO Matrix	

P.O	PLO-5	PLO-8	PLO-10
PO-1			
PO-2			
PO-3			
PO-4			
PO-5			
PO-6			

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																
PO-4																
PO-5																
PO-6																

Short Course Description	This course examines the principles and characteristics of Realistic Mathematics Education, types of contexts related to life phenomena related to numbers, algebra, measurement and geometry, probability and statistics, calculus, and combinatorics as well as their application in mathematics learning in the form of a path-based learning realistic mathematics at primary and secondary school levels through active task-based learning and presentations assisted by information technology.	
References	**Main :**	

1. [1] Hadi, S. (2017). Pendidikan Matematika Realistik. PT RajaGrafindo Persada.

Supporters:

1. [2] Holt, Rinehart, Winston. 2006. Mathematics in Context. Chicago: Encyclopædia Britannica, Inc.
2. [3] Johnson, Elanie B. 2002. Contextual Teaching and Learning. California: Corwin Press, Inc.
3. [4] Van den Heuvel, M. & Wijers, M. 2005. Mathematics Standards and Curricula in the Netherlands. ZDM vol 37 (4)
4. [5] Hadi, S. 2016. Realistic Mathematics Education: Theory, Development and Implementation
5. [6] Van den Heuvel, M. 1996. Assessment and Realistic Mathematics Education. Technipress Culemborg, Utrecht
6. [7] Teaching books developed by the PMRI (Indonesian Realistic Mathematics Education) team
7. [8] Almuna Salgado, F. (2016). Developing a Theoretical Framework for Classifying Levels of Context Use for Mathematical Problems. Mathematics Education Research Group of Australasia.
8. [9]Clements, D. H., & Sarama, J. (2004). Learning trajectories in mathematics education. Mathematical thinking and learning, 6(2), 81-89.
9. [10] Impome Thesis/Dissertation. MATHEMATICAL INVESTIGATIONS FOR PRIMARY SCHOOLS. http://www.fisme.science.uu.nl/en/impome/

Supporting lecturer	Prof. Rooselyna Ekawati, Ph.D. Shofan Fiangga, S.Pd., M.Sc. Ahmad Wachidul Kohar, S.Pd., M.Pd. Evangelista Lus Windyana Palupi, S.Pd., M.Sc. Dr. Yurizka Melia Sari, M.Pd. Novita Vindri Harini, M.Pd. Mukhtamilatus Sa'diyah, M.Pd.

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 meaning, philosophy and history of the development of realistic mathematics	Explains the definition, philosophy and history of the development of realistic mathematics	**Criteria:** The accuracy of the definition and explanation of the development of realistic mathematics education **Form of Assessment** : Participatory Activities, Practice/Performance	Collaborative approach (discussion and expository) 100 minutes		**Material:** Principles and characteristics of Realistic Mathematics and the history of its development. **References:** *[1] Hadi, S. (2017). Realistic Mathematics Education. PT RajaGrafindo Persada.*	5%
2	Understand the characteristics and principles of realistic mathematics learning and their relationship to the curriculum.	1. Explain the characteristics of Realistic Mathematics Learning 2. Explains the principles of Realistic Mathematics Learning.	**Criteria:** Accuracy in explaining the principles and characteristics of PMR, criticality in distinguishing between learning with PMR and those without. **Form of Assessment** : Participatory Activities	Collaborative approach (discussion and expository) 100 minutes		**Material:** Principles and characteristics of Realistic Mathematics and the history of its development. **References:** *[1] Hadi, S. (2017). Realistic Mathematics Education. PT RajaGrafindo Persada.*	5%
3	Understanding context types in problems for realistic mathematics learning	1. Identifying the meaning of context in realistic mathematics learning 2. Identifying types of context in realistic mathematics learning 3. Identifying levels of context use in realistic mathematics problems	**Criteria:** Accuracy in explaining the meaning of context and its use in PMR, criticality in distinguishing levels of context use in realistic mathematics problems **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Collaborative approach (discussion and expository) 100 minutes		**Material:** Understanding context, types and levels of context use in mathematics learning **References:** *[2] Holt, Rinehart, Winston. 2006. Mathematics in Context. Chicago: Encyclopædia Britannica, Inc.* **Material:** Preparation of context-based mathematical problems. **References:** *[8] Almuna Salgado, F. (2016). Developing a Theoretical Framework for Classifying Levels of Context Use for Mathematical Problems. Mathematics Education Research Group of Australasia.*	5%
4	Identifying context in several mathematics topics, namely numbers, algebra, and measurement	1. Identifying context in several mathematics topics, namely numbers, algebra, and measurement 2. Designing context-based problems for number, algebra, and measurement material	**Criteria:** Creativity of the context used, appropriateness of the level of context embedded in the problem being designed **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Collaborative approach (discussion and expository) 100 minutes		**Material:** Understanding context, types and levels of context use in mathematics learning **References:** *[2] Holt, Rinehart, Winston. 2006. Mathematics in Context. Chicago: Encyclopædia Britannica, Inc.* **Material:** Preparation of context-based mathematical problems. **References:** *[8] Almuna Salgado, F. (2016). Developing a Theoretical Framework for Classifying Levels of Context Use for Mathematical Problems. Mathematics Education Research Group of Australasia.*	5%

5	Identify context in several mathematical topics: geometry, probability, and statistics	1. Identifying context in several mathematical topics, namely geometry, probability and statistics 2. Design context-based problems for geometry, probability and statistics material	**Criteria:** Creativity of the context used, appropriateness of the level of context embedded in the problem being designed **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Collaborative approach (discussion and expository) 100 minutes		**Material:** Understanding context, types and levels of context use in mathematics learning **References:** *[2] Holt, Rinehart, Winston. 2006. Mathematics in Context. Chicago: Encyclopædia Britannica, Inc.* **Material:** Preparation of context-based mathematical problems. **References:** *[8] Almuna Salgado, F. (2016). Developing a Theoretical Framework for Classifying Levels of Context Use for Mathematical Problems. Mathematics Education Research Group of Australasia.*	5%
6	Understanding hypothetical learning trajectories for realistic mathematics learning	Identifying components of hypothetical learning trajectories on school mathematics topics	**Criteria:** Accuracy of identifying components of hypothetical learning trajectories on school mathematics topics **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Identifying characteristics of hypothetical learning trajectories for 100 minute realistic mathematics learning		**Material:** Understanding context, types and levels of context use in mathematics learning **References:** *[2] Holt, Rinehart, Winston. 2006. Mathematics in Context. Chicago: Encyclopædia Britannica, Inc.* **Material:** Preparation of context-based mathematical problems. **References:** *[8] Almuna Salgado, F. (2016). Developing a Theoretical Framework for Classifying Levels of Context Use for Mathematical Problems. Mathematics Education Research Group of Australasia.*	5%
7	Understanding hypothetical learning trajectories for realistic mathematics learning	Identifying characteristics of hypothetical learning trajectories for realistic mathematics learning	**Criteria:** Accuracy of identifying components of hypothetical learning trajectories **Form of Assessment** : Participatory Activities	Identifying characteristics of hypothetical learning trajectories for realistic mathematics learning Examining examples of hypothetical learning trajectories for realistic mathematics learning from 100 scientific journal articles		**Material:** Components of hypothetical learning trajectories, philosophical basis for developing hypothetical learning trajectories, hypothetical learning trajectories in design research **References:** *[9] Clements, DH, & Sarama, J. (2004). Learning trajectories in mathematics education. Mathematical thinking and learning, 6(2), 81-89.*	5%
8	Midterm exam	Identifying characteristics of hypothetical learning trajectories for realistic mathematics learning	**Form of Assessment** : Project Results Assessment / Product Assessment, Test	Written Test 100			0%
9	Understanding assessment in realistic mathematics learning	Explain the characteristics of assessment in realistic mathematics learning	**Criteria:** Collaborative approach (discussion and expository) **Form of Assessment** : Participatory Activities	Identifying assessment characteristics in realistic mathematics learning through 100 task-based discussion activities		**Material:** Realistic mathematics learning assessment **References:** *[6] Van den Heuvel, M. 1996. Assessment and Realistic Mathematics Education. Technipress Culemborg, Utrecht*	10%
10	Designing realistic mathematics learning based on hypothetical learning trajectories	Designing a realistic mathematics learning iceberg	**Form of Assessment** : Project Results Assessment / Product Assessment	Identifying the characteristics of existing hypothetical learning trajectories from structured learning ice bergs Examining the principles and characteristics of existing hypothetical learning trajectories from compiled learning ice bergs 100		**Material:** Design of learning trajectories in school mathematics learning **References:** *[10] Impome Thesis/Dissertation. MATHEMATICAL INVESTIGATIONS FOR PRIMARY SCHOOLS. http://www.fisme.science.uu.nl/...*	10%

11	Designing realistic mathematics learning based on hypothetical learning trajectories	Designing a hypothetical learning trajectory based on a realistic mathematics learning iceberg compiled.	**Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Identifying the characteristics of existing hypothetical learning trajectories from structured learning icebergs Examining the principles and characteristics of existing hypothetical learning trajectories from structured learning icebergs Developing icebergs into hypothetical learning trajectories for realistic mathematics learning 100			10%
12	Designing activities (learning tasks) for realistic mathematics learning based on hypothetical learning trajectories	1. Designing LKPD in accordance with the principles and characteristics of Realistic Mathematics Education 2. Design LKPD according to the hypothetical learning trajectory that has been prepared	**Criteria:** Creativity of LKPD and accuracy of use of PMR principles and characteristics in prepared LKPD	Designing activities (learning tasks) for realistic mathematics learning based on hypothetical learning trajectories in the form of Student Worksheets by deriving from revised icebergs			0%
13	Designing activities (learning tasks) for realistic mathematics learning based on hypothetical learning trajectories	1. Designing LKPD in accordance with the principles and characteristics of Realistic Mathematics Education 2. Design LKPD according to the hypothetical learning trajectory that has been prepared	**Criteria:** Creativity of LKPD and accuracy of use of PMR principles and characteristics in prepared LKPD **Form of Assessment** : Project Results Assessment / Product Assessment	Designing activities (learning tasks) for realistic mathematics learning based on hypothetical learning trajectories in the form of Student Worksheets by deriving from revised icebergs			0%
14	Communicating hypothetical learning trajectories of realistic mathematics learning that have been designed	Communicating hypothetical learning trajectories of realistic mathematics learning that have been designed	**Criteria:** Creativity and accuracy in presenting learning trajectories **Form of Assessment** : Project Results Assessment / Product Assessment	Presenting the hypothetical learning trajectory of realistic mathematics learning that has been designed Discussing improvements to the hypothetical learning trajectory of realistic mathematics learning that has been designed			10%

15	Communicating hypothetical learning trajectories of realistic mathematics learning that have been designed	Communicating hypothetical learning trajectories of realistic mathematics learning that have been designed	**Criteria:** Creativity and accuracy in presenting learning trajectories **Form of Assessment** : Project Results Assessment / Product Assessment	Presenting the hypothetical learning trajectory of realistic mathematics learning that has been designed Discussing improvements to the hypothetical learning trajectory of realistic mathematics learning that has been designed			10%
16		1.Novelty 2.Creativity	**Criteria:** 1.Novelty 2.Creativity	Students submit HLT, Iceberg and LKPD project assignments			0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	37.5%
2.	Project Results Assessment / Product Assessment	45%
3.	Practice / Performance	2.5%
		85%

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.