	Universitas Negeri Surabaya **Faculty of Engineering** **Civil Engineering Undergraduate Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Road Paving	2220102151	Compulsory Study Program Subjects	**T=2**	**P=0**	**ECTS=3.18**	4	September 22, 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

Program Objectives (PO)

PO - 1	Able to apply logical, critical, innovative, quality and measurable thinking in identifying, implementing and evaluating independently and coordinating groups to solve technical and non-technical problems and able to communicate verbally and in writing.
PO - 2	Able to apply the principles of mechanics, mathematics, and engineering concepts to the technical design process, drawing measurement results, and designing highway construction.
PO - 3	Able to carry out work on design, implementation, supervision, documentation of work on highway construction in accordance with applicable standards by prioritizing the principles of occupational and environmental security and safety systems (SMK3L).
PO - 4	Able to internalize ethics, norms and laws in carrying out work.
PO - 5	Master the principles, applications, technical references, procedures and work standards (SOP) in the Highway Transportation and Pavement laboratory.

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3
PO-4
PO-5

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																

Short Course Description

This course is an introduction to the definition of highways, the history of development and role of highways, highway classification, highway cross-sections. Highway pavement layer materials: asphalt, aggregate, filler. Types of asphalt and technology, asphalt properties, asphalt production process, asphalt classification, asphalt inspection, asphalt specifications, asphalt selection and mixing, implementation of the mixture in the field and spreading. Aggregate as a hard layer material: types of aggregate, aggregate inspection, aggregate specifications, analytical/graphical mixing of aggregates. Types of road pavement. Factors influencing road pavement planning. Stresses in flexible and rigid pavement layers. Subgrade bearing capacity: CBR, subgrade reaction modulus (k), subgrade stiffness modulus (E), design CBR, correlation between CBR, k and E, DDT. Carrying capacity of each hard layer. Relative strength coefficient. Planned traffic load. Regional factors. Flexible pavement planning using the Bina Marga method (Component Analysis Method), Overlay planning and gradual layer construction, rigid pavement planning using the Bina Marga Method, Road damage and road maintenance. Learning is carried out by applying a constructivist approach. The learning activity ends with an exercise in planning the thickness of highway pavement.

References

Main :	

1. AASHTO. 1986. Guide for Design of Pavement Structures . Washington DC: American Association of State Highway and Transportation Officials.
2. DepartemenPekerjaan Umum. 1987. Petunjuk Perencanaan Tebal Perkerasan Lentur Jalan Raya dengan Metode Analisa Komponen. Jakarta: Penerbit Yayasan Badan Penerbit PU.
3. Departemen Pekerjaan Umum. Direktorat Jenderal Bina Marga. Pedoman Perencanaan Perkerasan Kaku (Beton Semen).
4. Hartom.1988. Beton Semen sebagai Salah Satu Alternatif Perkerasan Jalan. Seminar Perencanaan dan Pelaksanaan Rigid Pavement, Surabaya: ITS.
5. Hendarsin, Shirley L. 2000. Penuntun Praktis Perencanaan Teknik Jalan Raya. Bandung: Politeknik Negeri Bandung, Jurusan Teknik Sipil.
6. Huang,Yang H. 1993. Pavement Analysis and Design . New Jersey: Prentice Hall.
7. Roestaman. Dasar-dasar Pelaksanaan Perkerasan Kaku (Rigid Pavement). Makalah Seminar.
8. Sukirman, Silvia. 1995. Perkerasan Lentur Jalan Raya. Bandung: Penerbit Nova.
9. Undang-Undang RI No 38. 2004. Jalan.
10. Widayanti, Ari. 2004. Perencanaan Perkerasan Jalan Raya. Surabaya: JTS FT Unesa.
11. Widayanti, Ari. 2013. Rekayasa Jalan Raya. Surabaya: JTS FT Unesa.
12. Construction and Building Materials Journal, homepage: www.elsevier.com/locate/conbuildmat .
13. Job Sheet Praktikum, Pedoman, Norma dan Standar yang Berlaku.
14. Saodang, Hamirhan. 2005. Konstruksi Jalan Raya Buku 2: Perancangan Perkerasan Jalan Raya. Yogyakarta: Nova.
15. Saodang, Hamirhan. 2009. Konstruksi Jalan Raya Buku 3: Struktur & Konstruksi Jalan Raya. Yogyakarta: Nova.
16. Indriani, M. N. 2018. Metode-Metode Perhitungan Perencanaan Tebal Perkerasan Lentur Jalan. Makassar: CV. Social Politic Genius (SIGn).
17. Hardiyatmo, H. C. 2019. Perancangan Perkerasan Jalan dan Penyelidikan Tanah Edisi Ke-3. Yogyakarta: UGM Press.

Supporters:

1. Jurnal nasional dan jurnal internasional

Supporting lecturer	Muhammad Imaduddin, S.T., M.T. Dr. Ari Widayanti, S.T., M.T. Yogie Risdianto, S.T., M.T.

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	1. Understand the concept of road pavement, including its meaning, function and elements. 2. Know the types of road pavement.	1. Be able to state the concept of road pavement, including its meaning, function and elements. 2. Be able to name types of road pavement.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Discussion presentation and question and answer. 2 X 50		**Material:** The concept of road pavement, including its meaning, function and elements. **References:** *Hendarsin, Shirley L. 2000. Practical Guide to Highway Engineering Planning. Bandung: Bandung State Polytechnic, Civil Engineering Department.* **Material:** Type of road pavement. **References:** *Hendarsin, Shirley L. 2000. Practical Guide to Highway Engineering Planning. Bandung: Bandung State Polytechnic, Civil Engineering Department.*	1%

2	1. Know the planned age of road pavement construction, in accordance with highway construction planning regulations. 2. Understand traffic parameters that influence road pavement planning.	1. Able to state the planned age of road pavement construction, in accordance with highway construction planning regulations. 2. Able to explain traffic parameters that influence road pavement planning.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Discussion presentation and question and answer. 2 X 50		**Material:** Age of road pavement construction plan, in accordance with highway construction planning regulations. **References:** *Widayanti, Ari. 2004. Highway Pavement Planning. Surabaya: JTS FT Unesa.* **Material:** Traffic parameters that influence road pavement planning. **References:** *Widayanti, Ari. 2004. Highway Pavement Planning. Surabaya: JTS FT Unesa.*	1%
3	1. Understand road pavement structures and their use according to environmental conditions. (Case study) 2. Know the drainage on road pavement.	1. Able to explain the structure of road pavement and its use in accordance with environmental conditions. 2. Able to explain drainage on road pavement.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Discussion presentation and question and answer. 2 X 50		**Material:** Road pavement structure and its use in accordance with environmental conditions. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.* **Material:** Drainage on road pavement. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.*	2%

4	1. Know the basic soil requirements for road pavement. 2. Understand road pavement foundation design, including understanding, requirements for constituent materials, and their use in accordance with environmental conditions. (Case study)	1. Be able to state the basic soil requirements for road pavement. 2. Able to explain the design of road pavement foundations, including the definition, requirements for constituent materials, and their use in accordance with environmental conditions.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Discussion presentations and exercises. 2 X 50		**Material:** Subgrade soil requirements for road pavement. **Reference:** *AASHTO. 1986. Guide for Design of Pavement Structures. Washington DC: American Association of State Highway and Transportation Officials.* **Material:** Road pavement foundation design, including understanding, requirements for constituent materials, and their use. **Reference:** *AASHTO. 1986. Guide for Design of Pavement Structures. Washington DC: American Association of State Highway and Transportation Officials.*	2%
5	Understand road pavement design planning, including flexible pavement, rigid pavement, granular pavement with plaster, cement soil pavement, as well as granular pavement and gravel pavement.	Able to plan road pavement designs, including flexible pavement, rigid pavement, granular pavement with plaster, cement soil pavement, as well as granular pavement and gravel pavement.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Discussion presentations and exercises. 2 X 50		**Material:** Road pavement design planning, including flexible pavement, rigid pavement, granular pavement with plaster, cement soil pavement, as well as granular pavement and gravel pavement. **Reference:** *AASHTO. 1986. Guide for Design of Pavement Structures. Washington DC: American Association of State Highway and Transportation Officials.*	2%

6	Understand the road pavement planning process based on influencing parameters. (PjBL)	Able to carry out the road pavement planning process based on influencing parameters.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Project Results Assessment / Product Assessment	Discussion presentation and question and answer. 2 X 50		**Material:** Road pavement planning based on influencing parameters. **Library:** *Department of Public Works. 1987. Guidelines for Planning Highway Flexible Pavement Thickness Using Component Analysis Methods. Jakarta: PU Publishing Agency Foundation Publisher.* **Material:** Road pavement planning based on influencing parameters. **References:** *Department of Public Works. Directorate General of Highways. Rigid Pavement Planning Guidelines (Cement Concrete).* **Material:** Road pavement planning based on influencing parameters. **Reference:** *AASHTO. 1986. Guide for Design of Pavement Structures. Washington DC: American Association of State Highway and Transportation Officials.* **Material:** Road pavement planning based on influencing parameters. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.*	10%

7	Understand the road pavement planning process based on influencing parameters. (PjBL)	Able to carry out the road pavement planning process based on influencing parameters.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Discussion presentation and question and answer. 2 X 50		**Material:** Road pavement planning based on influencing parameters. **Library:** *Department of Public Works. 1987. Guidelines for Planning Highway Flexible Pavement Thickness Using Component Analysis Methods. Jakarta: PU Publishing Agency Foundation Publisher.* **Material:** Road pavement planning based on influencing parameters. **References:** *Department of Public Works. Directorate General of Highways. Rigid Pavement Planning Guidelines (Cement Concrete).* **Material:** Road pavement planning based on influencing parameters. **Reference:** *AASHTO. 1986. Guide for Design of Pavement Structures. Washington DC: American Association of State Highway and Transportation Officials.* **Material:** Road pavement planning based on influencing parameters. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.*	2%
8	Midterm Exam (UTS)	-	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Project Results Assessment / Product Assessment, Test	Examination/Writing Test 2 X 50			20%

9	Understand the procedure for determining the overlay design thickness, based on the maximum deflection and deflection curve adjusted to environmental conditions. (Case Study)	Able to determine the thickness of the overlay design, based on the maximum deflection and deflection curve adjusted to environmental conditions.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Question and answer discussion presentation. 2 X 50		**Material:** Overlay design thickness, based on maximum deflection and deflection curve adapted to environmental conditions. **Reader:** *Sukirman, Silvia. 1995. Highway Flexible Pavements. Bandung: Nova Publishers.*	2%
10	Understand the procedure for planning the thickness of additional layers of flexible pavement using the deflection method.	Able to plan the thickness of additional layers of flexible pavement using the deflection method.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Question and answer discussion presentation. 2 X 50		**Material:** Planning the thickness of additional layers of flexible pavement using the deflection method. **Reference:** *AASHTO. 1986. Guide for Design of Pavement Structures. Washington DC: American Association of State Highway and Transportation Officials.*	1%
11	1. Explore the planning of rigid pavement structures according to the Highways Method. (Case Study) 2. Understand the determination of rigid pavement damage models.	1. Able to plan rigid pavement structures according to the Highways Method. 2. Able to explain the determination of rigid pavement damage models.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Question and answer discussion presentation. 2 X 50		**Material:** Rigid pavement structure planning according to the Bina Marga Method. **References:** *Department of Public Works. Directorate General of Highways. Rigid Pavement Planning Guidelines (Cement Concrete).* **Material:** Rigid pavement structure planning according to the Bina Marga Method. **Bibliography:** *Roestaman. Basics of Rigid Pavement Implementation. Seminar Paper.* **Material:** Determination of rigid pavement damage models. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.*	1%

12	1. Explore the planning of rigid pavement structures according to the Highways Method. (Case Study) 2. Understand the determination of rigid pavement damage models.	1. Able to plan rigid pavement structures according to the Highways Method. 2. Able to explain the determination of rigid pavement damage models.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Question and answer discussion presentation. 2 X 50		**Material:** Rigid pavement structure planning according to the Bina Marga Method. **References:** *Department of Public Works. Directorate General of Highways. Rigid Pavement Planning Guidelines (Cement Concrete).* **Material:** Rigid pavement structure planning according to the Bina Marga Method. **Bibliography:** *Roestaman. Basics of Rigid Pavement Implementation. Seminar Paper.* **Material:** Determination of rigid pavement damage models. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.*	2%
13	Understand damage to flexible pavement, including types of damage, causes of damage, and repair methods. (Case study)	Able to explain damage to flexible pavement, including types of damage, causes of damage, and repair methods.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, discussions and questions and answers. 2 X 50		**Material:** Damage to flexible pavement, including types of damage, causes of damage, and repair methods. **Library:** *National journals and international journals*	2%
14	1. Know the main materials for road pavement: aggregate, asphalt, and filler. 2. Understand the testing procedures for main road pavement materials, in accordance with applicable regulations.	1. Be able to explain the main materials for road pavement: aggregate, asphalt, and filler. 2. Able to carry out testing procedures for main road pavement materials, in accordance with applicable regulations.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Question and answer discussion presentation. 2 X 50		**Material:** Main road pavement materials: aggregate, asphalt, and filler and testing procedures. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.*	2%
15	Plan the thickness of the overlay from existing data. (PjBL)	Able to plan overlay thickness from existing data.	**Criteria:** Full marks are obtained if you do all the questions correctly. **Forms of Assessment** : Project Results Assessment / Product Assessment, Practical Assessment	Presentation, question and answer discussion, exercises and assignments. 2 X 50		**Material:** Thick overlay planning from existing data. **Library:** *Practical Job Sheet, Guidelines, Applicable Norms and Standards.*	20%

16	Final Semester Examination (UAS)		**Criteria:** Full marks are obtained if you do all the questions correctly. **Form of Assessment** : Project Results Assessment / Product Assessment, Test	Examination/Writing test. 2 X 50			30%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	10%
2.	Project Results Assessment / Product Assessment	55%
3.	Practical Assessment	10%
4.	Test	25%
		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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.