	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
Prestressed Concrete Structures	2220102116	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	5	August 9, 2022

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

Program Objectives (PO)

PO - 1	Students have the ability to design the use of environmentally friendly prestressed concrete materials
PO - 2	Students have the ability to analyze prestress forces based on elastic conditions, concrete-steel cooperation & load balancing.
PO - 3	Students have the skills to analyze the effect of prestressing force on the final stress of a certain static prestressed beam (ST) and the final stress of a statically indeterminate prestressed beam (STT).

PLO-PO Matrix

P.O
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

Understanding and initial ideas about prestressed concrete, how to apply prestressing force to steel (pretensioning & posttensioning), prestressing concrete and steel materials, basic principles of planning and analyzing cross-sections (elastic conditions, steel-concrete cooperation, load balancing), casting and cable pulling processes, loss prestressing forces (shrinkage, creep, relaxation, due to slippage, friction, influence of length), cross-section planning and stress calculations for concrete sections, casting and running cables, shear stresses, danger situation diagrams for prestressed concrete, anchorage in posttensioning systems, transverse tensile stresses at the final block of the limit moment. Learning is carried out using the Direct Learning Method (MPL) and ends with discussion activities.

References

Main :

1. T Y Lin. 2000. Desain Struktur Beton Prategan Jilid 1 . Mediana Penterjemah. Jakarta: Bina Rupa Aksara.
2. Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamental . New York: McGraw-Hill.
3. Nawy Edward G. 2001. Beton Prategang Suatu Pendekatan Mendasar Jilid 1 Edisi III . Bambang Suryoatmono Penterjemah. Jakarta: Erlangga.
4. Raju Krishna. 1989. Beton Prategang Edisi Kedua . Yani Sianipar Editor. Jakarta: Erlangga.
5. Anonim. SNI 2847-2019 Tentang Persyaratan Beton Struktural Untuk Bangunan Gedung. BSN

Supporters:

Supporting lecturer	Muhammad Imaduddin, S.T., M.T. Yogie Risdianto, S.T., M.T. Meity Wulandari, 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	Able to understand prestressed concrete structures	Explain the basic principles/concepts of prestressed concrete, the differences between conventional concrete and statically certain (ST) and statically indeterminate (STT) prestressed concrete.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, Discussions, Questions and Answers 2 X 50		**Material:** Basic concepts of prestressing **Reader:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Basic concepts of prestressing **Reader:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Basic concepts of prestressing **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Basic concepts of prestressing **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	5%

2	Able to understand the use of prestressed concrete materials	Explain prestressed concrete materials.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, Discussions, Questions and Answers 2 X 50		**Material:** Prestressed concrete material **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Prestressed concrete material **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Prestressed concrete materials **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Prestressed concrete material **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	5%

3	Able to understand the use of prestressed concrete materials	Explain prestressed concrete materials.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, Discussions, Questions and Answers 2 X 50		**Material:** Prestressed concrete material **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Prestressed concrete material **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Prestressed concrete materials **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Prestressed concrete material **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	5%

4	Able to analyze the behavior of prestressed concrete	Explain the analysis of prestressed concrete behavior.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers 2 X 50		**Material:** Analysis of prestressed concrete behavior **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Behavioral analysis of prestressed concrete **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Behavioral analysis of prestressed concrete **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Behavioral analysis of prestressed concrete **Reference:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	5%

5	Able to analyze the behavior of prestressed concrete	Explain the analysis of prestressed concrete behavior.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers 2 X 50		**Material:** Analysis of prestressed concrete behavior **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Behavioral analysis of prestressed concrete **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Behavioral analysis of prestressed concrete **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Behavioral analysis of prestressed concrete **Reference:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	10%

6	Able to analyze the loss of prestressed concrete force, final stress, cracking moment & ultimate moment	Explains the analysis of force loss in prestressed concrete, final stress, cracking moment & ultimate moment.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and individual assignments 2 X 50		**Material:** Prestress loss analysis **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Prestress loss analysis **Reader:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Analysis of loss of prestressing force **References:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Analysis of prestress loss **Reference:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	5%

7	Able to analyze the loss of prestressed concrete force, final stress, cracking moment & ultimate moment	Explains the analysis of force loss in prestressed concrete, final stress, cracking moment & ultimate moment.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers and individual assignments 2 X 50		**Material:** Prestress loss analysis **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Prestress loss analysis **Reader:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Analysis of loss of prestressing force **References:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Analysis of prestress loss **Reference:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	10%
8	UTS	Able to analyze the loss of final stress prestress force Mr & Mu.	**Criteria:** Score 45 if the calculation of the total loss of prestress force is correct. Score 10 if the final stress calculation is correct. Score 15 if Mr's calculation is correct. Score 20 if Mu's calculation is correct. Score 10 if the stress sketch is correct. **Form of Assessment** : Participatory Activities	2 X 50			0%

9	Able to analyze the loss of prestressed concrete force, final stress, cracking moment & ultimate moment	Explains the analysis of force loss in prestressed concrete, final stress, cracking moment & ultimate moment.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** force loss analysis of prestressed concrete **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** loss of force analysis of prestressed concrete **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** force loss analysis of prestressed concrete **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** force loss analysis of prestressed concrete **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	5%

10	Able to analyze the loss of prestressed concrete force, final stress, cracking moment & ultimate moment	Explains the analysis of force loss in prestressed concrete, final stress, cracking moment & ultimate moment.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** force loss analysis of prestressed concrete **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** loss of force analysis of prestressed concrete **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** force loss analysis of prestressed concrete **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** force loss analysis of prestressed concrete **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	10%

11	Able to analyze the loss of prestressed concrete force, final stress, cracking moment & ultimate moment	Explains the analysis of force loss in prestressed concrete, final stress, cracking moment & ultimate moment.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** force loss analysis of prestressed concrete **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** loss of force analysis of prestressed concrete **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** force loss analysis of prestressed concrete **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** force loss analysis of prestressed concrete **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	5%

12	Able to analyze the loss of prestressed concrete force, final stress, cracking moment & ultimate moment	Explains the analysis of force loss in prestressed concrete, final stress, cracking moment & ultimate moment.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** force loss analysis of prestressed concrete **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** loss of force analysis of prestressed concrete **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** force loss analysis of prestressed concrete **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** force loss analysis of prestressed concrete **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	10%

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14	Able to analyze the loss of prestressed concrete force, final stress, cracking moment & ultimate moment	Explains the analysis of force loss in prestressed concrete, final stress, cracking moment & ultimate moment.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers 2 X 50		**Material:** force loss analysis of prestressed concrete **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** loss of force analysis of prestressed concrete **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** force loss analysis of prestressed concrete **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** force loss analysis of prestressed concrete **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	10%

15	Able to analyze end block stress and stirrup requirement analysis.	Explain end block stress analysis and stirrup requirement analysis.	**Criteria:** According to the rubric, test **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers, and individual assignments 2 X 50		**Material:** Endblock and stirrup stress analysis **Reference:** *TY Lin. 2000. Prestressed Concrete Structure Design Volume 1. Mediana Translator. Jakarta: Literacy Development.* **Material:** Endblock and stirrup stress analysis **Reference:** *Naaman E Antonie. 1982. Prestressed Concrete Analysis and Design Fundamentals. New York: McGraw-Hill.* **Material:** Endblock and stirrup stress analysis **Reference:** *Nawy Edward G. 2001. Prestressed Concrete A Fundamental Approach Volume 1 Edition III. Bambang Suryoatmono Translator. Jakarta: Erlangga.* **Material:** Endblock and stirrup stress analysis **Reader:** *Raju Krishna. 1989. Prestressed Concrete Second Edition. Yani Sianipar Editor. Jakarta: Erlangga.*	10%
16							0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	100%
		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.