	Universitas Negeri Surabaya Faculty of Engineering, Building Engineering Education Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
REINFORCED CONCRETE STRUCTURES	8320503296	Compulsory Study Program Subjects	T=3	P=0	ECTS=4.77	3	August 18, 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 that is charged to the course

Program Objectives (PO)

PO - 1	Students are able to understand concrete structure calculation methods from plate calculations to foundations.
PO - 2	Students are able to design and choose the appropriate concrete structure calculation method according to the student's characteristics.
PO - 3	Students are able to apply structural analysis to concrete structure calculations from slab to foundation calculations.
PO - 4	Students are able to calculate slabs to foundations using the correct concrete structure calculation method.

PLO-PO Matrix

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

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																

Short Course Description	Basic assumptions for calculating reinforced concrete, load and loading factors, analysis and methods for designing rectangular sections in terms of ultimate strength. Calculation of cantilever plates, one-way plates, two-way plates, plates with line loads and deflection control and crack width control. Calculation of two-support beams, calculation of stairs, T-beams, double-bone beams and deflection control, and distribution lengths. Shear and torsion calculations. Calculation of short consoles, basics of calculating the strength of columns, braced and unbraced frames, safety provisions, short columns with small and large eccentricities, slender columns, percentage of reinforcement, round columns, beam and column connections, foot foundations, slab foundations continuous, full slab foundation and deep foundation.
References	**Main :**

	1. [1]. Departemen PU,2013, Persyaratan Beton Struktural untuk Bangunan Gedung SNI 2847-2013, BSN Bandung LPMB 2. [2]. Gideon Kusuma,1993, Dasar-dasar Perencanaan beton Bertulang berdasarkan SKSNI 1991, Jakarta Erlangga 3. [3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York.Prentice Hall 4. [4]. Jack.C.Mc.Cormac.2013. Design of Reinforced Concrete.Russel H Brown. 5. [5]. ACI Structural Journal American Concrete Institute. 2015.
	Supporters:
Supporting lecturer	Drs. Andang Widjaja, S.T., M.T. Mochamad Firmansyah Sofianto, S.T., M.Sc., 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 explain how to derive formulas for rectangular design of reinforcement	Explain the basic assumptions for calculating rectangular cross-sections	**Criteria:** 1.Can plan plate thickness correctly (score 50). 2.Can draw correctly (score 50) **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers Exercise 3 x 50	Lectures, discussions and questions and answers Exercise 3 x 50	**Material:** rectangular reinforcement design **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** rectangular reinforcement design **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** rectangular reinforcement design **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

2	Able to plan cantilever plate reinforcement & one-way plates	Explains Limit Strength planning and can calculate reinforcement for cantilever plates & one-way plates	**Criteria:** 1. Can plan plate thickness correctly (score 50). 2. Can draw correctly (score 50)	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** cantilever plate reinforcement & one-way plate **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** cantilever plate reinforcement & one-way plate **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** cantilever plate reinforcement & one-way plate **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

3	Able to plan two-way slab reinforcement and line load slabs	Explains how to calculate two-way plates & line load plates	**Criteria:** 1. Can plan plate thickness correctly (score 50). 2. Can draw correctly (score 50)	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** two-way slab reinforcement and line load slabs **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** two-way slab reinforcement and line load slabs **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** two-way slab reinforcement and line load slabs **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

4	Able to apply deflection control and crack width control	Explain how to apply deflection control and crack width	**Criteria:** 1. Can plan plate thickness correctly (score 50). 2. Can draw correctly (score 50)	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** deflection control and crack width control **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** deflection control and crack width control **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** deflection control and crack width control **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

5	Able to calculate the reinforcement of single reinforced beams and their shear reinforcement. Able to calculate the reinforcement of T beams	Explains how to calculate a double-supported beam and its shear reinforcement. Explains how to calculate the reinforcement for a T beam	**Criteria:** 1. Can plan single reinforced beams and T beams correctly (score 50). 2. Can draw correctly (score 50)	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** reinforcement of single reinforced beams and their shear reinforcement. Be able to calculate the reinforcement of T beams. **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** reinforcement of single reinforced beams and their shear reinforcement. Be able to calculate the reinforcement of T beams. **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** reinforcement of single reinforced beams and their shear reinforcement. Be able to calculate the reinforcement of T beams. **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

6	Able to calculate the reinforcement of single reinforced beams and their shear reinforcement. Able to calculate the reinforcement of T beams	Explains how to calculate a double-supported beam and its shear reinforcement. Explains how to calculate the reinforcement for a T beam	**Criteria:** 1. Can plan single reinforced beams and T beams correctly (score 50). 2. Can draw correctly (score 50) **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** reinforcement of single reinforced beams and their shear reinforcement. Be able to calculate the reinforcement of T beams. **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** reinforcement of single reinforced beams and their shear reinforcement. Be able to calculate the reinforcement of T beams. **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** reinforcement of single reinforced beams and their shear reinforcement. Be able to calculate the reinforcement of T beams. **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

7	Able to calculate the reinforcement of Double Bone beams	Explains how to calculate the reinforcement for Double Bone beams	**Criteria:** 1. Can plan doubly reinforced beams correctly (score 50). 2. Can draw correctly (score 50) **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** calculating the reinforcement of a double bone beam. **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** calculating the reinforcement of a double bone beam. **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** calculating the reinforcement of a double bone beam. **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%
8		Able to calculate and describe reinforcement in plate and beam construction	**Criteria:** Solve all UTS questions correctly and precisely	Midterm exam 3 x 50	Midterm exam 3 x 50		10%

9	Able to plan torsion shear beams Able to plan short consoles	Explaining the ultimate strength planning regarding torsion shear beams. Explaining the planning of short consoles	**Criteria:** 1. Can plan reinforcement for torsion shear beams and short consoles correctly (score 50). 2. Can draw correctly (score 50)	Lectures, discussions and questions and answers. Exercise 3 x 50‘	Lectures, discussions and questions and answers. Exercise 3 x 50‘	**Material:** torsion shear beam Able to plan short consoles **References:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** torsion shear beam Able to plan short consoles **References:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** torsion shear beam Able to plan short consoles **References:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

10	Able to plan ordinary columns and columns using stiffeners. Able to plan short columns with small and large eccentricities	Explains the planning of a regular column	**Criteria:** Can plan columns correctly (score 100). **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers. Exercise 3 x 50‘	Lectures, discussions and questions and answers. Exercise 3 x 50‘	**Material:** Concept of ordinary column calculations **References:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** Concept of ordinary column calculations **References:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** Concept of ordinary column calculations **References:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

11	Able to plan short columns with small and large eccentricities	Explains the planning of short columns with small and large eccentricities	**Criteria:** Can plan columns correctly (score 100). **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** planning columns using stiffeners. Able to plan short columns with small and large eccentricities. **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** planning columns using stiffeners. Able to plan short columns with small and large eccentricities. **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** planning columns using stiffeners. Able to plan short columns with small and large eccentricities. **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

12	Able to plan slender columns	Explain the planning of slender columns	**Criteria:** Can plan columns correctly (score 100). **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers. Exercise 3 x 50	Lectures, discussions and questions and answers. Exercise 3 x 50	**Material:** slim column **References:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** slim column **References:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** slim column **References:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%
13	Able to plan round columns	Explain the planning of round columns	**Criteria:** Can plan columns correctly (score 100). **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers. Exercise 3 x 50‘	Lectures, discussions and questions and answers. Exercise 3 x 50‘	**Material:** round column **References:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** round column **References:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** round column **References:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

14	Able to plan beam-column connections	Explain the planning of beam-column connections	**Criteria:** Can plan beam and column joints correctly (score 100). **Form of Assessment** : Participatory Activities	Lectures, discussions and questions and answers. Exercise 3 x 50‘	Lectures, discussions and questions and answers. Exercise 3 x 50‘	**Material:** planning beam - column connections **References:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** planning beam - column connections **References:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** planning beam - column connections\ **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%

15	Able to plan local, continuous, full plate and foundation calculations	Explains the planning of beam-column connections. Explains the calculations for local, continuous, full plate and deep foundations	**Criteria:** complete tasks correctly and according to concept **Form of Assessment** : Participatory Activities, Portfolio Assessment	Lectures, discussions and questions and answers. Exercise 3 x 50‘	Lectures, discussions and questions and answers. Exercise 3 x 50‘	**Material:** planning local, continuous, full plate and foundation calculations. **Reference:** *[1]. Department of Public Works, 2013, Structural Concrete Requirements for Buildings SNI 2847-2013, BSN Bandung LPMB* **Material:** planning local, continuous, full plate and foundation calculations. **Reference:** *[2]. Gideon Kusuma, 1993, Basics of Reinforced Concrete Design based on SKSNI 1991, Jakarta Erlangga* **Material:** planning local, continuous, full plate and foundation calculations. **Reference:** *[3]. Edward G Nawy, 2009. Reinforced Concrete A Fundamental Approach. New York. Prentice Hall*	5%
16	Able to solve problems regarding columns and foundations	Solve questions regarding columns and foundations	**Criteria:** Solve questions regarding columns and foundations correctly and according to what is taught **Form of Assessment** : Participatory Activities	3 x 50‘ Semester Final Exam	3 x 50‘ Semester Final Exam		20%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	62.5%
2.	Portfolio Assessment	2.5%
		65%

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.