							Document Code

Universitas Negeri Surabaya
Faculty of Engineering
Civil Engineering Undergraduate Study Program

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
High Building Steel Structure	2220102107	Study Program Elective Courses	**T=2**	**P=0**	**ECTS=3.18**	5	July 19, 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 have knowledge of the theory of evaluation of lateral support frame systems and the loads acting on steel structures of tall buildings
	PO - 2	Students are able to design and select the right lateral support frame system for a building according to the type of building and the load zone acting on the building.
	PO - 3	Students have a responsible attitude in developing skills in designing steel structures in accordance with Indonesian National Standards, especially for tall buildings
	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	Conduct studies and provide an understanding of tall buildings using concrete and steel materials, the influence of working lateral loads in the form of wind loads and earthquake loads on building structures in accordance with the building zone, the lateral supporting steel frame system used in accordance with the maximum height of the building and load zones, and the use of computer applications in planning and evaluating lateral resisting steel frame systems.

References	**Main :**

1. Departemen Pekerjaan Umum. 2002.SNI-03-1729-2002 Tata Cara Perencanaan Struktur Baja untuk Bangunan Gedung. Jakarta.
2. Badan Standadisasi Nasional. 2012. SNI 1726:2012 Tata Cara Perencanaan Ketahanan Gempa untuk Struktur Bangunan Gedung dan Non Gedung. Jakarta.
3. Badan Standadisasi Nasional. 2013. SNI 1727:2013 Beban Minimum untuk Perencanaan Bangunan Gedung dan Struktur Lain. Jakarta.
4. Wolfgang Schueller. 2001. Struktur BangunanBertingkat Tinggi. Bandung: Refika Aditama.
5. Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.
6. Pramono. 2006. Buku latihan Aplikasi Rekayasa Konstruksi
7. SNI 1727-2015 dan seterusnya tentang Beban Minimum Untuk Perancangan Bangunan Gedung dan Struktur Lain
8. SNI 1726-2019 Persyaratan Gempa Struktural dan Non struktural Untuk Bangunan Gedung

Supporters:	

Supporting lecturer	Muhammad Imaduddin, 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 understand the concept and meaning of tall building steel structures	1. Explain the meaning of tall building structures 2. Explain the use of steel structures in tall buildings	**Criteria:** Full marks if the answer is complete, clear and in accordance with theory **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers, and presentations 2 X 50	Lectures, discussions, questions and answers, and presentations 2 X 50	**Material:** Concept and understanding of high-rise steel structures. **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.* **Material:** Concept and understanding of steel structures for tall buildings. **Reference:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.* **Material:** Concept and understanding of steel structures for tall buildings **Reference:** *SNI 1727-2015 and so on regarding Minimum Loads for Designing Buildings and Other Structures*	3%

2	Able to understand and calculate earthquake lateral forces acting on steel structures of tall buildings	1. Explain the meaning of lateral loads due to earthquakes and earthquake zones 2. Explain the calculation of earthquake loads 3. Explain the application of earthquake loads to steel structures of tall buildings	**Criteria:** Full marks if the answer is complete, clear and in accordance with theory **Form of Assessment** : Participatory Activities, Tests	Lectures, discussions, questions and answers, and presentations 2 X 50	Lectures, discussions, questions and answers, and presentations 2 X 50	**Material:** Earthquake forces **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* **Material:** Earthquake forces **Reader:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*	3%
3	Able to understand and calculate the lateral wind forces that act on steel structures of tall buildings	1. Explain the meaning of lateral loads due to wind 2. Explain the calculation of wind loads 3. Explain the application of wind loads to steel structures of tall buildings	**Criteria:** Full marks if the answer is complete, clear and in accordance with theory **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers, and presentations 2 X 50	Lectures, discussions, questions and answers, and presentations 2 X 50	**Material:** Wind force **Reference:** *SNI 1727-2015 and so on regarding Minimum Loads for the Design of Buildings and Other Structures* **Material:** Wind style **Reader:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*	4%
4	Able to identify and explain lateral support steel frame systems: - Rigid frame - Semirigid frame - Braced frame - rigid and braced frame outrigger and belt truss	1. Explain the meaning of lateral supporting steel frames 2. Explain lateral support steel frame systems 3. Explain the behavior of lateral resisting steel frame systems	**Criteria:** Full marks if the answer is complete, clear and in accordance with theory **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers, and presentations 2 X 50	Lectures, discussions, questions and answers, and presentations 2 X 50	**Material:** Lateral support frame systems **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.* **Material:** Lateral resisting frame system **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* **Material:** Lateral support frame system **Reference:** *SNI 1727-2015 and so on regarding Minimum Loads for the Design of Buildings and Other Structures*	3%

| 5 | Able to identify and explain lateral support steel frame systems: - Rigid frame - Semirigid frame - Braced frame - rigid and braced frame - outrigger and belt truss | 1. Explain the meaning of lateral supporting steel frames 2. Explain lateral support steel frame systems 3. Explain the behavior of lateral resisting steel frame systems | **Criteria:** Full marks if the answer is complete, clear and in accordance with theory **Form of Assessment** : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Lateral support frame systems **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.* **Material:** Lateral resisting frame system **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* **Material:** Lateral support frame system **Reference:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.* | 4% |
| 6 | Able to identify and explain lateral support steel frame systems: - Rigid frame - Semirigid frame - Braced frame - rigid and braced frame - outrigger and belt truss | 1. Explain the meaning of lateral supporting steel frames 2. Explain lateral support steel frame systems 3. Explain the behavior of lateral resisting steel frame systems | **Criteria:** Full marks if the answer is complete, clear and in accordance with theory **Form of Assessment** : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Lateral support frame systems **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.* **Material:** Lateral resisting frame system **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* **Material:** Lateral support frame system **Reference:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.* | 4% |

| 7 | Able to identify and explain lateral support steel frame systems: - Rigid frame - Semirigid frame - Braced frame - rigid and braced frame - outrigger and belt truss | 1. Explain the meaning of lateral supporting steel frames 2. Explain lateral support steel frame systems 3. Explain the behavior of lateral resisting steel frame systems | **Criteria:** Full marks if the answer is complete, clear and in accordance with theory

Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Lateral support frame systems **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*

Material: Lateral support frame system **Reference:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.*

Material: Lateral resisting frame system **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* | 4% |
| 8 | Master the material from meetings 1 - 7 by taking the midterm exam (UTS) | Can complete UTS on time and get maximum marks | **Form of Assessment** : Participatory Activities, Tests | Midterm Exam 2 X 50 | Midterm Exam 2 X 50 | | 20% |

| 9 | Able to evaluate lateral support steel frame systems | Explain the evaluation steps for lateral support steel frame systems | **Criteria:** Full marks if the answer is complete, clear and in accordance with theory

Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Evaluation of lateral support frame systems **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*

Material: Evaluation of lateral resisting frame systems **References:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings*

Material: Evaluation of lateral support frame systems **References:** *SNI 1727-2015 and so on regarding Minimum Loads for the Design of Buildings and Other Structures*

Material: Evaluation of lateral support frame systems **Reference:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.* | 4% |

10	Able to evaluate lateral support steel frame systems	Explain the evaluation steps for lateral support steel frame systems	**Criteria:** Full marks if the answer is complete, clear, in accordance with theory and correct **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers, and presentations 2 X 50	Lectures, discussions, questions and answers, and presentations 2 X 50	**Material:** Tall Building Planning **Reader:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.* **Material:** Tall Building Planning **Reader:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.* **Material:** Tall Building Planning **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* **Material:** Tall Building Planning **Reference:** *SNI 1727-2015 and so on regarding Minimum Loads for Designing Buildings and Other Structures*	4%
11	Able to evaluate lateral support steel frame systems	Explain the evaluation steps for lateral support steel frame systems	**Criteria:** Full marks if the answer is complete, clear, in accordance with theory, and correct **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers, and presentations 2 X 50	Lectures, discussions, questions and answers, and presentations 2 X 50	**Material:** Evaluation of lateral support frame systems **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.* **Material:** Evaluation of lateral support frame systems **Reference:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.*	3%

| 12 | Able to evaluate lateral support steel frame systems | Explain the evaluation steps for lateral support steel frame systems | **Criteria:** Full marks if the answer is complete, clear, in accordance with theory and correct

Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Tall Building Structures **Reader:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*

Material: Tall Building Structures **Reader:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.* | 3% |
| 13 | Able to plan lateral supporting steel frames in tall buildings using computer applications | Planning and evaluating lateral support steel frame systems in tall buildings using computer applications | **Criteria:** Full marks if the answers are complete, sequential, clear and correct.

Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Lateral support steel frame planning **Reference:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*

Material: Lateral support steel frame planning **Reference:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.*

Material: Lateral support steel frame planning **Reference:** *SNI 1727-2015 and so on regarding Minimum Loads for the Design of Buildings and Other Structures*

Material: Lateral support steel frame planning **Reference:** *Public Works Department. 2002.SNI-03-1729-2002 Procedures for Planning Steel Structures for Buildings. Jakarta.* | 4% |

| 14 | Able to plan lateral supporting steel frames in tall buildings using computer applications | Planning and evaluating lateral support steel frame systems in tall buildings using computer applications | **Criteria:** Full marks if the answer is complete, sequential, clear and in accordance with theory

Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Shear walls and dual systems **Reader:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*

Material: Sliding walls and dual systems **Reader:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.*

Material: Shear walls and dual systems **Reference:** *SNI 1727-2015 and so on regarding Minimum Loads for Designing Buildings and Other Structures*

Material: Shear walls and dual systems **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* | 4% |
| 15 | Able to plan lateral supporting steel frames in tall buildings using computer applications | Planning and evaluating lateral support steel frame systems in tall buildings using computer applications | **Criteria:** Full marks if the answers are complete, sequential, clear and correct

Form of Assessment : Participatory Activities | Lectures, discussions, questions and answers, and presentations 2 X 50 | Lectures, discussions, questions and answers, and presentations 2 X 50 | **Material:** Shear walls and dual systems **Reader:** *Wolfgang Schueller. 2001. High-Rise Building Structures. Bandung: Refika Aditama.*

Material: Sliding walls and dual systems **Reader:** *Jason A Cook. 2005. Structural Steel FramingOptions for Mid and High Rise Buildings. Massachusetts Institute of Technology.*

Material: Shear walls and dual systems **Reference:** *SNI 1726-2019 Structural and Non-structural Earthquake Requirements for Buildings* | 3% |

| 16 | 1. Able to explain the principles of planning tall buildings 2. Able to calculate lateral support components for tall buildings | Able to do all the questions given in the exam | **Criteria:** Full marks are obtained if you do all the questions correctly and correctly **Form of Assessment** : Participatory Activities, Tests | Final Exam Semester 2 x 50 | Final exams | | 30% |

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	73.5%
2.	Test	26.5%
		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.