



**Universitas Negeri Surabaya  
Faculty of Engineering,  
Electrical Engineering Undergraduate Study Program**

Document  
Code

**SEMESTER LEARNING PLAN**

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Telecommunication System Quality and Reliability*	2020102352	Compulsory Study Program Subjects	T=0	P=0	ECTS=0	7	May 1, 2023
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator	
	Dr. Nurhayati, S.T., M.T.		Prof. Dr. I Gusti Putu Asto B., M.T.			Dr. Lusia Rakhmawati, S.T., M.T.	

Learning model	Project Based Learning
----------------	------------------------

Program Learning Outcomes (PLO)	PLO study program that is charged to the course							
	Program Objectives (PO)							
	PO - 1	Able to apply knowledge of Wireless Communication System Applications to gain a thorough understanding of engineering principles						
	PO - 2	Able to design and carry out experiments in the laboratory/field as well as analyze and interpret data to strengthen Wireless Communication System Applications						
	PO - 3	Able to communicate effectively both verbally and in writing						
	PO - 4	Able to apply engineering principles, identify, formulate and analyze data/information to solve problems in the field of Wireless Communication Systems						
	PO - 5	Able to apply modern electrical engineering methods and skills needed to solve problems in the field of Wireless Communication Systems engineering						
	PLO-PO Matrix							
		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>P.O</td></tr> <tr><td>PO-1</td></tr> <tr><td>PO-2</td></tr> <tr><td>PO-3</td></tr> <tr><td>PO-4</td></tr> <tr><td>PO-5</td></tr> </table>	P.O	PO-1	PO-2	PO-3	PO-4	PO-5
	P.O							
PO-1								
PO-2								
PO-3								
PO-4								
PO-5								

**PO Matrix at the end of each learning stage (Sub-PO)**

	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th rowspan="2">P.O</th> <th colspan="16">Week</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> <tr><td>PO-1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	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																
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	Students can discuss the basic concepts of wireless communications, identify the evolution of radio communications, explore the basics of antennas and propagation, determine system design concepts, cellular, explain frequency reuse, conclude cellular system capacity, categorize grade of service (GoS), explore propagation path loss, and compare outdoor and indoor propagation, characterizing multipath fading, RAKE receiver, channel coding and interleaving, projecting the development of the latest wireless communication system technology using the case method in lectures.
--------------------------	---

References	<p><b>Main :</b></p> <ol style="list-style-type: none"> <li>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</li> <li>T.S. Rappaport. Wireless Communications Principles and Practice</li> </ol>
------------	---

		<b>Supporters:</b>					
		1. Huseyin Arslan, Zhi Ning Chen, Maria-Gabriella Di Benedetto - (2006) Ultra Wideband Wireless Communication-Wiley-Interscience					
<b>Supporting lecturer</b>		Dr. Nurhayati, 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	Introduction to the implementation of wireless communication systems in the telecommunications and information industry.	<ol style="list-style-type: none"> <li>1. Get to know the fields of telecommunications and information business</li> <li>2. Review the types of digital modulation used in various communications standards</li> <li>3. Review channel coding and detection</li> <li>4. Reviewing multiplexing and multiple access methods</li> <li>5. Plan industrial visits and guest lectures</li> </ol>	<b>Criteria:</b> Activeness and accuracy of answers  <b>Form of Assessment :</b> Participatory Activities	Presentation, group discussion and reflection 2 X 50		<b>Material:</b> Meeting material 1 <b>Reader:</b> <i>TS Rappaport. Wireless Communications Principles and Practice</i>	5%
2	Able to understand channel coding and forward error correction techniques in wireless communication systems.	<ol style="list-style-type: none"> <li>1. Describe the working principle of block coding</li> <li>2. Describe the principles of decoding and correction</li> <li>3. Discuss other types of channel coding (convolutional code, reed-solomon, LDPC, turbo code, raptor, etc.)</li> <li>4. Discuss the working principles of hard and soft decision/detection</li> </ol>	<b>Criteria:</b> Activeness and accuracy of answers  <b>Form of Assessment :</b> Participatory Activities	Presentation, group discussion and reflection 2 X 50		<b>Material:</b> Meeting material 2 <b>Bibliography:</b> <i>Huseyin Arslan, Zhi Ning Chen, Maria-Gabriella Di Benedetto - (2006) Ultra Wideband Wireless Communication-Wiley-Interscience</i>	5%
3	Able to understand channel coding and forward error correction techniques in wireless communication systems.	<ol style="list-style-type: none"> <li>1. Describe the working principle of block coding</li> <li>2. Describe the principles of decoding and correction</li> <li>3. Discuss other types of channel coding (convolutional code, reed-solomon, LDPC, turbo code, raptor, etc.)</li> <li>4. Discuss the working principles of hard and soft decision/detection</li> </ol>	<b>Criteria:</b> Activeness and accuracy of answers  <b>Form of Assessment :</b> Participatory Activities	Presentation, discussion and reflection 2 X 50		<b>Material:</b> Meeting material 3 <b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i>	10%
4	Students are able to understand multiple access techniques for wireless communications	<ol style="list-style-type: none"> <li>1. Describe frequency division access (FDMA) and time division (TDMA) techniques</li> <li>2. Describe spread spectrum multiple access techniques</li> <li>3. Describes radio packets</li> <li>4. Describes the capacity of the cellular system</li> </ol>	<b>Criteria:</b> Activeness and accuracy of answers  <b>Form of Assessment :</b> Participatory Activities	Presentation, discussion and reflection 2 X 50		<b>Material:</b> Meeting material 4 <b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i>	5%

5	Students are able to understand multiple access techniques for wireless communications	<ol style="list-style-type: none"> <li>1. Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2. Describe spread spectrum multiple access techniques</li> <li>3. Describes radio packets</li> <li>4. Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
6	Able to understand and explain Cellular Systems, Cellular System Architecture	<ol style="list-style-type: none"> <li>1. Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2. Describe spread spectrum multiple access techniques</li> <li>3. Describes radio packets</li> <li>4. Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
7	Able to understand and explain the concepts of CDMA, Infrastructure vs AdHoc, Wireless LAN, 802.11 standard, Physical layer	<ol style="list-style-type: none"> <li>1. Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2. Describe spread spectrum multiple access techniques</li> <li>3. Describes radio packets</li> <li>4. Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
8	Able to understand and explain the concepts of CDMA, Infrastructure vs AdHoc, Wireless LAN, 802.11 standard, Physical layer	<ol style="list-style-type: none"> <li>1. Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2. Describe spread spectrum multiple access techniques</li> <li>3. Describes radio packets</li> <li>4. Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Written Test 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
9	able to understand and explain AdHoc Network routing and DSR	<ol style="list-style-type: none"> <li>1. Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2. Describe spread spectrum multiple access techniques</li> <li>3. Describes radio packets</li> <li>4. Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
10	able to understand and explain AODV and DSDV as Optimized Routing protocols	<ol style="list-style-type: none"> <li>1. Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2. Describe spread spectrum multiple access techniques</li> <li>3. Describes radio packets</li> <li>4. Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%

11	Able to explain and identify Location Based Routing	<ol style="list-style-type: none"> <li>1.Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2.Describe spread spectrum multiple access techniques</li> <li>3.Describes radio packets</li> <li>4.Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
12	Students are able to identify Location Management in AdHoc Network	<ol style="list-style-type: none"> <li>1.Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2.Describe spread spectrum multiple access techniques</li> <li>3.Describes radio packets</li> <li>4.Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
13	Students are able to identify Mobile IP, Mobile Routing, mobile TCP	<ol style="list-style-type: none"> <li>1.Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2.Describe spread spectrum multiple access techniques</li> <li>3.Describes radio packets</li> <li>4.Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	5%
14	Students are able to identify Data Management in Wireless Mobile Environment	<ol style="list-style-type: none"> <li>1.Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2.Describe spread spectrum multiple access techniques</li> <li>3.Describes radio packets</li> <li>4.Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	10%
15	Students are able to identify Topological Design, Routing, and Handover in Satellite Networks	<ol style="list-style-type: none"> <li>1.Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2.Describe spread spectrum multiple access techniques</li> <li>3.Describes radio packets</li> <li>4.Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, discussion and reflection 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	10%
16	Students are able to identify Topological Design, Routing, and Handover in Satellite Networks	<ol style="list-style-type: none"> <li>1.Describe frequency division multiple access (FDMA) and time division (TDMA) techniques</li> <li>2.Describe spread spectrum multiple access techniques</li> <li>3.Describes radio packets</li> <li>4.Describes the capacity of the cellular system</li> </ol>	<p><b>Criteria:</b> Activeness and accuracy of answers</p> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Written Test 2 X 50		<p><b>Material:</b> Meeting material 4</p> <p><b>Bibliography:</b> <i>W. Stallings. 2005. Wireless Communications and Networks. 2nd edition. McGraw Hill.</i></p>	10%

#### Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	55%
2.	Project Results Assessment / Product Assessment	45%

## 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.