

General Curriculum

Undergraduate Program in Electrical Engineering Education

Faculty of Engineering (FT)

Universitas Negeri Surabaya (Unesa)

OBJECTIVE OF THE DEGREE PROGRAM

1. Institution Vision and Mission

The vision of Unesa is as follows:

“Excellent in Education Strong in Science”

The mission of Unesa is as follow:

- Organizing education and learning centered on students by using an active learning approach and optimizing the use of technology
- Conducting research in education, natural sciences, social and cultural sciences, arts, and / or sports, and technological development whose findings are beneficial for the development of science and public welfare
- Disseminating science, technology, arts and culture, and sports, and the results of research through community service-oriented towards empowering and civilizing the community
- Realizing Unesa as a center of education, mainly primary and secondary education and a scientific center based on the noble values of national culture
- Organizing an autonomous, accountable, and transparent tertiary education institution to guarantee and improve quality and improve quality continuously.

The vision of the Faculty of Engineering (FT) is as follows:

“Excellent in Technology and Vocational Education”

The mission of FT is as follow:

- Providing quality education that is relevant to the needs of the global job market and the development of science and technology, which refers to the National Standards of Higher Education.
- Improve the quality of educators and education personnel, the quality of facilities and infrastructure to support continuous improvement in the quality of the learning process.
- Develop research in the field of technology and vocational education based on professionalism to be applied in the context of community service and education.
- Build institutions that are healthy, efficient, effective, productive, transparent, accountable, prosperous, and fair.
- Develop cooperation with related national and international institutions on an ongoing basis.
- Produce educational and non-educational staff who are competent, professional, religious, creative, independent, and have the spirit of leadership and are capable of entrepreneurship.

2. Program Educational Objectives (PEO)

The 21st century is an information age where the development of communication and information technology will change the world into a more complex system characterized by change and openness. The 21st Century is also an era of participation and quality for all individuals and community contributions. The Electrical Engineering Education study program aims to produce graduates of education in the fields of electrical engineering and electronic engineering expertise who can work as teachers, instructors, *widyasuara*. Researchers in the areas of education, academics, and entrepreneurs with the following description: Mastering and applying teacher competency, which includes pedagogic, personality, social, and professional competencies.

1. Mastering and implementing pedagogical, professional, personality, and social competencies in the electrical engineering expertise program. (teacher training)
2. Mastering Science and Technology and have knowledge in the field of electrical engineering and electronic engineering (knowledge and understanding)
3. Mastering analytical techniques and scientific methods to solve problems in practice in the areas of electrical engineering and electronic engineering. (engineering analysis).
4. The ability to design products in the field of electrical engineering and electronic engineering. (engineering design)
5. Having skills in developing products in the field of electrical engineering. (engineering practice and product development)
6. Having the ability to transfer knowledge and expertise in the field of electrical engineering. (transferable skills)
7. Have the ability to adapt to the progress of electricity. (specific skills)

Table 1. The objective of The Undergraduate Program in Electrical Engineering Education versus the 6th Level of National Qualification Framework

	Capable of applying science, technology, and art within her/his expertise and adaptable to the various situation faced while solving a problem	Mastering in-depth general and specific theoretical concept of individual knowledge and capable of formulating related problem-solving procedure	Capable of taking the strategic decision based on the information and data analysis and provides direction in choosing various alternative solutions independently and in groups	Responsible for her/his job and can be assigned to take responsibility for the attainment of the organization's performances
Objective 1	S	S	S	S
Objective 2	S	S	S	S
Objective 3	S	S	S	S
Objective 4	S	S	S	M
Objective 5	S	S	S	M
Objective 6	S	S	M	S

S-Strong, M-Moderate

3. Program Learning Outcomes (PLO)

The Undergraduate Program in Electrical Engineering Education sets the Program Learning Outcomes (PLO) for the graduates as follows:

1. Able to synchronize the curriculum of electric power and electronic engineering training in vocational education that is relevant to the demands of global industrial development (Education).
2. Able to plan, implement, and evaluate innovative and effective learning programs in vocational electrical engineering education that are relevant to the development of the global industry (Education).
3. Able to apply applied research to innovate vocational learning methods, optimize production process technology and electrical engineering services that are relevant to industry (Education).
4. Having extensive knowledge in the field of general knowledge, social, and humanities (General).

5. Able to communicate in Indonesian and English, both speaking, listening, reading, and writing (General).
6. Has a responsible character and is committed to professional ethics (General / SSC4.6).
7. Having extensive knowledge of mathematics, science, and electrical engineering. Being able to solve complex problems that are typical in the electrification engineering and electronics engineering expertise program by following the rules of scientific writing (SSC2.2).
8. Can analyze the research and development of electrification engineering and electronic engineering expertise program by following the rules of scientific writing (SSC2.2).
9. Able to design series, devices, and products in the electricity expertise and electronics engineering program (SSC3.1).
10. Being able to become a practitioner who can apply his knowledge and skills to develop products in the electrification engineering and electronics engineering expertise program in a comprehensive manner (SSC4.1).
11. Having the ability to project management and business practices in entrepreneurship as a form of lifelong learning through education/training formally and informally (SSC5.3).

Those outcomes and the objectives of the Undergraduate Program in Physics are accessible to stakeholders through <http://ft.unesa.ac.id/>. Table 2 below shows the correlation between the program learning outcomes and the objectives of the program.

Table 2. Correlation between the Objective of the Undergraduate Program in Electrical Engineering Education and the Program Learning Outcomes

	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6
Outcome 1	S	S	S	M	M	S
Outcome 2	S	S	S	M	M	S
Outcome 3	S	S	S	S	S	M
Outcome 4	S	M	M	M	M	S
Outcome 5	S	M	M	M	M	S
Outcome 6	S	M	M	M	S	S
Outcome 7	S	S	S	M	M	M
Outcome 8	S	S	S	M	M	M
Outcome 9	S	S	S	S	S	M
Outcome 10	S	S	S	S	S	M
Outcome 11	S	S	S	S	S	S

S-Strong, M-Moderate

PROGRAM STRUCTURE

1. The Curriculum

The Undergraduate Program in Electrical Engineering Education offers two options of sciences those are Electrical Power Engineering and Communication Electronics. The Electrical Engineering Education curriculum is in line with the Unesa vision and carries out the mission set up to reach the goal of education. The Curriculum is reviewed and updated periodically every five years to make it by the dynamics of the outside world but still keeping the significant proportion of core Electrical Engineering Education. The current implemented curriculum is curriculum 2019. The present curriculum adopts new paradigms of education, which are:

- 1) Outcomes-based education
- 2) Learner-centered education/learning
- 3) Continuous improvement
- 4) International accreditation and benchmarking

To obtain a bachelor's degree, students should take 144 credit units (CU) consisting of 85 CU compulsory courses, 53 CU concentration courses, and up to 10 elective courses. A significant number of concentration and elective courses provided by the curriculum describe a variety of research groups.

The weight of research is reasonably adequate as the total credit units dedicated to the final project are 6 CU.

The 2019 curriculum of the undergraduate program is designed for 8 semesters (total 144 CU) and is divided into four study stages:

Stage 1: Freshman

Stage 2: Strong Foundation

Stage 3: Advanced Concepts

Stage 4: Bachelor Thesis

In terms of knowledge, the curriculum of the Undergraduate Program in Electrical Engineering Education is delivered in 4 phases, as illustrated in Figure 1. In this structure, the learning process to gain Electrical Engineering Education competence is modeled as a spiral. Based on this structure, the process of obtaining a learning outcome begins with the introduction of basic concepts of Electrical Engineering Education. Next, students are introduced to Mathematical, Physical, Educational, and Electrical to strengthen the understanding of fundamental concepts of Electrical Engineering Education. Advanced Electrical Engineering Education concepts are given at a higher level to obtain broad and deep Electrical Engineering Education fundamentals. They are accompanied by sufficient knowledge and skills in certain areas of expertise. At the end of

their studies, students are expected to be able to synthesize and apply previous knowledge and skills through a final project by taking on problems in the area of expertise they are interested in.

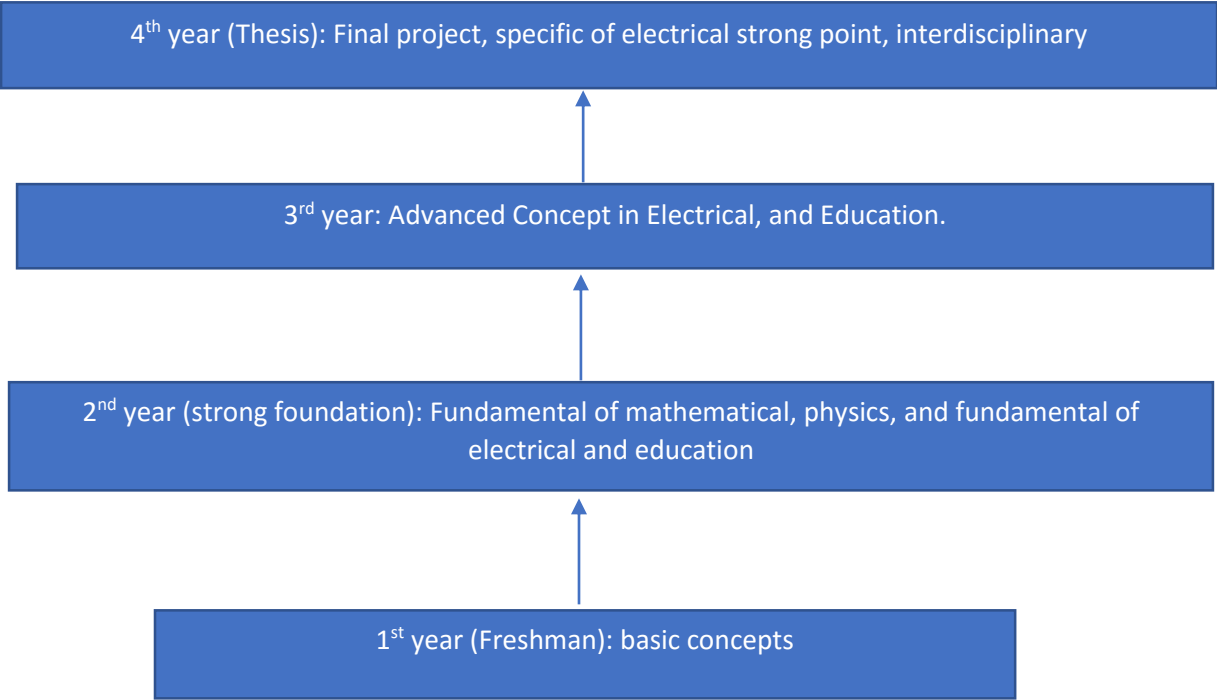


Figure 1. A model of curriculum structure of the Undergraduate Program in Electrical Engineering Education

The detail curriculum structure of the Undergraduate Program in Electrical Engineering Education and list of concentration and elective courses are shown in the table below

Table 3. Course Structure for Freshman

1 st Semester				2 nd Semester				
Code	Course Title	CU		Code	Course Title	CU		
1000002003	Core Personality Development Courses	Indonesian	2	1000002024	Core Personality Development Courses	Buddhist	2	
1000002018	Core Personality Development Courses	Pancasila Education	2			1000002025	Hindu Religious	
1000003042	Personality Development Courses	Basics of Education	3			1000002026	Islamic	
	Basic Skills Courses	Learning Theory	2			1000002027	Catholic Religious	
8320103059	Scientific and Skills Courses	Basic Engineering Mathematics	3			1000002028	Confucius Religious	
8320103037	Scientific and Skills Courses	Engineering Physics	2			1000002029	Protestant Religious	
	Scientific and Skills Courses	Practical Physics Engineering	1	1000002033	Core Personality Development Courses	Civic education	2	
8320102087	Scientific and Skills Courses	Vocational Education	2	8320103013	Personality Development Courses	English	3	
8320102156	Scientific and Skills Courses	Basic Electric Circuit	2	1000002039	Personality Development Courses	Educational Psychology	2	
					Personality Development Courses	Digital Literacy	2	
				8320102067	Basic Skills Courses	Learning Media	2	
				8320103060	Scientific and Skills Courses	Advanced Engineering Mathematics	3	
				8320102159	Scientific and Skills Courses	Advanced Electrical Circuits	2	
				8320102061	Scientific and Skills Courses	Basic Electromagnetic Field	2	
				8320102030	Scientific and Skills Courses	Basic Digital Electronics	2	
TOTAL			19	TOTAL			22	

Table 4. Course Structure for Strong Foundation

3 rd Semester				4 th Semester			
Code		Course Title	CU	Code		Course Title	CU
1000002011	Personality Development Courses	Basic socio-cultural / basic natural sciences	2	8320102178	Basic Skills Courses	Statistics	3
	Personality Development Courses	Physical Education and Fitness	2	8320103106	Basic Skills Courses	Innovative Learning Planning	2
8320103180	Scientific and Skills Courses	Learning strategies	2	8320102206	Basic Skills Courses	Educational Philosophy	2
8320102039	Scientific and Skills Courses	Computer programming	2	Communication Electronics Expertise Program			
8320102062	Scientific and Skills Courses	Advanced Electromagnetic Fields	2	8320102152	Scientific and Skills Courses	Basic Electronics Circuit	2
8320102031	Scientific and Skills Courses	Advanced Digital Electronics	2	8320103094	Scientific and Skills Courses	Digital Signal Processing	2
Communication Electronics Expertise Program				8320102010	Scientific and Skills Courses	Computer Applications in Electronic Studies	2
8320102123	Scientific and Skills Courses	Digital Electronics Practicum	1		Scientific and Skills Courses	Basic Telecommunications Systems	2
	Scientific and Skills Courses	Electronic image	2	8320103182	Scientific and Skills Courses	Audio Video Techniques	3
8320103025	Scientific and Skills Courses	Electronics	2	8320102049	Scientific and Skills Courses	Data communication	2
8320102164	Scientific and Skills Courses	Sensors and Actuators	2	Electric Power Engineering Expertise Program			
8320102184	Scientific and Skills Courses	Laser technique	2	8320103189	Scientific and Skills Courses	Refrigeration and Air Conditioning Engineering	2
8320102097	Scientific and Skills Courses	Electronic Measurement	2	8320102027	Scientific and Skills Courses	Power Electronics	2
Electric Power Engineering Expertise Program				8320102071	Scientific and Skills Courses	AC Electric Machine	2
8320102012	Scientific and Skills Courses	Electricity Materials	2	8320103172	Scientific and Skills Courses	Control and Control System	2

8320102039	Scientific and Skills Courses	Electrical Instrumentation and Measurement	2		Scientific and Skills Courses	Digital Electronics Practicum	2
8320102067	Scientific and Skills Courses	Engineering drawings	3	8320102017	Scientific and Skills Courses	Electric Repair Shop	2
8320102202	Scientific and Skills Courses	Transformer	2				
8320102120	Scientific and Skills Courses	Electromechanical Basic Practicum	2				

Table 5. Course Structure for Advanced Concept

5 th Semester				6 th Semester			
Code	Course Title	CU		Code	Course Title	CU	
8320103032	Basic Skills Courses	Learning Evaluation and Learning	2	8320103075	Basic Skills Courses	Research methodology	4
8320103044	Basic Skills Courses	School Curriculum	2		Creative Work Course	Micro Teaching	2
	Scientific and Skills Courses	Education Management	2				
Communication Electronics Expertise Program				8320103052	Subjects for Social Life	Community Service Program	3
8320102153	Scientific and Skills Courses	Advanced Electronic Circuit	2	Communication Electronics Expertise Program			
8320102122	Scientific and Skills Courses	Electronics Practicum	1	8320103147	Scientific and Skills Courses	Electronics Design	3
8320103041	Scientific and Skills Courses	Telecommunications Network	2	8320102006	Scientific and Skills Courses	Antennas and Propagation of Waves	2
8320103175	Scientific and Skills Courses	Telecommunication System	2		Scientific and Skills Courses	Antenna Practices and Wave Propagation	1
8320102133	Scientific and Skills Courses	Telecommunications Practicum	1	8320103064	Scientific and Skills Courses (selective)	Mechatronics	2

8320102170	Scientific and Skills Courses	Fiber Optic Communication System	2	8320102193	Scientific and Skills Courses (selective)	Switching Techniques	2
8320103077	Scientific and Skills Courses	Microcontroller	3	Electric Power Engineering Expertise Program			
	Scientific and Skills Courses	Microcontroller Practicum	1	8320102095	Scientific and Skills Courses	Optimization and Operation of the Electric Power System	3
Electric Power Engineering Expertise Program				8320102004	Scientific and Skills Courses	Electric Power System Analysis	2
8320102130	Scientific and Skills Courses	Electrical Engineering Practicum	2	8320102084	Scientific and Skills Courses	Maintenance and Repair of Electrical Machines	2
8320103102	Scientific and Skills Courses	Electric Power Planning and Installation	3	8320102165	Scientific and Skills Courses	Electric Power System Simulation	2
8320103072	Scientific and Skills Courses	DC Electric Machine	2	8320103144	Scientific and Skills Courses	Electric Power System Protection	3
8320102126	Scientific and Skills Courses	Electrical Installation Practicum	2				
8320103139	Scientific and Skills Courses	Programmable Logic Controller (PLC)	2				
8320102128	Scientific and Skills Courses	Full Practice and Automation	2				

Table 6. Course Structure for Thesis

7 th Semester				8 th Semester			
Code	Course Title	CU		Code	Course Title	CU	
8320102115	Scientific and Skills Courses	Internship	2	8320102207	Personality Development Courses	Entrepreneurship	2
	Creative Work Course	Introduction to School Field I	1	8320106177	Creative Work Course	Bachelor Thesis	6
	Creative Work Course	Introduction to School Field II	3	Communication Electronics Expertise Program			

Communication Electronics Expertise Program					Scientific and Skills Courses (selective)	IoT	2
8320102162	Scientific and Skills Courses	Industrial Robot	2	Electric Power Engineering Expertise Program			
8320102146	Scientific and Skills Courses (selective)	Radar and Navigation	2	8320102194	Scientific and Skills Courses (selective)	High Voltage Engineering	2
	Scientific and Skills Courses (selective)	Embedded System	2	8320102019	Scientific and Skills Courses (selective)	Scada Basics	2
	Scientific and Skills Courses (selective)	Industrial Automation	2				
Electric Power Engineering Expertise Program							
8320103176	Scientific and Skills Courses	Electric Power Transmission System	3				
8320102168	Scientific and Skills Courses	Electric Power Distribution System	2				
	Scientific and Skills Courses	Electric Energy Generation	2				
8320102085	Scientific and Skills Courses (selective)	Selection and Use of Electric Motors	2				
8320102104	Scientific and Skills Courses (selective)	Electric Power Network Planning	2				
8320102105	Scientific and Skills Courses (selective)	Electrical Engine Planning	2				

Table 7 Mapping of the courses that support the program learning outcomes (PLO)

	Code		Course Title	CU	PLO											
					1	2	3	4	5	6	7	8	9	10	11	
1	1000002024	Core Personality Development Courses	Buddhist	2				√		√						
	1000002025		Hindu Religious													
	1000002026		Islamic													
	1000002027		Catholic Religious													
	1000002028		Confucius Religious													
	1000002029		Protestant Religious													
2	1000002033	Core Personality Development Courses	Civic education	2				√		√						
3	1000002018	Core Personality Development Courses	Pancasila Education	2				√		√						
4	1000002003	Core Personality Development Courses	Indonesian	2				√	√	√						
5	8320103013	Personality Development Courses	English	3				√	√	√						
6	1000002011	Personality Development Courses	Basic socio-cultural / basic natural sciences	2				√		√						
7	8320102207	Personality Development Courses	Entrepreneurship	2					√	√		√				√
8		Personality Development Courses	Digital Literacy	2				√	√	√						
9		Personality Development Courses	Physical Education and Fitness	2				√		√						
10	1000003042	Personality Development Courses	Basics of Education	3	√	√	√			√						
11	1000002039	Personality Development Courses	Educational Psychology	2	√	√	√			√						
12	8320103075	Basic Skills Courses	Research methodology	4			√			√		√	√			
13	8320102178	Basic Skills Courses	Statistics	3			√			√		√	√			
14	8320102206	Basic Skills Courses	Educational Philosophy	2	√	√	√			√						
15		Basic Skills Courses	Learning Theory	2	√	√	√			√						
16	8320103044	Basic Skills Courses	School Curriculum	2	√	√	√			√						
17	8320103106	Basic Skills Courses	Innovative Learning Planning	2	√	√	√			√						
18	8320102067	Basic Skills Courses	Learning Media	2	√	√	√			√						
19	8320103032	Basic Skills Courses	Learning Evaluation and Learning	2	√	√	√			√						
20		Creative Work Course	Micro Teaching	2	√	√	√			√		√				
21		Creative Work Course	Introduction to School Field I	1	√	√	√			√		√				
22		Creative Work Course	Introduction to School Field II	3	√	√	√			√		√				

23	8320106177	Creative Work Course	Bachelor of Thesis	6	√	√	√	√	√	√	√	√	√	√	√
24	8320103052	Subjects for Social Life	Community Service Program	3				√	√	√		√			√
25	8320103059	Scientific and Skills Courses	Basic Engineering Mathematics	3						√	√				
26	8320103037	Scientific and Skills Courses	Engineering Physics	2						√	√				
27		Scientific and Skills Courses	Practical Physics Engineering	1						√			√	√	
28	8320102087	Scientific and Skills Courses	Vocational Education	2	√	√	√			√					
29	8320102156	Scientific and Skills Courses	Basic Electric Circuit	2						√	√				
30	8320103060	Scientific and Skills Courses	Advanced Engineering Mathematics	3						√	√				
31	8320102159	Scientific and Skills Courses	Advanced Electrical Circuits	2						√	√				
32	8320102061	Scientific and Skills Courses	Basic Electromagnetic Field	2						√	√				
33	8320102030	Scientific and Skills Courses	Basic Digital Electronics	2						√	√				
34	8320103180	Scientific and Skills Courses	Learning strategies	2	√	√	√			√					
35	8320102039	Scientific and Skills Courses	Computer programming	2						√	√				
		Code	Course Title	CU	PLO										
					1	2	3	4	5	6	7	8	9	10	11
36	8320102062	Scientific and Skills Courses	Advanced Electromagnetic Fields	2						√	√				
37	8320102031	Scientific and Skills Courses	Advanced Digital Electronics	2						√	√				
38		Scientific and Skills Courses	Education Management	2	√	√	√			√					
39	8320102115	Scientific and Skills Courses	Industry practice	2					√	√				√	√
Communication Electronics Expertise Program															
40	8320102123	Scientific and Skills Courses	Digital Electronics Practicum	1						√			√	√	
41	8320103025	Scientific and Skills Courses	Electronics	2						√	√				
42	8320102164	Scientific and Skills Courses	Sensors and Actuators	2						√	√				
43	8320102184	Scientific and Skills Courses	Laser technique	2						√	√				
44	8320102097	Scientific and Skills Courses	Electronic Measurement	2						√	√		√	√	
45	8320102152	Scientific and Skills Courses	Basic Electronics Circuit	2						√	√				

46	8320103094	Scientific and Skills Courses	Digital Signal Processing	2							√	√			
47		Scientific and Skills Courses	Electronic image	2							√	√		√	√
48	8320102010	Scientific and Skills Courses	Computer Applications in Electronic Studies	2							√			√	√
49		Scientific and Skills Courses	Basic Telecommunication s Systems	2							√	√			
50	8320103182	Scientific and Skills Courses	Audio Video Techniques	3							√	√			
51	8320102049	Scientific and Skills Courses	Data communication	2							√	√			
52	8320102153	Scientific and Skills Courses	Advanced Electronic Circuit	2							√	√			
53	8320102122	Scientific and Skills Courses	Electronics Practicum	1							√			√	√
54	8320103041	Scientific and Skills Courses	Telecommunication s Network	2							√	√			
55	8320103175	Scientific and Skills Courses	Telecommunication System	2							√	√			
56	8320102133	Scientific and Skills Courses	Telecommunication s Practicum	1							√			√	√
57	8320102170	Scientific and Skills Courses	Fiber Optic Communication System	2							√	√			
58	8320103077	Scientific and Skills Courses	Microcontroller	3							√	√			
59		Scientific and Skills Courses	Microcontroller Practicum	1							√			√	√
60	8320103147	Scientific and Skills Courses	Electronics Design	3							√			√	√
61	8320102006	Scientific and Skills Courses	Antennas and Propagation of Waves	2							√	√			
62		Scientific and Skills Courses	Antenna Practices and Wave Propagation	1							√			√	√
63	8320102162	Scientific and Skills Courses	Industrial Robot	2							√	√			
64	8320103064	Scientific and Skills Courses (selective)	Mechatronics	2							√	√			
65	8320102193	Scientific and Skills Courses (selective)	Switching Techniques	2							√	√			
66	8320102146	Scientific and Skills Courses (selective)	Radar and Navigation	2							√	√			
67		Scientific and Skills Courses (selective)	Embedded System	2							√	√			
68		Scientific and Skills Courses (selective)	IoT	2							√	√			

69		Scientific and Skills Courses (selective)	Industrial Automation	2							√	√				
Electric Power Engineering Expertise Program																
40	8320102012	Scientific and Skills Courses	Electricity Materials	2							√	√				
41	8320102039	Scientific and Skills Courses	Electrical Instrumentation and Measurement	2							√	√		√		
42	8320102067	Scientific and Skills Courses	Engineering drawings	3							√	√		√		
43	8320102202	Scientific and Skills Courses	Transformer	2							√	√				
44	8320102120	Scientific and Skills Courses	Electromechanical Basic Practicum	2							√			√	√	
45	8320102004	Scientific and Skills Courses	Electric Power System Analysis	2							√	√				
46	8320102027	Scientific and Skills Courses	Power Electronics	2							√	√			√	
47	8320102071	Scientific and Skills Courses	AC Electric Machine	2							√	√			√	
48	8320102168	Scientific and Skills Courses	Electric Power Distribution System	2							√	√		√	√	
49	8320103172	Scientific and Skills Courses	Control and Control System	2							√	√			√	
		Code	Course Title	CU	PLO											
					1	2	3	4	5	6	7	8	9	10	11	
50	8320103189	Scientific and Skills Courses	Refrigeration and Air Conditioning Engineering	2						√	√		√	√		
51	8320102130	Scientific and Skills Courses	Electrical Engineering Practicum	2						√			√	√		
52	8320102084	Scientific and Skills Courses	Maintenance and Repair of Electrical Machines	2						√	√		√	√		
53	8320103101	Scientific and Skills Courses	Electric Lighting Planning and Installation	2						√	√			√		
54	8320103102	Scientific and Skills Courses	Electric Power Planning and Installation	3						√	√			√		
55	8320103072	Scientific and Skills Courses	DC Electric Machine	2						√	√					
56	8320102126	Scientific and Skills Courses	Electrical Installation Practicum	2						√			√	√		
57	8320103139	Scientific and Skills Courses	Programmable Logic Controller (PLC)	2						√	√		√	√		
58	8320102128	Scientific and Skills Courses	Full Practice and Automation	2						√			√	√		

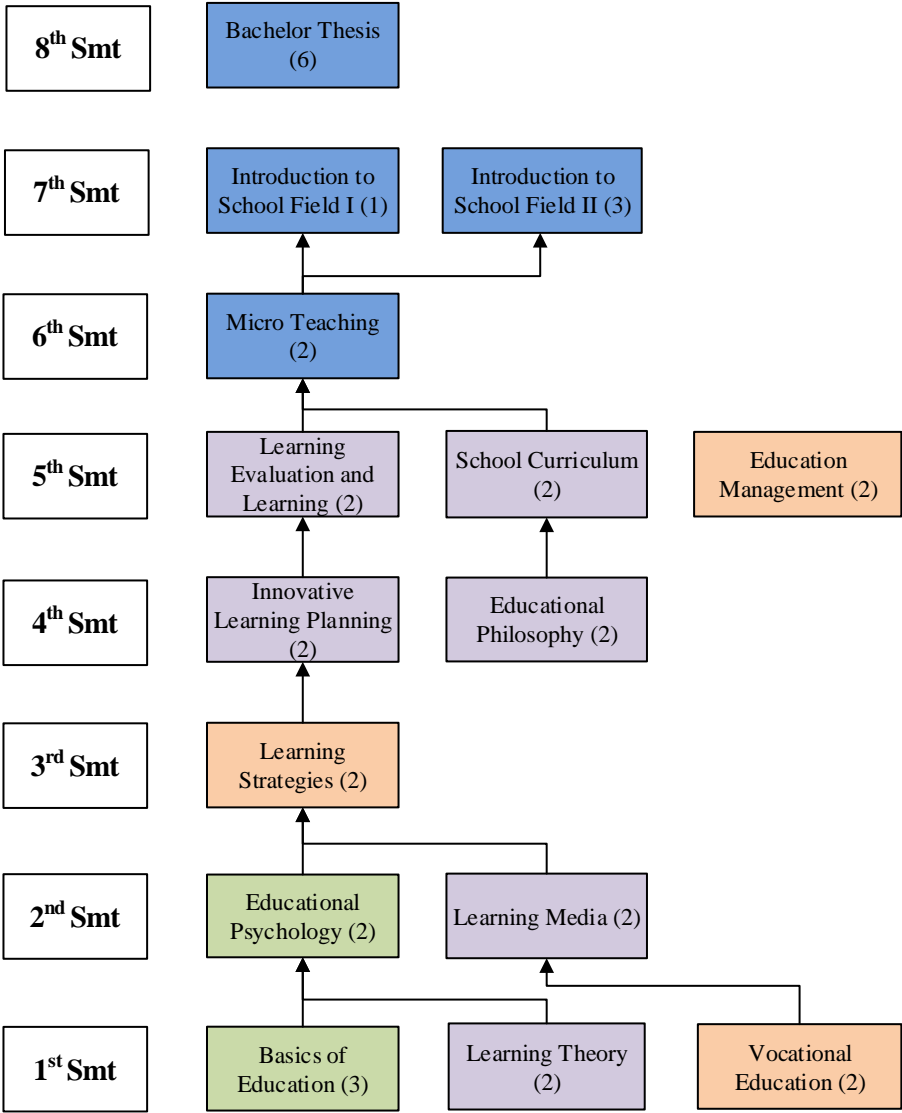
59	8320102017	Scientific and Skills Courses	Bengkel Listrik	2							√			√	√	
60	8320103144	Scientific and Skills Courses	Electric Power System Protection	3							√	√		√	√	
61	8320103176	Scientific and Skills Courses	Electric Power Transmission System	3							√	√		√	√	
62		Scientific and Skills Courses	Electric Energy Generation	2							√	√				
63	8320102095	Scientific and Skills Courses	Optimization and Operation of the Electric Power System	3							√	√				
64	8320102165	Scientific and Skills Courses	Electric Power System Simulation	2							√	√				
65	8320102085	Scientific and Skills Courses (selective)	Selection and Use of Electric Motors	2							√	√		√	√	
66	8320102104	Scientific and Skills Courses (selective)	Electric Power Network Planning	2							√			√	√	
67	8320102105	Scientific and Skills Courses (selective)	Electrical Engine Planning	2							√			√	√	
68	8320102194	Scientific and Skills Courses (selective)	High Voltage Engineering	2							√	√				
69	8320102019	Scientific and Skills Courses (selective)	Scada Basics	2							√	√		√	√	

COURSE ROADMAP

The whole courses in the program are prepared to support the success of achieving Learning Outcomes. All courses taken by students contribute to the achievement of PLOs. The following table shows the relationship (mapping) between the courses and the PLOs.

Table 6. Mapping of the courses that support the program learning outcomes (PLO)

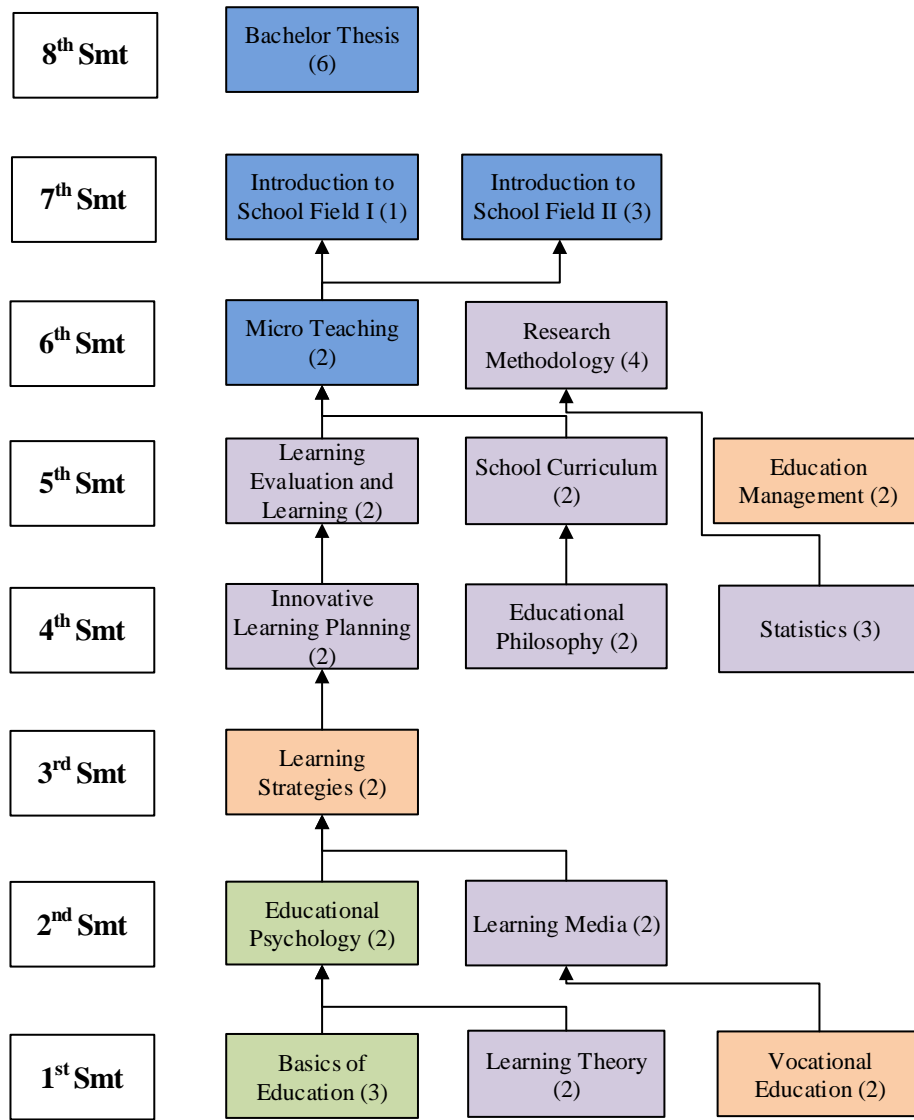
ROADMAP PLO1 DAN PLO2



Keterangan:

- Core Personality Development Courses
- Institutional Personality Development Courses
- Basic Skills Courses
- Creative Work Courses
- Subjects for Social Life
- Scientific and Skills Courses
- Scientific and Skills Courses (Selective)

ROADMAP PLO3



Keterangan:

- Core Personality Development Courses
- Institutional Personality Development Courses
- Basic Skills Courses
- Creative Work Courses
- Subjects for Social Life
- Scientific and Skills Courses
- Scientific and Skills Courses (Selective)

ROADMAP PLO4

8th Smt

Bachelor Thesis
(6)

7th Smt

6th Smt

Community
Service Program
(3)

5th Smt

4th Smt

3rd Smt

Basic Social Cultural/
Basic Natural
Science (2)

Physical
Education and
Fitnes (2)

2nd Smt

Religion (2)

Civic Education
(2)

English (3)

Digital Literacy
(2)

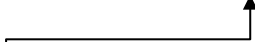
1st Smt

Pancasila
Education (2)

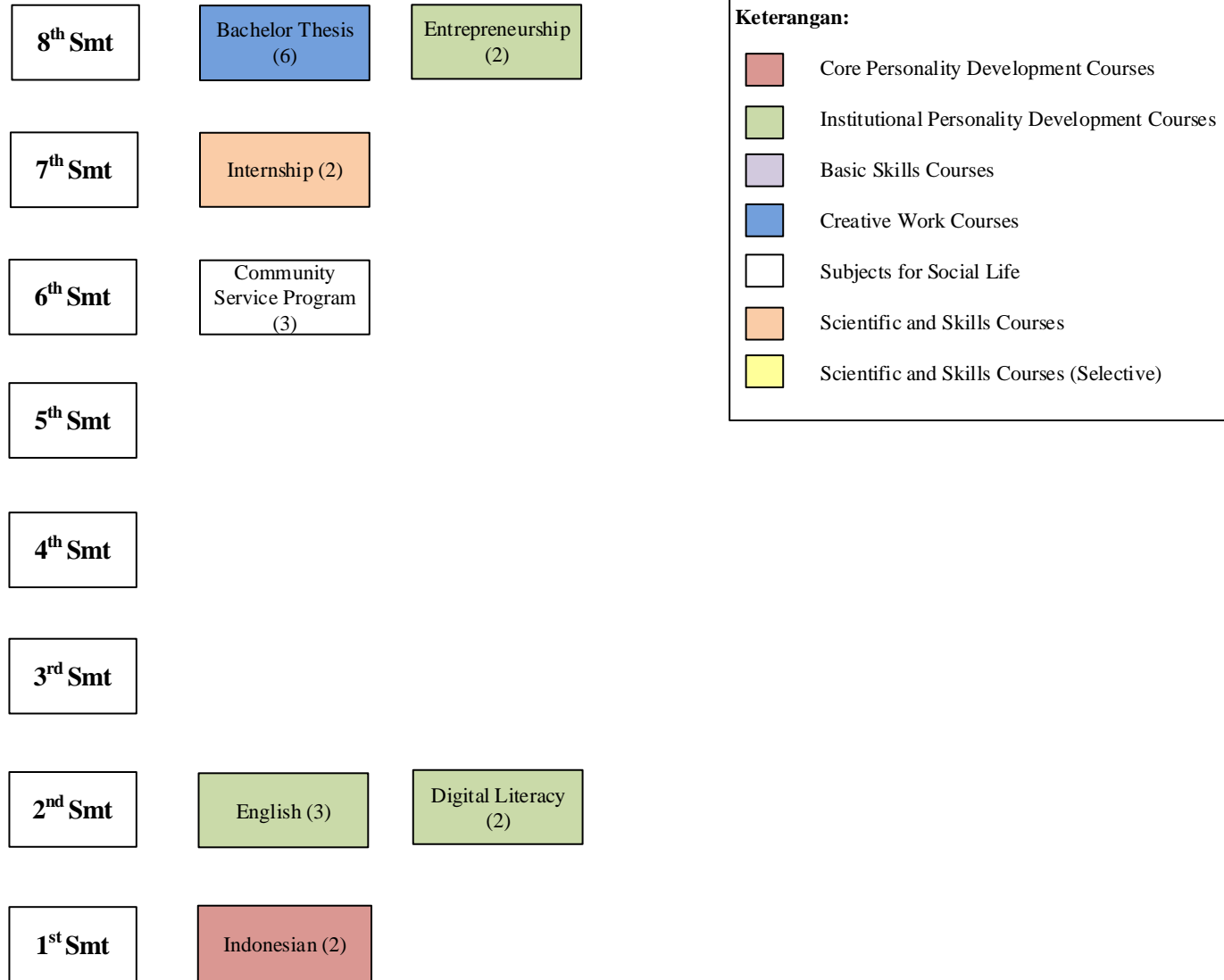
Indonesian (2)

Keterangan:

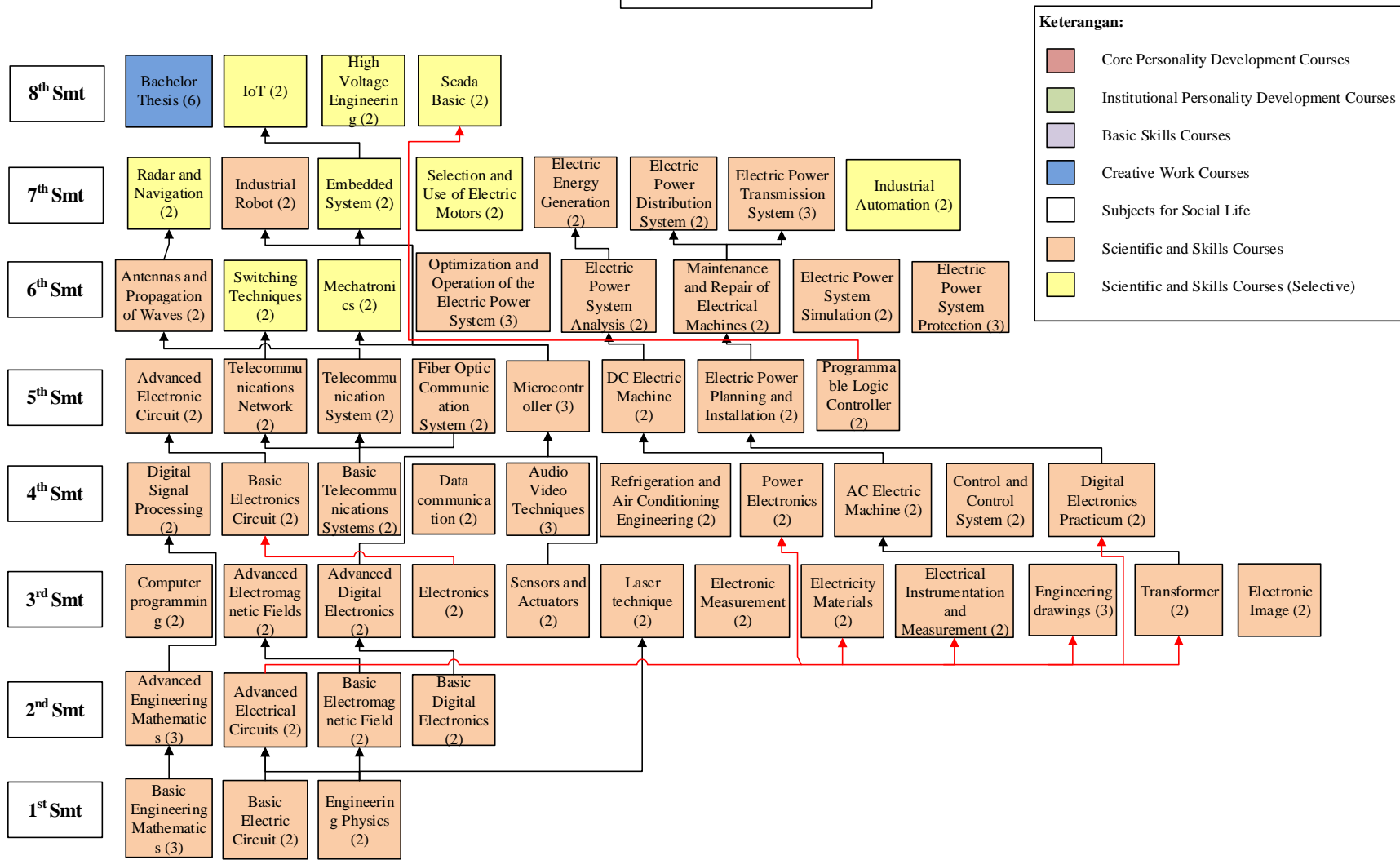
- Core Personality Development Courses
- Institutional Personality Development Courses
- Basic Skills Courses
- Creative Work Courses
- Subjects for Social Life
- Scientific and Skills Courses
- Scientific and Skills Courses (Selective)



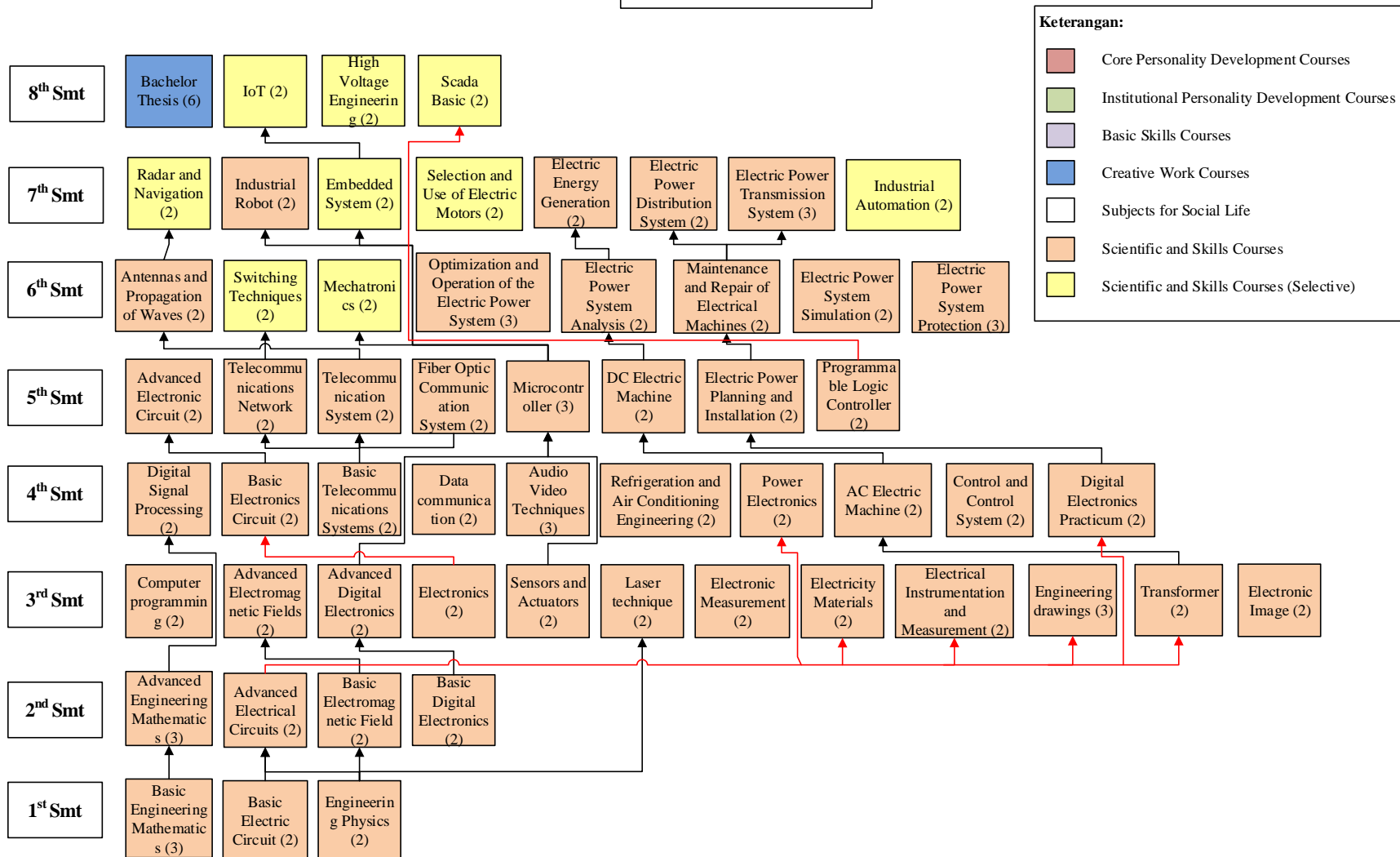
ROADMAP PLO5



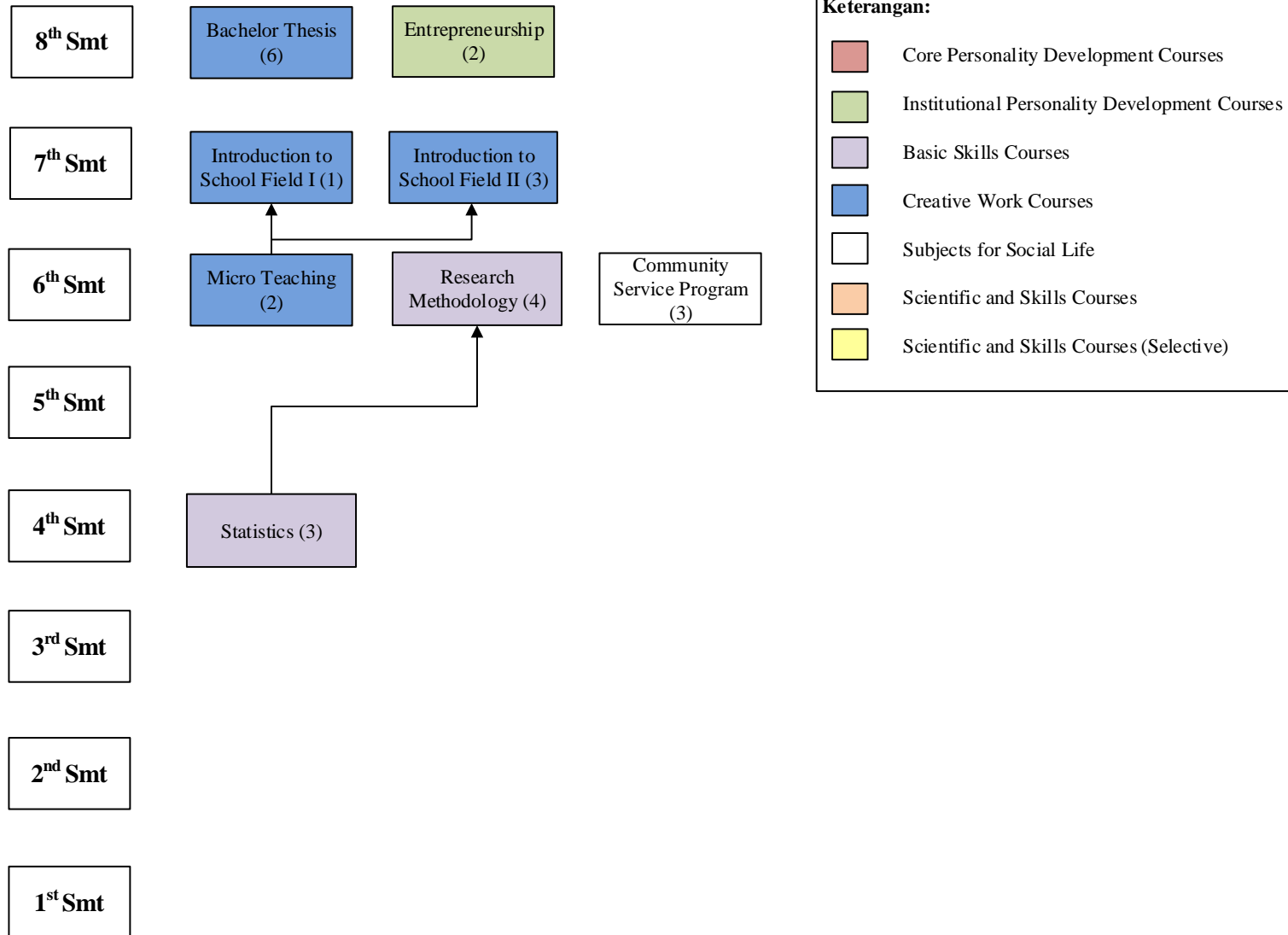
ROADMAP PLO6



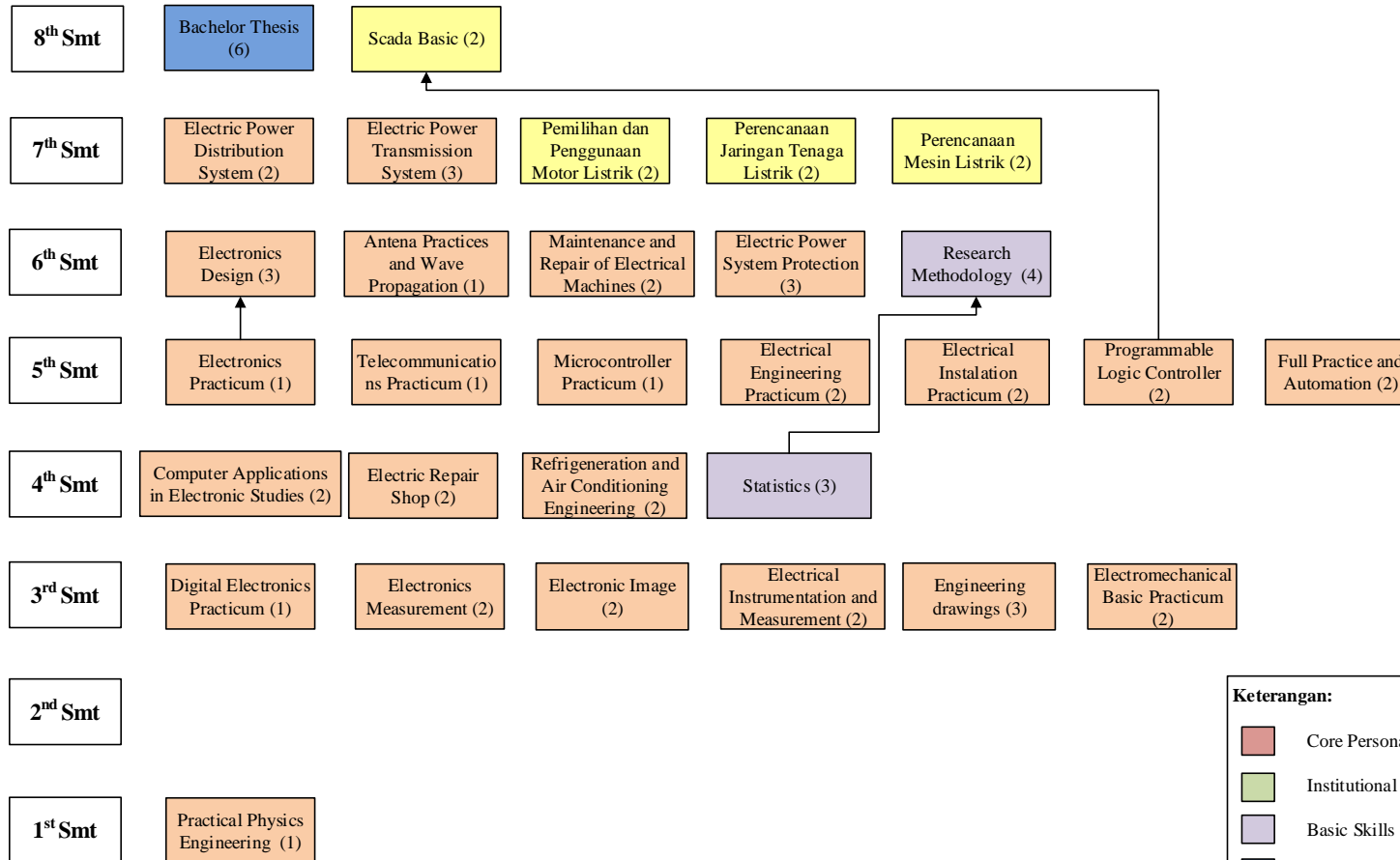
ROADMAP PLO7



ROADMAP PLO8



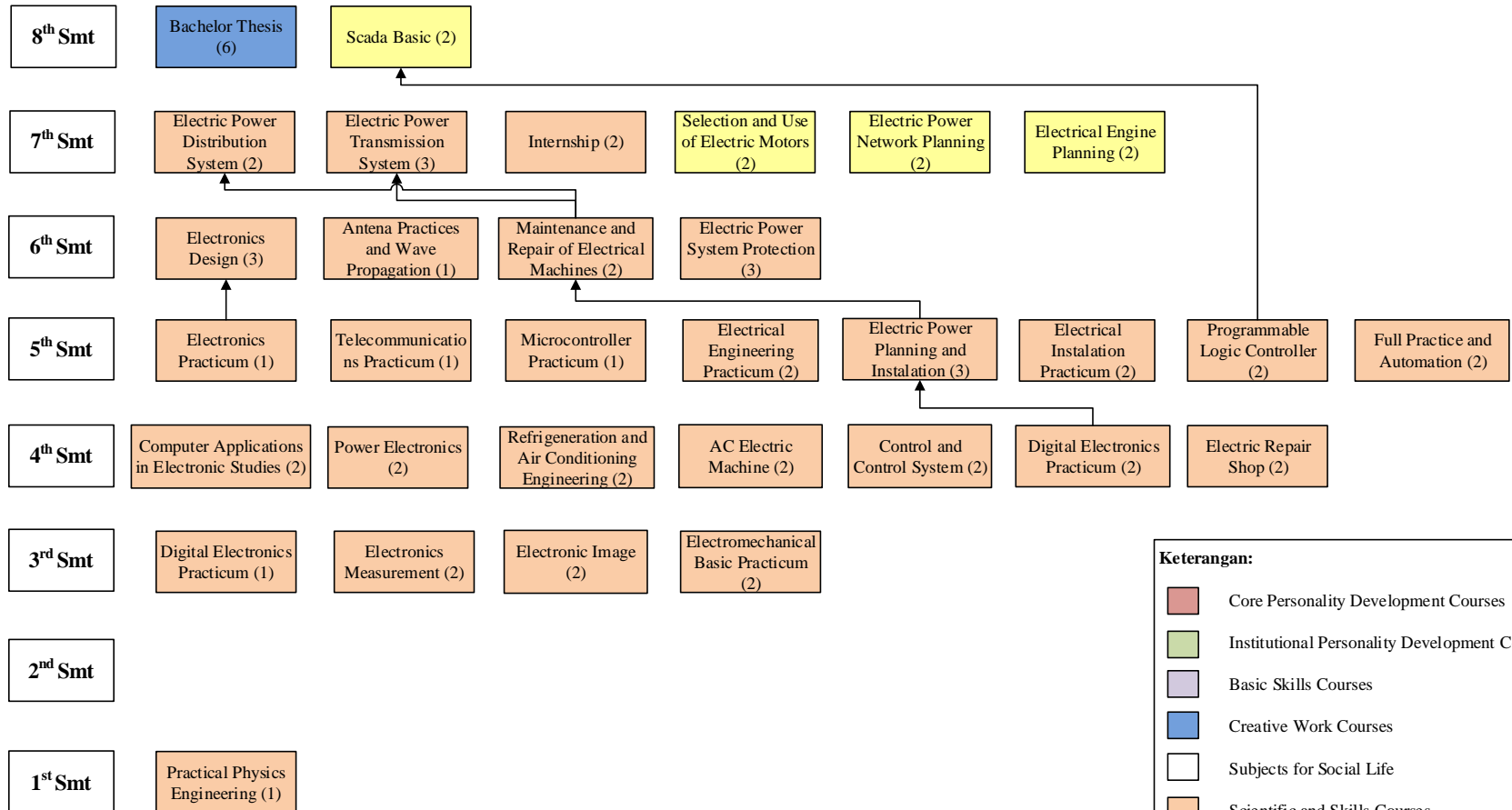
ROADMAP PLO9



Keterangan:

- Core Personality Development Courses
- Institutional Personality Development Courses
- Basic Skills Courses
- Creative Work Courses
- Subjects for Social Life
- Scientific and Skills Courses
- Scientific and Skills Courses (Selective)

ROADMAP PLO10



Keterangan:

- Core Personality Development Courses
- Institutional Personality Development Courses
- Basic Skills Courses
- Creative Work Courses
- Subjects for Social Life
- Scientific and Skills Courses
- Scientific and Skills Courses (Selective)

ROADMAP PLO11

