Kementerian Pendidikan Tinggi, Sains, dan Teknologi
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KURIKULUM PROGRAM STUDI PENDIDIKAN TEKNIK ELEKTRONIKA DAN INFORMATIKA - S2

https://ptei.ft.uny.ac.id/

Master of Electronics and Informatics Engineering Education (MEIEE)

DEAN'S REMARKS

Assalamu'alaikum warahmatullahi wabarakatuh,

Greetings to all of us,

Let us offer praise and gratitude to Allah SWT for His abundant mercy and grace, through which the process of compiling the Outcome-Based Education (OBE)-based curriculum book in our faculty has been successfully carried out.

I extend my highest appreciation to the entire curriculum drafting team, lecturers, educational staff, alumni, external stakeholders (industry, schools, and colleagues from universities), and all parties who have contributed to this process. The preparation of this curriculum book is a strategic step in improving the quality of higher education—one that not only keeps pace with the times but also responds to the competency demands of the 21st century.

As we all know, the OBE approach emphasizes learning outcomes as the primary orientation in the learning process. This makes the curriculum not merely an academic document, but also a guiding instrument to ensure that the educational process produces graduates who are excellent, creative, innovative, competent, and ready to face global dynamics.

This curriculum book is expected to serve as the primary reference for implementing structured, measurable learning activities aligned with learning outcomes. In addition, this book will also facilitate continuous evaluation and quality assurance processes.

I believe this success is the result of collective work and a collaborative spirit from the entire academic community. May this hard work become a strong foundation for building an excellent, creative, and sustainably innovative academic culture.

Finally, I would like to express my thanks and congratulations on the completion of this curriculum book. May Allah SWT always grant guidance and blessings in every step we take to educate the nation's life.

Wassalamu'alaikum warahmatullahi wabarakatuh.

Yogyakarta, 21 April 2025
Dean of the Faculty of Engineering UNY

Prof. Dr. Mutiara Nugraheni, S.TP., M.Si.

FOREWORD BY THE HEAD OF STUDY PROGRAM

Assalamu'alaikum warahmatullahi wabarakatuh,

This 2025 Curriculum Book for the Master's Program in Electronics and Informatics Engineering Education is prepared as a reference for the implementation of academic education for the Master's Program in Electronics and Informatics Engineering Education, Faculty of Engineering, Yogyakarta State University (FT UNY). This book serves as an official guide for students, lecturers, and related parties in understanding the direction of educational development, research, and the application of technology that is relevant to the needs of the times—particularly in the field of electronics and informatics engineering education.

The revision and renewal of this curriculum is an important step to respond to the rapidly evolving challenges in education, technology, and industry. In this new curriculum, we emphasize strong mastery of in-depth theoretical concepts in electronics and informatics engineering, as well as educational sciences, combined with a more applied approach based on intelligent technologies and the demand s of Industry 4.0 and 5.0. This curriculum is also designed to equip students with the ability to continuously develop their knowledge in a sustainable manner, so they can contribute to educational innovation and future technological development.

This program aims not only to produce graduates who are competent in engineering and education, but also graduates who are able to manage educational institutions, research projects, and technology-based businesses or entrepreneurship. We believe that by emphasizing lifelong learning and direct application in industry, our graduates will be ready to face various global challenges and play an active role in advancing technology-based vocational education.

We hope this curriculum book provides clear and comprehensive insight into the educational structure, courses, and the learning outcomes expected of students. May every step taken in this educational process result in significant contributions to the world of education and to society as a whole.

Keep striving in pursuing a meaningful and challenging education. May each of your achievements create a lasting positive impact on the advancement of science and technology in the field of electronics and informatics engineering education.

Yogyakarta, 21 April 2025
Head of Master of Electronics and Informatics Engineering Education Study Program

Dr. Ir. Fatchul Arifin, MT.

PROGRAM STUDY IDENTITY

Study Program Name	:	Master's Program in Electronics and Informatics Engineering Education (S2)
Establishment Permit	:	Decree of the Minister of Education and Culture No. 360/E/O/2014
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INTRODUCTION

A. BACKGROUND

Curriculum change is natural and should occur as part of a dynamic (Dewey, 1938) and continuous process (Tyler, 1949; Directorate General of Higher Education, Research and Technology, 2024). Various disruptive and accelerating changes in the global context (Megatrends 2045, the Industrial Revolution 5.0, the SDGs, green economics, the digital era, new generations); the regional context within the ASEAN Economic Community framework; the national context within the framework of national development toward Golden Indonesia 2045; as well as the local context within regional development priorities, provide a very strong rationale for the need to adjust the curriculum. These changes have consequences that require new human resource capabilities—indeed, capabilities that may be far different from those of today, including those of higher education graduates. Higher education is required to produce graduates who excel academically and scientifically, possess creativity and innovation, are collaborative, capable of problem-solving and critical thinking, are responsive and adaptive to global challenges, and are committed to ethical values and sustainability.

Yogyakarta State University (UNY), as one of the leading higher education institutions, is strongly committed to producing high-quality graduates. This commitment is realized through adaptive, innovative, and collaborative curriculum reconstruction; innovative learning; and adaptive, comprehensive assessment. The envisioned curriculum is more innovative, adaptive, flexible, and collaborative, aligned with future workforce needs.

This is consistent with the purpose of education as a conscious and planned effort to create a learning environment and learning process that enables learners to actively develop their potential so that they possess spiritual religious strength, self-control, personality, intelligence, noble character, and the skills needed for themselves, society, the nation, and the state (Law Number 12 of 2012).

The development of the UNY 2025 Curriculum was carried out based on the results of a comprehensive evaluation of the implementation of the UNY 2020 Curriculum, in line with various demand s for change driven by the very rapid acceleration of developments across multiple contexts. Curriculum development also refers to various changes in national regulations, including the Higher Education System Law, the Indonesian National Qualifications Framework, and the National Standards for Higher Education. In addition, curriculum development also refers to the achievement of UNY's vision and priority development programs.

The challenge faced by higher education institutions in curriculum development in the industry 5.0 era—with its various attributes in global and regional contexts—is to produce graduates who are excellent, competitive, and adaptive in facing future challenges, equipped with relevant knowledge and skills as well as strong moral values. As is well known, the Industrial Revolution 5.0 has begun to unfold with a focus on collaboration between humans and machines to empower people to fully utilize their skills and to make work safer, more efficient, and more meaningful. Closely related keywords include automation, robotization, big data analytics, smart systems, virtualization, AI, machine learning, and the Internet of Things. Automation systems and artificial intelligence (AI) are not only used to improve production efficiency, but also to increase human engagement in the process. The graduates expected are those who can contribute optimally to national development and play an active role at regional and global levels. Higher education institutions, including UNY, need to reorient and reconstruct curricula that can meet these challenges. Competencies such as leadership, language skills, IT literacy, and writing skills need to receive adequate emphasis.

The development of the UNY 2025 Curriculum is carried out by taking into account the context of 21st-century education, not only prioritizing mastery of scientific/technical fields, but

also instilling various skills as outlined in 21st-century competencies. The 21st-century competencies referred to include life and career skills (life skills and work skills).

Learning and innovation skills (skills for learning and innovating) and information, media, and technology skills (skills related to information, media, and technology). The expected graduates are those who possess comprehensive capabilities—both hard skills and soft skills—in a harmonious balance.

Law Number 12 of 2012 on Higher Education states that curriculum development is the right of higher education institutions; however, it also stipulates that curriculum development must refer to national standard. A curriculum as a design consists of four elements: learning outcomes, areas of study/content, the learning process to achieve them, and assessment. Based on this, the development of the UNY 2025 Curriculum refers to the National Standards for Higher Education as set out in the Regulation of the Minister of Education, Culture, Research, and Technology (Permendikbudristek) No. 53 of 2023 on Higher Education Quality Assurance. The full curriculum design comprises eight (8) National Education Standards, grouped into Output Standards, Process Standards, and Content Standards.

The 2025 Curriculum development refers to the Indonesian National Qualifications Framework (INQF), which contains nine (9) competency qualification levels. The INQF serves as a reference for aligning, equating, and integrating the fields of education and job training, as well as work experience, in the formulation of learning outcomes. Every higher education graduate, including those from UNY, must achieve a certain INQF level. Bachelor's and Applied Bachelor's graduates are required to reach INQF level 6; Professional programs must reach INQF level 7; Master's programs must reach INQF level 8; and Doctoral programs must reach INQF level 9. This is intended to ensure that graduates have qualifications equivalent to those agreed upon within the INQF. Curriculum design begins by determining the graduate profile, which is then elaborated into Graduate Learning Outcomes (CPL). The capability statements in the INQF descriptors are expressed using the term "learning outcomes," while competencies are encompassed within—or form part of—those learning outcomes (CPL).

Government Regulation of the Republic of Indonesia Number 35 of 2022 on Yogyakarta State University as a State University with Legal Entity status establishes the vision: "To become a world-class education university that is excellent, creative, and sustainably innovative." In an effort to realize this vision, the development of the UNY 2025 Curriculum is carried out by integrating the values of excellence, creativity, and sustainable innovation at every stage of curriculum implementation. This vision is elaborated in one of the missions: to provide excellent, creative, innovative, and sustainable academic, vocational, and professional education at all levels. In the context of becoming a world-class education university, the UNY 2025 Curriculum is designed to produce graduates with strong character who are able to adapt and excel at both regional and international levels.

The UNY 2025 Curriculum is designed with attention to developments in science and scholarship and to new paradigms in higher education curriculum development. Outcome-Based Curriculum (OBC), as part of implementing Outcome-Based Education (OBE), is the curriculum development paradigm used in alignment with the 2024 Guidelines for Higher Education Curriculum Development. Curriculum development that is grounded in graduate outputs or learning outcomes is expected to respond to dynamic human resource needs, government policies, and global issues in education, such as biodiversity conservation, climate change, the Millennium Development Goals (MDGs), the Sustainable Development Goals (SDGs), strengthening global citizenship, and a more inclusive, adaptive, and personalized educational orientation—toward achieving UNY's vision while also contributing to the realization of Indonesia Emas 2045. Through this approach, the UNY 2025 Curriculum is expected to produce graduates who are not only excellent academically

and professionally, but also collaborative, responsive, and adaptive to global and local challenges, and committed to ethical values and sustainability.

Both theoretically and in practice, curriculum development begins with an evaluation of the existing curriculum (maintaining or improving what is already good, and improving what is still lacking in line with the dynamics of external change and internal conditions), followed by curriculum development, implementation, and re-evaluation. To ensure that the processes of curriculum development, implementation, and evaluation can be carried out systematically, purposefully, effectively, and efficiently, a university-level curriculum development guide is needed.

B. CURRICULUM DEVELOPMENT FOUNDATION

The curriculum development of Yogyakarta State University (UNY) is not based solely on academic needs and labor market demand s, but also on a set of comprehensive and in-depth foundations. This development process refers to five main foundations: (1) the Philosophical Foundation, (2) the Sociological Foundation, (3) the Psychological Foundation, (4) the Historical Foundation, and (5) the Juridical/Legal Foundation, which serve as the basis for formulating a holistic curriculum that is relevant to various aspects of life.

1. Philosophical Foundation

The UNY curriculum is grounded in the philosophy of Pancasila and aims to formulate "Pancasila-based knowledge". This Pancasila-based knowledge will serve as the foundation for Indonesian civilization. Higher education institutions such as UNY have the duty and responsibility to help formulate Pancasila-based knowledge, in addition to providing education and teaching related knowledge to future generations. In line with this, UNY carries the slogan "leading in character education."

Indonesian civilization is based on national culture and the culture of Pancasila. Pancasila culture consists of two elements that reflect two driving forces in Indonesia's history. The first element is modern culture along with the modern knowledge that supports it. Accordingly, Indonesian civilization is built in the form of a modern state (the nation-state system). The second element is indigenous culture, including religions that have inspired the intentions and purposes of civilization-building. In Indonesian history, religion has played an important role in shaping civilization, giving rise to the term "Bhinneka Tunggal Ika" (Unity in Diversity). This term is highly compatible with the idea of "tolerance" in modern civilization, creating continuity between indigenous culture and modern culture.

Pancasila was indeed drawn from the Indonesian homeland as a result of compromise among various socio-political forces. It was also offered as a solution to the crisis of modern civilization, which has produced wars, failed to create world peace, and failed to resolve global humanitarian problems. Modern civilization has succeeded in helping Western countries become developed nations, but it has left unresolved issues in other parts of the world because Western civilization is anthropocentric and heavily shaped by personal or national interests. The Pancasila paradigm is expected to address the crisis of modern civilization because it makes room for religions to inject spiritual values into modern civilization. However, this is not easy, as it relates to the capacity to formulate Pancasila-based knowledge.

The level of advancement of Indonesian civilization depends on the quality of Pancasila-based knowledge formulated from Pancasila culture. If Indonesia has not yet become a developed country after 79 years of independence, it means it has not well formulated Pancasila-based knowledge. National culture (Pancasila) is not something taken for granted; it is also related to the ability to integrate modern culture along with the knowledge system that underpins it. The low literacy level of Indonesian students, as reflected in the 2023 PISA results, illustrates this. Although Indonesia's literacy ranking increased by 5% compared to 2018, the score itself declined. This

occurred because the implementation of the 2013 Curriculum (Revised 2017) and the Merdeka Curriculum has not been accompanied by the formulation of knowledge based on the theoretical framework of modern civilization.

2. Sociological Foundation

The sociological foundation in curriculum development refers to social considerations that influence and shape the educational process. In this context, the curriculum functions not only as a tool for transferring knowledge, but also as an instrument for understand ing, adapting to, and responding to social dynamics within society. The sociological foundation involves analyzing factors such as social structure, cultural values, demographic change, labor market needs, and global challenges that affect people's lives. The following sociological contexts are taken into account in developing the UNY 2025 Curriculum:

a. Social and Cultural Change: Indonesian society and the world in general are undergoing rapid social and cultural changes, largely influenced by globalization, digitalization, and technological advances. The curriculum must be able to reflect these changes and prepare students to participate actively in an increasingly plural and dynamic society.
b. Workforce Needs: The dynamics of the labor market are also an important consideration, as graduates are expected to possess competencies that match current industry needs. This includes technical skills, soft skills, and the ability to adapt to rapid changes in the workplace.
c. Social Justice and Inclusion: The curriculum must reflect a commitment to social justice and inclusion, ensuring that all students—regardless of socioeconomic background, culture, or gender—have equal access to quality education. This also includes efforts to address educational gaps and to ensure that higher education contributes to improving the quality of life in society more broadly.

The UNY 2025 Curriculum is developed on a strong sociological foundation, reflected in various curriculum aspects as follows:

a. Responsive to Social Needs: The curriculum is designed to be responsive to continuously changing social needs by incorporating contemporary issues such as environmental sustainability, digital ethics, and social entrepreneurship into courses and other academic activities. This enables students to understand and propose solutions to social problems within society.
b. Flexibility and Adaptation: Recognizing the diversity of students' needs and backgrounds, the UNY 2025 Curriculum provides flexibility in learning pathways through off-campus learning programs. Students may choose courses, internship programs, or social projects aligned with their interests and career aspirations, enabling them to develop optimally according to the social context in which they will contribute.
c. Social Character Formation: The curriculum also emphasizes the development of character and social values, such as cooperation, leadership, tolerance, and social responsibility. Through specially designed co-curricular and extracurricular activities, students are encouraged to engage with society and develop a deep understanding of their role as active and responsible citizens.

With this sociological foundation, the UNY 2025 Curriculum aims not only to produce graduates who are academically competent but also to shape individuals who are ready to contribute positively to social life, capable of facing global challenges, and actively involved in building a more just and inclusive society.

3. Psychological Foundation

The psychological foundation in developing the UNY 2025 Curriculum focuses on a deep understanding of students' characteristics as adult learners. University students have distinct

learning characteristics that differ from learners at earlier educational levels; therefore, higher education approaches must be aligned with the principles of andragogy—adult-centered learning methods. Based on this psychological foundation, the UNY 2025 Curriculum is oriented toward producing students who are independent, innovative, and able to adapt quickly to change. Learning at UNY focuses on integrating three main approaches as follows:

a. Learning Theory and the Development of Thinking Skills: The UNY 2025 Curriculum refers to an understanding of how students acquire knowledge, skills, attitudes, or values through experience, instruction, or interaction with the environment. Students are encouraged to develop the ability to think more logically and abstractly, and to solve increasingly complex problems over time through the learning process.
b. Emotions: Beyond learning theory and the development of thinking skills, the UNY 2025 Curriculum also incorporates emotions into students' learning processes. Understanding how emotions affect motivation, concentration, engagement, and information processing can help students manage their emotions more effectively. By enhancing emotional intelligence and learning to cope with stress, students can create a more productive and enjoyable learning environment, which ultimately improves their academic outcomes and well-being.
c. Psychomotor Skills: In disciplines that require practical and technical skills, effective psychomotor skill development through practice, feedback, and repetition can help students become more prepared to apply their knowledge in real-world situations. Learning that involves psychomotor skills also strengthens the integration between cognition and physical action, which ultimately improves the quality of education and students' professional readiness.

With learning theory and the development of thinking skills, emotions, and psychomotor skills embedded in the UNY 2025 Curriculum, UNY seeks to create a learning environment that is flexible, innovative, and responsive to students' needs. Through this approach, the curriculum is oriented toward producing graduates who not only have relevant knowledge and skills, but also the ability to continue learning and adapt in facing future challenges. This curriculum is designed to shape graduates who are ready to become leaders, innovators, and lifelong learners.

4. Historical Foundation

The historical foundation in developing the UNY 2025 Curriculum Guide is an important basis that connects the legacy of the past with present and future needs. This foundation aims to ensure that the curriculum is not only able to adapt to developments of the times but also continues to preserve and pass on cultural values and the nation's golden historical heritage to the next generation. Thus, students not only learn in accordance with the context and challenges of their era but also gain a deep understand ing of the historical and cultural heritage that shapes their identity as individuals and citizens.

UNY's history began with the development of the Faculty of Pedagogy at Gadjah Mada University (UGM), which became the Yogyakarta Institute of Teacher Training and Education (IKIP Yogyakarta) in 1965, and later received an expand ed mand ate to become UNY in 1999. This broader mand ate provided opportunities for UNY to develop pure fields of expertise—science, technology, social sciences, and humanities—as well as their applied forms, in order to strengthen the development of education. UNY's core commitment has not changed even though the institution has undergone transformation. This commitment includes: (1) preparing students to become capable or excellent educators and educational personnel aligned with Indonesia's needs; (2) researching and developing educational sciences; and (3) carrying out community service, especially in the field of education. The use of the Historical Foundation in the UNY 2025 Curriculum includes the following:

a. Facilitating Learning Relevant to the Times: The UNY 2025 Curriculum is designed to provide students with knowledge and skills relevant to current developments. This includes understand ing the latest technologies, social dynamics, and global challenges faced in the 21st century. With a historical foundation, the curriculum not only reflects current developments but also integrates lessons from the past, enabling students to understand how history has shaped today's world.
b. Passing on Cultural Values and the Nation's Golden Historical Heritage: One of the main goals of the historical foundation is to ensure that the curriculum is able to transmit the nation's cultural and historical values to students. The UNY 2025 Curriculum includes components that teach local, national, and global history and culture in ways that are relevant and inspiring. Students are encouraged to study and appreciate a rich historical heritage and to understand the nation's role and contributions to the development of world civilization.
c. Transforming Historical Lessons into a Modern Context: The historical foundation in the UNY 2025 Curriculum also includes efforts to transform values and lessons from history into learning in the modern era. Students are taught to apply wisdom and principles from the nation's golden history in addressing present and future challenges. This includes learning about successful strategies from the past that can be adapted to solve contemporary problems, as well as ethical and moral values that remain relevant.
d. Preparing Students for the Industry 4.0 Era and Society 5.0: The UNY 2025 Curriculum is designed to prepare students to face and play an active role in the industry 4.0 era and Society 5.0. The historical foundation helps students understand how previous industrial revolutions have shaped today's world, and how they can become innovators and leaders in the ongoing digital and social transformation. This curriculum teaches critical, creative, and collaborative skills needed to read and respond to continuously changing trends and developments.

With a strong historical foundation, the UNY 2025 Curriculum aims not only to produce graduates who are technically and professionally competent, but also individuals who have a deep understand ing of their historical and cultural heritage. This enables UNY graduates not only to adapt to the changing times, but also to contribute significantly to shaping a better future—both locally and globally.

5. Legal (Juridical) Foundation
   a. Law of the Republic of Indonesia No. 14 of 2005 on Teachers and Lecturers (State Gazette of the Republic of Indonesia Year 2005 No. 157, Supplement to the State Gazette No. 4586).
   b. Law of the Republic of Indonesia No. 12 of 2012 on Higher Education (State Gazette of the Republic of Indonesia Year 2012 No. 158, Supplement to the State Gazette No. 5336).
   c. Presidential Regulation of the Republic of Indonesia No. 8 of 2012 on the Indonesian National Qualifications Framework (INQF).
   d. Government Regulation No. 35 of 2022 on Yogyakarta State University as a Legal-Entity State University.
   e. Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 73 of 2013 on the Implementation of the INQF in Higher Education.
   f. Regulation of the Minister of Education and Culture No. 7 of 2020 on the Establishment, Change, Dissolution of State Higher Education Institutions, and the Establishment, Change, and Revocation of Permits for Private Higher Education Institutions.

g. Regulation of the Minister of Education, Culture, Research, and Technology No. 6 of 2022 on Diplomas, Certificates of Competence, Professional Certificates, Degrees, and Equivalency of Diplomas from Higher Education Institutions in Other Countries.
h. Regulation of the Minister of Education, Culture, Research, and Technology No. 13 of 2022 on Amendments to the Regulation of the Minister of Education and Culture No. 22 of 2020 on the Strategic Plan of the Ministry of Education and Culture 2020–2024.
i. Regulation of the Minister of Education, Culture, Research, and Technology No. 53 of 2023 on Higher Education Quality Assurance.
j. Decree of the Minister of Research, Technology, and Higher Education No. 123 of 2019 on Internships and the Recognition of Semester Credit Units for Industry Internships for Bachelor's and Applied Bachelor's Programs.
k. Rector's Regulation on the Academic Guide of Yogyakarta State University.
l. UNY Rector's Regulation No. 15 of 2023 on UNY Academic Regulations.
m. UNY Rector's Decree No. 682 on the Revision of Undergraduate Program Curricula at UNY.

C. UNIVERSITY AND FACULTY VISION, MISSIONS, GOALS, AND STRATEGY

Based on Government Regulation No. 35 of 2022, Chapter II, Article 4, UNY's vision and mission are as follows:

UNY Vision: "A World-Class Education University that is Excellent, Creative, and Sustainably Innovative."

UNY Mission: Based on Government Regulation No. 35 of 2022, Chapter II, Article 5, UNY has the following missions:

a) to provide academic, vocational, and professional education pathways that are excellent, creative, and sustainably innovative;
b) to conduct research and development in the fields of science and technology, social sciences and humanities, sport and health, and arts and culture that are excellent, creative, and sustainably innovative;
c) to carry out community service activities that are excellent, creative, and sustainably innovative to empower and improve community welfare;
d) to organize and build sustainable networks at national and international levels; and
e) to implement institutional governance, services, and quality assurance that are transparent and accountable.

UNY Objectives

1. to produce graduates who are excellent, creative, innovative, devout, independent, and scholarly.
2. to generate discoveries, development, and dissemination of science, technology, arts, and /or sports that improve the well-being of individuals and society, support regional and national development, and contribute to solving global problems.
3. to carry out community service and empowerment activities that encourage the development of human, societal, and natural potential to realize community welfare.
4. to establish networks involving the community, academia, industry, and media at national and international levels; and
5. to ensure transparent and accountable university governance in implementing higher education autonomy.

Vision, Mission, and Objectives of the Faculty of Engineering

FT UNY Vision: "To become a world-class faculty that is excellent, creative, and sustainably innovative in the fields of vocational and engineering education."

FT UNY Missions:

1. to provide vocational and engineering education that is excellent, creative, innovative, and sustainable.
2. to conduct research to discover, develop, and disseminate science, technology, and the arts that improve the welfare of individuals and society, support regional and national development, and contribute to solving global problems in an excellent, creative, innovative, and sustainable manner.
3. to carry out community service and empowerment that promotes the development of human, societal, and environmental potential to achieve community welfare.
4. to implement sound, clean, and accountable faculty governance and services to realize a faculty that is excellent, creative, innovative, and sustainable.
5. to create learning processes and environments that empower students creatively and sustainably innovatively to engage in lifelong learning.
6. to develop cooperation with other institutions, both national and international, in a creative and sustainably innovative manner to improve the quality of the Tridharma (education, research, and community service) implementation based on equality and mutual benefit.

D. CURRICULUM DEVELOPMENT STAGES

The stages of curriculum development begin with a needs analysis (market signal) through curriculum evaluation in the form of measuring the achievement of Graduate Learning Outcomes (CPL) in the running curriculum, tracer studies, input from graduate employers, alumni, and field experts. Curriculum evaluation is also conducted by reviewing developments in science and technology in relevant fields, labor market needs, and the vision and values developed by each institution (scientific vision).

The needs analysis stage (market signal) and the studies carried out by the study program according to its disciplinary field (scientific vision) produce the Graduate Profile. Based on this graduate profile, the Graduate Learning Outcomes (CPL), areas of study, courses along with credit weights (SKS), and the curriculum structure are formulated. The next stage is the formulation of learning and assessment strategies. Schematically, these stages are presented in Figure 1 below.

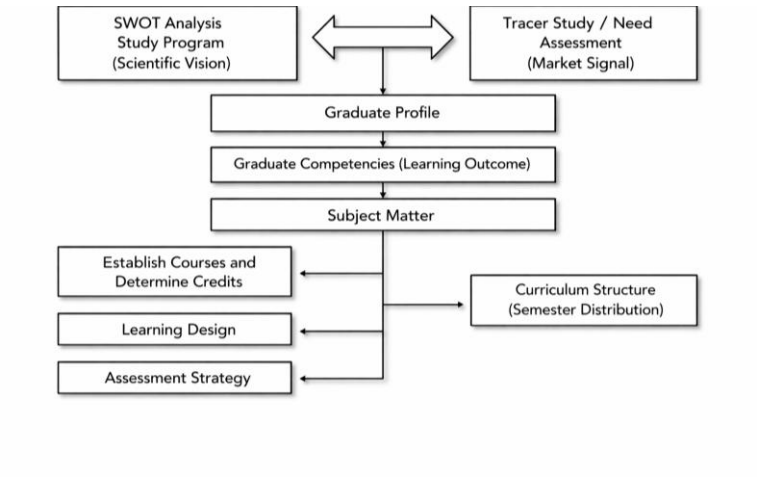

Figure 1. Stage of Curriculum Development

In detail, the stages of curriculum development as shown in Figure 1 above, can be described as follows:

1. Establishing the Graduate Profile

   The graduate profile describes the roles graduates can perform in a particular area of expertise or field of work after completing their studies. The profile is determined based on studies of

labour market needs required by the government and the business and industrial sectors, as well as the need to develop science and technology. Ideally, the graduate profile of a study program should be developed by a group of similar study programs, so that an agreed profile can be accepted and used as a national reference. For graduates to carry out the roles stated in the profile, they must possess the capabilities expressed in the formulation of the Graduate Learning Outcomes (CPL).

2. Formulating Graduate Competencies (Learning Outcomes) or Graduate Learning Outcomes (CPL)
   The Graduate Competency Standards are formulated by integrating attitudinal values, knowledge, and skills that indicate students' achievements at the end of a higher education program. Attitudinal, knowledge, and skills competencies are no longer described in detail. The determination of learning outcomes is formulated by integrating attitudes, knowledge, and skills (Permendikbudristek No. 53 of 2023).
3. Determining Areas of Study and Learning Materials
   Each CPL item of a study program contains areas of study that will be used to form courses. These areas of study may consist of one or more branches of science and their subfields, or a body of knowledge that has been integrated into new knowledge agreed upon by a forum of similar study programs as a characteristic of that study program's field. From the areas of study, the content is then further elaborated into more detailed learning materials. The breadth and depth of learning materials refer to the CPL.
4. Developing Courses and Determining Credit Weight (SKS)
   The determination of courses for the running curriculum is carried out by evaluating each course with reference to the previously established study program CPL. The evaluation is conducted by examining how closely each course (learning materials, types of assignments, exam questions, and assessment) is related to the formulated CPL. The creation of new courses is based on several CPL items that are assigned to that course.

   The SKS credit weight of a course is understood as the amount of time needed by students to acquire the capabilities formulated in the course. The key factors used to estimate credit weight include: the level of capability to be achieved; the depth and breadth of learning materials to be mastered; and the learning methods/strategies chosen to achieve those capabilities.
5. Organizing Courses Within the Curriculum Structure
   The organization of courses within the curriculum structure must be carried out carefully and systematically to ensure that students' learning stages are appropriate and to guarantee that learning is conducted efficiently and effectively to achieve the study program CPL. Course organization within the curriculum structure consists of horizontal and vertical organization. Horizontal organization within a semester is intended to broaden students' perspectives and skills in a wider context. Meanwhile, vertical organization across semesters is intended to deepen mastery of competencies according to increasing levels of learning difficulty in order to achieve the established study program CPL.
6. Designing the Learning Process
   Planning the learning process involves formulating: (a) the learning outcomes that become the learning objectives; (b) how to achieve those objectives through learning strategies and methods; and (c) how to assess the achievement of learning outcomes. Implementation of the learning process refers to structured learning activities carried out according to guidance from lecturers and /or the teaching team using certain forms, strategies, and methods. Learning is an interaction process between students, lecturers, and learning resources within a learning environment. The learning process is implemented by: (a) creating a pleasant, inclusive,

collaborative, creative, and effective learning atmosphere; (b) providing equal learning opportunities regardless of educational, social, economic, cultural, or language background, admission pathways, and students with special needs; (c) ensuring the safety, comfort, and well-being of the academic community; and (d) providing flexibility in the educational process to facilitate lifelong continuing education.

7. Learning Assessment Strategy

   Assessment of the learning process is an evaluation of the planning and implementation of learning activities aimed at improving the learning process. Assessment of the learning process is carried out by lecturers and /or the teaching team in coordination with the study program management unit. Assessment of student learning outcomes is conducted in a valid, reliable, transparent, accountable, fair, objective, and educational manner. Student learning outcome assessment takes the form of formative and summative assessment. Formative assessment aims to: (a) monitor student learning progress; (b) provide feedback so that students meet their learning outcomes; and (c) improve the learning process. Summative assessment aims to evaluate students' achievement as the basis for determining course completion and study program graduation, referring to the fulfillment of graduate learning outcomes. Summative assessment is conducted in the form of written exams, oral exams, project assessments, assignment assessments, competency tests, and /or other similar forms of assessment.

STUDY PROGRAM CURRICULUM

Master of Electronics and Informatics Engineering Education (MEIEE)

A. RATIONALE

The Master's Program in Electronics and Informatics Engineering Education (MPTEI) is designed to address the need for experts who can integrate competencies in electronics and informatics engineering with a vocational education approach. This program has a scholarly orientation that emphasizes technology-based educational innovation using intelligent technologies such as IoT, AI, and embedded systems, while promoting learning approaches that are creative, adaptive, and collaborative.

Curriculum revision for MPTEI has become important given the very rapid development of science and technology, as well as the increasingly complex and dynamic demand s of industry and education. Evaluation of the previous curriculum indicates the need to strengthen aspects of industrial practice, technology product development, and cross-sector digital literacy. In addition, alignment with the latest regulations—such as Permendikbudristek No. 53 of 2023—encourages the integration of more holistic and applied learning outcomes.

Input from alumni, graduate employers, and industry also indicates that MPTEI graduates are expected not only to master technical and pedagogical aspects, but also to be able to become creators of digital solutions and drivers of technological innovation with direct impact on society and industry. Therefore, the new curriculum is developed using an Outcome-Based Education (OBE) approach and a future-oriented vision that integrates local strengths with global competencies.

With this new curriculum development, MPTEI is committed to producing graduates who are adaptive, excellent, and highly competitive, and who can contribute to creating an inclusive and sustainable education and technology ecosystem in the digital era.

B. CURRICULUM EVALUATION AND TRACER STUDY

Curriculum evaluation is intended to obtain information regarding the results of implementing the curriculum that has been and is currently being carried out. Through curriculum evaluation, input and needs can be collected from the community, the workplace/industry, students, alumni, graduate employers, the government, the Ministry of Education, accreditation bodies, departments, faculties, the university, and other related parties. A tracer study is conducted to assess graduate performance and employer satisfaction. Employer satisfaction indicates that graduates are of good quality; conversely, employer dissatisfaction becomes input for the study program to make improvements.

Curriculum evaluation in the form of analyzing the achievement of program educational objectives (TPP) can be conducted through direct or indirect assessment, including:

- Senior Questionnaire
- Exit survey
- Alumni survey/tracer study
- Graduate employer survey
- Fundamentals of Engineering (FE) examination results
- Course assessments by individual instructors and students
- Input from members of the Department Board of Advisors
- Students entering graduate programs

1. Results of Curriculum Evaluation and Tracer Study

Below is an example summary of the results of the study program's curriculum evaluation (this section may be completed in full or adjusted according to the urgency or needs of the study program).

Table 1. Summary of Curriculum Evaluation Results and Tracer Study

Input	Importance Level (v)					Accepted(v)	
	5	4	3	2	1	Y	T
A. Input and Needs from the Community							
From Sulistyo and Ridho (Community) 1. We hope that graduates of this program will not only become technically proficient teachers, but also have high communication, ethics, and social awareness skills. Curriculum is necessary Instilling character values and soft skills so that they can become wise educators and leaders in society.	V					V	
2. In the digital era like now, it is important for engineering education graduates to be able to adapt quickly to technological changes, as well as understand how	V					V	

Input	Importance Level (v)					Accepted(v)	
	5	4	3	2	1	Y	T
technology impacts people's lives. We hope that the curriculum not only teaches technical aspects, but also equips students with critical insights into technology ethics, social impact, and responsibilities as educators in the midst of digital transformation							
B. Inputs and Needs from the World of Work/Industry							
Mr. Eka Indarto (Jogja MediaTech) 1. Digitalization plays a very important role in post-pandemic economic recovery, so it needs a combination of electronics and Informatics Engineering.	V					V	
2. Strengthening student competencies by providing roles, including: - Product Manager / Owner: Able to lead the development of technology-based products - Business Manager / Owner: Understand the business aspects of the digital solutions developed.	V					V	
3. The emphasis is on strengthening competencies in product development, including the ability to plan, execute, evaluate, and innovate digital products.	V					V	
4. The curriculum needs to reflect the integration between engineering, digital business, and digital product development.		V				V	
5. Evaluation must also consider the impact of technology Evaluation must also consider the impact of technology on society and industry, not just technical aspects		V				V	
6. It is necessary to reformulate the vision, mission, CPL, and profile of graduates to match the demands of digitalization and the needs of the industry.	V					V	
7. The curriculum must be oriented towards digital product development, technological innovation, and digital-based business		V				V	
8. It is proposed that the approach in curriculum design can be inspired by the work philosophy of large technology companies, such as: - Apple: "Throw away the unused / unnecessary - Emphasizing the importance of efficiency, simplicity, and a focus on essence in the curriculum structure. The curriculum needs to be designed without the burden of material that is not applicable to students. - Google: *"Collect as much as possible for the benefit of others."* - Encouraging a spirit of collaboration, open access to data, and innovation based on the utilization of information for social and industrial purposes.	V					V	
9. It is emphasized that the Master's curriculum in MEIEE should provide sufficient space for students to understand	V					V	

Input	Importance Level (v)					Accepted(v)	
	5	4	3	2	1	Y	T
and actively engage in value creation processes, including through: • Technology-based product and service innovation • System operation and maintenance (operation & maintenance) • Development of creative, technology-driven services Students are expected not only to become users of technology, but also creators of solutions that deliver added value.							
10. The Department is expected to orient the curriculum so that it does not focus solely on technical aspects, but also: - Demonstrates the tangible contribution of technology to society and industry - Develops students' ability to analyze the social, cultural, and economic impacts of the technologies being studied	V					V	
11. The Master's curriculum in PTEI should be aligned with projected societal needs in 2030, which increasingly demand - High levels of digital literacy - Readiness to adapt rapidly to technological change - Technology-based entrepreneurial mindset - Ability to work within cross-sector digital ecosystems (government, industry, communities, and media	V					V	
A. Alumni Feedback and Needs							
1. Alumni expect more tangible support for students during their period of study, including the provision of scholarships (from UNY and external partners), intensive academic mentoring, and active motivation to ensure timely completion of theses or final projects.		V				V	
2. The curriculum should place greater emphasis on practical components than on theoretical ones. Students need to be involved in field activities, internships, and industry-based training. Relevant professional certification should also be facilitated to enhance graduates' competitiveness in the job market		V					V
3. There are concerns that the program's name is overly specific and not widely recognized within formal employment classifications. Alumni propose the adoption of specific strategies to ensure that graduates of the Master's Program in PTEI maintain strong employment prospects, including careers as lecturers or as professionals in engineering and informatics fields.	V					V	
4. Facilities and infrastructure need to be updated in line with technological advancements, particularly laboratory equipment and instructional media. Faculty members are also encouraged to share research outputs and teaching materials that can enrich students' learning experiences.	V					V	

Input	Importance Level (v)					Accepted(v)	
	5	4	3	2	1	Y	T
5. Alumni expect more professional services from campus administrative staff. Diploma issuance procedures—especially for students from other islands or from overseas—should be more flexible (e.g., through official delivery services). Publication regulations should also be clearly socialized and should not impose excessive burdens on students	V					V	
6. More structured academic supervision schedules are expected, rather than relying solely on faculty availability. The study program should also monitor student progress regularly to prevent delays in graduation.	V					V	
7. Informal activities such as social gatherings, casual discussions, and family-oriented events are perceived as highly beneficial. Alumni suggest that these activities be revitalized on a regular basis, including through alumni involvement in seminars or training programs.	V					V	
8. To enhance global competitiveness, students should be involved in international research and publications. Alumni also recommend that several courses be delivered in English to better prepare students for global challenges.	V					V	
9. The name "Education of Electronic Engineering and Informatics" is considered too long and insufficiently flexible. Alumni suggest that the program consider adjustment or rebranding to improve recognition among institutions and industry.		V					V
10. Alumni expect greater transparency regarding scholarships, publication requirements, financial assistance, and faster, more courteous administrative services. This is particularly important for students from remote regions and from abroad who face additional time and financial constraints.	V					V	
B. Feedback and Needs from graduate user							
Mr. Jumiyanto (Graduate User, SMA Piyungan) 1. Graduates have demonstrated good competence to date. It is recommended that this characteristic be maintained while adjusting practical skills to meet current industry needs.	V					V	
2. The curriculum should more explicitly emphasize the application of IoT within Arduino-based robotics contexts, supported by software such as Cordova. Additional recommendation: Procurement of 3D printer facilities to support hands-on prototype development	V					V	
3. It is recommended that curriculum documents be prepared using more inclusive language, employing appropriate Indonesian terminology to ensure clarity for all stakeholders, including students and prospective students	V					V	
4. Robotics courses should be designed using a project- and practicum-based approach, with strong integration between embedded systems and the Internet of Things	V					V	
C. Feedback from the Advisory Board and Related Experts							

Input	Importance Level (v)					Accepted(v)	
	5	4	3	2	1	Y	T
Dr Ratna Wardani, MT (Asesor LAMDIK) 1. The number of Graduate Learning Outcomes (CPL) should not be excessive, but should adequately represent essential competencies.	V					V	
2. The program's vision and mission need to be updated to: - Demonstrate clear academic direction and areas of excellence - Align with current technological trends Example from Universitas Negeri Surabaya (UNESA): They have incorporated topics such as Learning Analytics, Adaptive Learning, and Cyber Security.	V					V	
3. The graduate profile also needs to be revised to better align with current workforce demands	V					V	
D. Feedback and Requirements from the Government (Regulatory Framework)							
1. The curriculum needs to integrate electronic engineering, Informatics Engineering, pedagogy, and educational technology to ensure graduates are capable of developing innovative solutions for technology-based vocational education challenges.	V						V
2. The curriculum should facilitate advanced research methodology courses, scientific publication management, and research seminars to enhance both the quality and quantity of students' scholarly outputs.	V					V	V
E. Feedback from Accreditation Organization (Internal)							
1. Feedback: The curriculum needs to be systematically designed to ensure direct alignment between graduate profiles, learning outcomes (CPL), course structure, and learning methods. Accreditation bodies emphasize the importance of outcome-based education measured through CPL achievement aligned with the Indonesian National Qualifications Framework (INQF) and National Higher Education Standards (SN-Dikti). 2. Implications: Curriculum mapping and documentation are required to demonstrate course alignment with CPL, as well as evidence of CPL achievement through authentic assessment.	V					V	
F. Feedback and Needs from the Department							
1. The curriculum must be developed comprehensively and involve multiple stakeholders, including faculty members, students, alumni, and industry	V					V	
2. Strong foundational values are required: - Local cultural values of Yogyakarta, such as *"Sangkan Paraning Dumadi"* and *"Memayu Hayuning Bawono,"* can serve as philosophical foundations of the curriculum.	V					V	

Input	Importance Level (v)					Accepted(v)	
	5	4	3	2	1	Y	T
- The curriculum should reflect values that represent the character and uniqueness of the program							
3. The TPCAK approach previously used is no longer considered relevant, as learning is no longer focused solely on pedagogy.		V					V
4. Each course or subject should undergo impact evaluation: - If a subject is included in the curriculum, what impact does it have on graduates and the labour market?	V					V	
5. It is recommended that the curriculum incorporate innovation diffusion concepts, which may be embedded in the Research Methodology course or introduced as a standalone/new course	V					V	
6. The importance of more detailed tracking and mapping of graduate profiles is emphasized to support continuous evaluation	V					V	
G. Feedback and Needs from the Faculty							
1. Feedback: The Faculty encourages curricula that do not focus solely on technical aspects of electronics and Informatics Engineering but also emphasize pedagogical approaches relevant to vocational education. Implications: Courses integrating technology with innovative learning strategies, technology-based microteaching, and digital instructional media development should be strengthened.	V					V	
1. Feedback: The Faculty expects graduates of the Master's program to be capable of conducting applied research relevant to societal needs and vocational education. 2. Implications: The curriculum should support problem-based research proposal development, interdisciplinary collaboration, and outputs such as publications, prototypes, or digital educational solutions.	V					V	
H. Feedback and Needs from the University							
1. Feedback: The University encourages all study programs to develop curricula that support the institutional vision of producing graduates who are excellent, innovative, and impactful at both national and global levels. Implications: The curriculum should incorporate a global mindset, technology-based entrepreneurship (technopreneurship), and adaptive competencies aligned with 21st-century technology and education developments.	V					V	
2. Feedback:	V					V	

Input	Importance Level (v)					Accepted(v)	
	5	4	3	2	1	Y	T
The University directs postgraduate programs to expand internationalization opportunities through English-taught curricula, joint research, and student/faculty exchanges with international partners. Implications: Several courses should be designed in bilingual formats (Indonesian–English), and research topics should be oriented toward global issues to facilitate collaboration with international institutions and industries.							

Description: 5 = very important, 4 = important, 3 = quite important, 2 = not important, 1 = very unimportant

2. Formulation of Curriculum Changes for Study Programs

Based on the results of the curriculum evaluation and tracer study, improvements are prepared that will be carried out in the preparation of the next curriculum.

Table 2. Dimensions of Change Based on Curriculum Evaluation and Tracer Study Results

Aspects of Change	Curriculum 2020	Curriculum 2025
1. Graduate Competencies (Input from Graduate users)	The competence of graduates is considered good, but there is still a need for improvement, especially in the aspects of creativity, innovation, and initiative.	The curriculum was revised by integrating project-based activities and laboratory practicums linked to Embedded Systems and the Internet of Things (IoT).
2. Learning Methods	Some learning methods have not fully explored the potential of students' creativity	Learning methods are applied that are designed to encourage the increase of student creativity to produce innovation.
3. Graduate Learning Outcomes	Learning outcomes are presented in detail which includes aspects of attitudes, knowledge, general skills, and special skills, referring to Permendikbud No. 3 of 2020.	Learning outcomes are presented in an integrated manner as a complete competency unit that includes attitudes, knowledge, general skills, and special skills, referring to Permendikbud Ristek No. 53 of 2023.
4. Curriculum Content	The Curriculum has not been explicitly stated list courses that integrate professional ethics.	Professional ethics is integrated into philosophy of science and professional ethics courses as an effort to strengthen character and professionalis
5. Assessment Learning based on OBE	It has not fully referred to an outcome-based approach (Outcome-Based Education/OBE).	Learning assessments are designed based on the OBE (Outcome-Based Education) approach that focuses on learning outcomes and outcomes.

Based on Table 2 above, it can be known in detail the changes that occurred and were accommodated in the new curriculum based on the inputs from the previous curriculum evaluation. The process of curriculum change is a continuous change based on the results of previous curriculum evaluations. Thus, curriculum change is a process of continuous improvement based on the results of evaluation of previous and current conditions.

C. VISION, MISSION, AND EDUCATIONAL GOALS OF THE STUDY PROGRAM

1. Scientific Vision of the Study Program:

The scientific vision of the study program is the ideal of the study program in reviewing and developing certain sciences that are superior and characteristic of the field of expertise of the study

program to respond to the development of science and technology and its application in the benefit of society for the improvement of the quality of life of the people in it, both individually and collectively (Appendix 12 of the Regulation of the National Accreditation Board for Higher Education Number 2 of 2022). As a guide to determine the vision of the study program, it can pay attention to 4 aspects: (1) the accuracy and uniqueness of the scientific field of the study program, (2) future-oriented, (3) alignment with the vision of the institution, and (4) the needs of the community.

Scientific Vision of the Master's Program in Electronics and Informatics Engineering Education (S2):

"Developing vocational education and learning innovations in the field of engineering electronics and Informatics Engineering based on intelligent technology that is superior, creative, and innovative in a sustainable manner"

2. Mission of the Study Program

The mission of the study program is an effort that must be carried out by the study program according to its functions and duties to realize the vision set. The mission of the study program is derived from the vision of the study program in line with the Vision and Mission of Higher Education as well as the Vision and Mission of the Faculty. The mission is written at least to include the tri dharma, namely the mission in the implementation of education, research, and community service, and can be added with other missions that support the implementation of the 3 tridharma such as governance, cooperation, and others.

Mission of the Master's Program in Electronics and Informatics Engineering Education:

1. Organizing academic and professional education in the field of education and vocational learning in electronic engineering and Informatics Engineering that is superior, creative, and
   Innovative based on intelligent technology to produce graduates who are adaptive and have high competence in the development and application of science in a sustainable manner.
2. Carry out research oriented towards educational innovation and intelligent technology to develop and disseminate science, technology, and art to improve the quality of vocational education and provide solutions to global challenges in the field of electronics engineering and Informatics engineering.
3. Organizing community service and empowerment in the field of electronics engineering and Informatics engineering that supports the development of human, community, and environmental potential to improve social welfare and advance regional and national development.
4. Implementing transparent, accountable, and professional academic governance and services to realize superior, creative, and innovative study programs in a sustainable manner.
5. Building cooperation with various institutions, both national and international, creatively and innovatively to improve the quality of education, research, and community service in the field of electronics engineering and Informatics engineering with the principles of equality and mutual benefit.

Study Program Educational Objectives:

a. Formulation of Study Program Education Objectives (TPP)

Study Program Education Objectives (TPP) or also known as Programme Educational Outcome (TPP) is a statement that broadly describes career achievement and professional programs prepared by the study program to be achieved by its graduates in the first few years (3-5 years) after the student graduates (Abet, 2008). The formulation of the TPP is carried out in

accordance with the vision of the university, the vision of the faculty, and the scientific vision of the study program.

Objectives of the Master's Program in Electronics and Informatics Engineering Education

1. Producing graduates who are able to master the concepts and theories of science related to electronics engineering, informatics, and education, and continuously develop this knowledge Sustainably through lifelong learning, to support the dynamic advancement of education and technology.
2. Producing graduates who are able to develop and manage educational institutions, research projects, as well as businesses or entrepreneurs related to the field of electronics engineering, informatics, and intelligent technology education for education
3. To produce graduates who are able to demonstrate a high level of professionalism, ethical and social responsibility, and the ability to self-study with a lifelong learning attitude through research, and professional activities both at the national and international levels, especially in the application of smart technologies for education
4. Producing graduates who are able to implement their ideas orally and in writing that have an impact on society in the field of electronics and informatics engineering education, as well as the application of smart technology in education, taking into account social impacts and long-term sustainability.

b. Conformity of the Educational Objectives of the Study Program with the Vision of Higher Education, Faculty, and Study Programs

Ensuring the conformity of the TPP with the vision of universities, faculties, and study programs can be explained in a narrative combined with a matrix or conformity table. The following table can be used to ensure the compatibility between the TPP and the vision of the university, faculty, or study program.

Table 3. TPP Compatibility Matrix for PTEI Masters with the Vision of Universities, Faculty, and Study Program

TPP	UNY Vision			The Faculty of Engineering Vision			Scientific Vision of Study Program			
	Excellentl	Creative	Sustainably Innovative	Excellentl	Creative	Sustainably Innovative	Smart Technology	Excellent	Creative	Sustainably Innovative
TPP 1	V	V	V	V	V	V	V	V	V	V
TPP 2	V	V	V	V	V	V	V	V	V	V
TPP 3	V	V	V	V	V	V	V	V	V	V
TPP 4	V	V	V	V	V	V	V	V	V	V

c. Conformity of the Study Program's Educational Objectives with the Indonesian National Qualifications Framework (INQF).

To ensure the fulfillment of the competency level requirements contained in the Indonesian National Qualifications Framework (INQF), it is necessary to ensure the compatibility between the TPP and the INQF level (level 5 for Diploma 3, level 6 for Bachelor/Applied Bachelor, level 8 for

Masters, and level 9 for Doctor) I. The following is an example of ensuring the compatibility between the educational objectives of the study program (TPP) and the INQF descriptor.

Table 4. Suitability of the Educational Objectives of the Master of Electronics Engineering Education Study Program and Informatics with INQF level 8

Descriptors INQF Level 8	Educational Objectives of Study Programs			
	TPP 1	TPP 2	TPP 3	TPP 4
in their scientific field or professional practice through research to produce innovative and tested works.	v	v	v	v
Able to solve problems in science, technology, and/or the arts within their field of expertise through an inter- or multidisciplinary approach.	v	v	v	v
Able to manage research and development that is beneficial to society and science, and able to receive international recognition	v	v	v	v

Note: in the series of formulation of the vision, mission, goals, and objectives of the study program, TPP can be interpreted as a specific statement about the results to be achieved within a certain period of time to support the achievement of the vision and mission of the study program. Considering that the mission of the study program includes aspects of learning, research, community service, governance, and also cooperation, the formulation of the TPP can be carried out in accordance with the mission that has been formulated. Specifically, TPP can be included in one of the items related to education.

3. Strategy of Study Program:

Strategies are various strategic efforts made by study programs to achieve the set goals.

D. GRADUATE PROFILE

1. Graduate Profile and Profile Description

Graduate Profile and Profile Description A graduate profile is a characteristic or role that can be performed by graduates in a particular field of expertise or field of work after completing their studies. The profile of graduates can be determined based on the results of a study on the needs of the job market needed by the government and the business and industrial world, as well as the need to develop science and technology. The profile of graduates of study programs should be compiled by a group of similar study programs (study programs), so that there is an agreement that can be accepted and used as a reference nationally. The formulation of the graduate profile can be in the form of:

a. Specific occupation or profession followed by a description of competencies
b. Competencies of a single occupation/specific profession followed by a description of competencies

Table 5. Graduate Profile of the Master's Program in Electronics and Informatics Engineering Education

Graduate Profile	Description Profile
Professional Educator in the Field of Electronics Engineering and Informatics engineering	- Have competence as an educator, lecturer, or instructor who is able to develop and apply smart technology in learning electronics and informatics engineering. - Able to design innovative learning strategies based on AI, IoT, big data, and other digital technologies to improve the quality of vocational and technical education

Graduate Profile	Description Profile
Researcher in the field of Intelligent Technology for Education	- Able to conduct quality research in the field of intelligent technology for Education. - Actively contribute to the development of science in the fields of engineering, electronics, and Informatics engineering education.
Vocational Education Developer and Consultant	- Able to analyze, design, and implement solutions to improve the efficiency and effectiveness of the vocational education system in the field of electronics engineering and informatics engineering - Become a consultant in digital transformation in educational institutions, training industries, and the development of technology-based learning systems
Engineer in the Electronics and Informatics engineering Industri	- Able to apply expertise in automation systems, computer networks, embedded systems, and data processing in related industries - Able to contribute to the development of robotics, smart devices, and digital infrastructure in the manufacturing, telecommunications, or industrial control systems sectors
Entrepreneurs in the Field of Electronics and Informatics engineering	- Able to create and develop IoT-based businesses, artificial intelligence, control systems, and software and hardware solutions. - Able to develop startups in the field of digital technology, smart measurement and control systems, as well as cloud computing and big data-based innovations

2. Suitability of Graduate Profiles with the Educational Objectives of the Study Program

To ensure the suitability between the profile of graduates and the educational objectives of the study program, it can be done through the matrix or table of suitability of the graduate profile with the TPP as follows.

Table 6. Suitability of Graduate Profiles with the Educational Objectives of the Master's Study Program Electronics and Informatics Engineering Education

Graduate Profile	Study Program Educational Objectives			
	TPP 1	TPP 2	TPP 3	TPP 4
Professional Educator in the Field of Electronics Engineering and Informatics engineering	V	V	V	V
Researcher in Intelligent Technologies for Education	V	V	V	V
Developer and Consultant in Vocational Education	V	V	V	V
Engineer in the Informatics engineering and Electronics Industry	V		V	V
Entrepreneur in Informatics engineering and Electronics Engineering	V	V	V	V

E. GRADUATE LEARNING OUTCOMES

1. Formulation of Graduate Learning Outcomes (CPL)

Graduate Learning Outcomes, hereinafter abbreviated as CPL, is a form of formulation of graduate competency standard, namely minimum criteria regarding the unity of competencies, attitudes, skills, and knowledge that show student achievement from the learning outcomes at the end of the higher education program (Permendikbud Ristek Number 53 of 2023). The determination of CPL is formulated by integrating the values of attitudes, knowledge, and skills that show student achievements from the learning results at the end of the higher education program.

CPL is formulated to prepare students to become members of society who have faith, piety, noble character, character in accordance with the values of Pancasila, are able and independent to

apply, develop, find science and technology that is beneficial to society, and actively develop their potential. The CPL for each study program includes competencies that include:

a. mastery of science and technology, specific skills/skills and their application to 1 (one) or a set of certain scientific fields.
b. general skills needed as a basis for mastery of science and technology as well as relevant fields of work
c. knowledge and skills needed for the world of work and /or continuing studies at a higher level or to obtain a professional certificate; and
d. intellectual ability to think independently and critically as a lifelong learner.

The CPL formula refers to the qualification level of INQF. The CPL formulated must be clear, observable, measurable and achievable in the learning process, and can be demonstrated and assessed for achievement. Each item of CPL contains abilities (behavior/cognitive processes) and study materials (subject matters), and can be added to the context (Tyler, 2013; Anderson & Krathwohl, 2001).

Table 7. Graduate Learning Outcomes (CPL) of the Master's Program in Electronics and Informatics Engineering Education

No	Description CPL
CPL-1	Able to master the basic theory and concepts of electronics engineering - informatics and its application, which is necessary in analyzing, designing, and evaluating electronic-informatics systems, based on superior and responsible character values.
CPL-2	Able to master the concepts and theories of vocational education in electronics engineering and informatics required in the design, implementation, and evaluation of electronic engineering and informatics learning.
CPL-3	Able to analyze and develop solutions to existing educational problems in the field of electronics and informatics engineering to improve the efficiency and effectiveness of vocational and engineering education.
CPL-4	Able to integrate intelligent technology in learning electronics and informatics engineering to improve the quality of vocational education and training. CPL-5 Able to demonstrate professional ethics in learning practices and industry interactions based on divine values, morals, social responsibility, nationalism, and academic norms
CPL-5	Able to demonstrate professional ethics in learning practices and industry interactions based on divine values, morals, social responsibility, nationalism, and academic norms
CPL-6	Able to develop logical, critical, systematic, and creative thinking in Carry out scientific research and create designs or works in the fields of electronic engineering, informatics, and intelligent technology by paying attention to the values of the humanities, as well as compiling scientific conceptions according to academic rules, procedures, and ethics, while maintaining the values of professionalism.
CPL-7	Able to collaborate with various stakeholders in the field of education and the industrial world, in the development of informatics electronics education, both at the national and international levels.
CPL-8	Capable of developing IoT-based enterprises, artificial intelligence, control systems, and software and hardware for industry and education.

Table 8. Identify CPL Structure based on Ability, Study Material, and Context

CPL	CPL Statement	(Behavior)	(Subject Matter)	(Context)
CPL-1	Able to master theory and the basic concept of electronics-Informatics engineering engineering and its application, which is necessary in analyzing,	Able to master the fundamental theories and concepts of electronics	Fundamental theories and concepts of electronics engineering and informatics	Analysis, design, and evaluation of electronics and informatics engineering systems.

CPL	CPL Statement	(Behavior)	(Subject Matter)	(Context)
	designing, and evaluating electronic-informatics systems, based on superior and responsible character values.	engineering and informatics engineering, as well as their applications.	engineering; values of excellence in character; and responsibility.	
CPL-2	Able to master the concepts and theories of vocational education in electronics engineering and Informatics engineering that are required in the design, implementation, and evaluation of learning in electronics engineering and Informatics engineering.	Able to master the concepts and theories of vocational education in electronics engineering and informatics engineering.	Concepts and theories of vocational education in electronics engineering and informatics engineering.	Design, implementation, and evaluation of learning in electronics engineering and informatics engineering.
CPL-3	Capable of analyzing and develop solutions to existing educational problems in the field of electronics engineering and informatics engineering to increase the efficiency and effectiveness of vocational and engineering education.	Able to analyze and develop solutions to educational problems in the fields of electronics engineering and informatics engineering.	Educational issues in electronics engineering and informatics engineering; efficiency and effectiveness of vocational and technical education.	Education Vocational Technique
CPL-4	Capable of integrating intelligent technology in learning engineering electronics and Informatics engineering to improve the quality of vocational education and training.	Able to integrate intelligent technologies into learning.	Intelligent technologies; learning in electronics engineering and informatics engineering.	Education and Training Vocational
CPL-5	Capable of demonstrating Professional ethics in learning practices and industrial interactions based on divine values, morals, social responsibility, nationalism, and academic norms.	Demonstrate ethics Professional	Religious values, morality, social responsibility, nationalism, and academic norms.	Practice Learning and Indsutry Interaction

CPL	CPL Statement	(Behavior)	(Subject Matter)	(Context)
CPL-6	Capable of developing logical, critical, systematic, and creative thinking in carrying out scientific research and the creation of designs or works in the fields of electronics engineering, informatics engineering, and intelligent technology by paying attention to the values of the humanities, as well as compiling scientific conceptions according to academic rules, procedures, and ethics, while maintaining the values of professionalism.	Able to develop logical, critical, systematic, and creative thinking in research and in the creation of designs or works.	Scientific research: designs or works in the fields of electronics engineering, informatics engineering, and intelligent technologies; humanities values; scientific concepts; principles, procedures, and academic ethics; and professionalism values.	Electronics engineering, informatics engineering, and intelligent technologies.
CPL-7	Able to collaborate with various stakeholders in the field of education and the industrial world, in the development of informatics engineering electronics education, both at the national and international levels.	Able collaborate with a variety of acting importance	Development of electronics and informatics engineering engineering education.	Education and industry sectors at both national and international levels.
CPL-8	Capable of developing IoT-based ventures, artificial intelligence, control systems, and software and hardware for industry and education.	Able to develop technology-based businesses.	IoT, artificial intelligence, control systems, software, and hardware.	Industry and education

2. Compatibility of Graduate Learning Outcomes with Graduate Profiles
The following table is the compatibility between Graduate Learning Outcomes and graduate profiles.

Table 9. Table of Compatibility between Graduate Learning Outcomes and Graduate Profiles

Graduate Profile	CPL							
	CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
Professional Educator in Electronics Engineering and Informatics engineering	V	V	V	V	V		V	
Researcher in Intelligent Technologies for Education	V	V	V	V	V	V	V	

Developer and Consultant in Vocational Education	V	V	V		V	V	V	V
Engineer in the Informatics engineering and Electronics Industry	V			V	V	V	V	V
Entrepreneur in Informatics engineering and Electronics Engineering	V			V	V	V	V	V

3. Compability of Graduate Learning Outcomes with the Study Program Educational Objectives

CPL is derived from the Study Program Educational Objectives (TPP); therefore, it is necessary to ensure that all TPP have been distributed across the CPL. Conversely, it is also necessary to ensure that all CPL are linked to the TPP, so that there are no CPL outside the scope of the TPP. The following table presents the alignment between CPL and TPP.

Table 10. Compatibility between CPL and TPP

CPL		**Study Program Educational Objectives**			
		TPP 1	**TPP 2**	**TPP 3**	**TPP 4**
CPL1	Able to master the basic theory and concepts of electronics-informatics engineering engineering and its application, which is necessary in analyzing, designing, and evaluating electronic-informatics systems, based on superior character values and full of responsibility.	V			
CPL2	Able to master the concepts and theories of vocational education in electronics engineering and informatics engineering required in the design, implementation, and evaluation of electronic engineering and informatics engineering learning.	V			
CPL3	Able to analyze and develop solutions to existing educational problems in the field of electronic engineering and informatics engineering to improve the efficiency and effectiveness of vocational and engineering education.		V	V	V
CPL4	Able to integrate intelligent technology in learning electronic engineering and informatics engineering to improve the quality of vocational education and training.	V		V	V
CPL5	Able to demonstrate professional ethics in learning practices and industrial interactions based on divine values, morals, social responsibility, nationalism, and academic norms		V	V	V
CPL6	Able to develop logical, critical, systematic, and creative thinking in carrying out scientific research and creating designs or works in the fields of electronics engineering, informatics engineering, and intelligent technology by paying attention to the values of the humanities, as well as compiling scientific conceptions according to academic rules, procedures, and ethics, while maintaining the values of professionalism.		V	V	V
CPL7	Able to collaborate with various stakeholders in both education and industry in the development of electronics and informatics engineering education, at both national and international levels.		V	V	V
CPL8	Able to develop technology-based ventures involving IoT, artificial intelligence, control systems, as well as software and hardware for industry and education.		V	V	V

Based on the matrix or compatibility table between CPL and TPP above, it can be seen that all TPP s are described in CPL. Likewise, all CPLs support the existence of TPP, and there are no CPLs outside of TPP.

4. Conformity of Graduate Learning Outcomes with Specific Standards

Certain institutions such as International accreditation bodies sometimes require the fulfillment of a specific stand ard. For example, ASIIN as an international accreditation institution requires the fulfillment of Subject Specific Criteria-SSC (see ASIIN Subject-Specific Criteria (SSC) 01-Bachelor's degree programs). This requires ensuring the conformity between CPL and SSC.

Table 11. Alignment of CPL with the ASIIN SSC Stand ard

Sub - Specific Criteria		1	2	3	4	5	6	7	8
	Knowledge and understanding								
1	Have an in-depth knowledge of advanced fundamentals in math and science	√							
2	Have in-depth knowledge of advanced fundamentals specific to the field of electronics engineering	√							
3	Have in-depth knowledge of advanced fundamentals specific to the field of informatics engineering	√							
4	Have in-depth knowledge in one of the main application areas mentioned based on the specific fundamentals of that field	√	√	√	√				√
	Analysis in the field of Engineering								
5	Can evaluate complex and new modeling, measurement, design, and testing methods regarding their relevance, effectiveness, and efficiency, and can independently develop new methods			√	√		√		
	Engineering Design								
6	have specialized skills to design, develop and operate complex technical systems and services, so that they are able to optimally assemble the best components of these systems as well as evaluate the interaction of the system with its environment, taking into account technical, social, economic and ecological aspects				√		√		√
	Investigations Assesmen								
7	develop appropriate methods for conceptualizing, conducting, and evaluating in-depth research related to technical topics according to their level of knowledge and understanding			√	√				√
	Application of Engineering and Product Innovation								
8	use and develop their knowledge and skills to gain practical skills in problem-solving, organizing research, and developing systems and processes	√	√		√		√		√
9	adapt quickly, methodically, and systematically to new and unfamiliar tasks assess the applicable methods and their limitations	√	√				√		√
	systematically reflect on the nontechnical implications of engineering work and integrate the results responsibly in their actions						√		√

Sub - Specific Criteria		1	2	3	4	5	6	7	8
11	Able to evaluate applicable methods along with their limitations.			√	√		√		√
12	Systematically reflect on the non-technical implications of engineering work and responsibly integrate the results into their actions.			√		√			
	Transferable Skills								
13	Able to manage and coordinate complex and evolving work and learning relationships that require new strategic approaches.			√				√	
14	able to take over responsibility for scientific contributions to professional knowledge and/or professional practice			√		√	√	√	√
15	Checking the strategic capacity of the team					√		√	

F. STUDY MATERIALS AND COURSE FORMATION

1. Selection of Study Materials and Learning Materials

In each item, the CPL study program contains study materials that will be used to form the course. The study material can be in the form of one or more branches of science and their branches of knowledge, or a group of knowledge that has been integrated into a new knowledge that has been agreed upon by a similar study program forum as a characteristic of the field of science of the study program. From the study materials, it is further elaborated into learning materials. The level of breadth and depth of learning materials refers to the CPL listed in the SN Dikti.

Study materials and learning materials can be updated or developed according to the development of science and technology and the direction of science development of the study program. The process of determining study materials needs to involve groups of scientific fields/laboratories in the study program. The formation of a course based on the selected study material can be started by creating a matrix between the CPL formulation and the study material to ensure its relevance (see Table 12)

Table 12. Suitability of Study Materials with Graduate Learning Outcomes

STUDY MATERIALS		No CPL							
		CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
1. Pedagogical Competencies in Electronics Engineering and Informatics engineering Education	1. Theories and learning models in electronics engineering and informatics engineering education.		V	V					
	2. Competency-Based Curriculum Design for Electronics Engineering and Informatics engineering Education.		V	V					
	3. Innovative Learning Methods in Electronics Engineering and Informatics		V	V					

STUDY MATERIALS		No CPL							
		CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
	engineering Education.								
	4. Evaluation and Assessment of Learning in Electronics Engineering and Informatics engineering Education		V	V			V		V
	5. Management of Vocational Education and Training in Electronics Engineering and Informatics engineering		V	V		V			
2. Scientific Competence and Application in Electronics Engineering and Informatics engineering	1. Design and Development of Embedded Systems	V							
	2. Development of Information Systems Using Contemporary Approaches	V							
	3. Development of Digital and Immersive Learning Media	V							
	4. Networks and Cybersecurity	V							
	5. Software Engineering	V							
	6. Digital Signal Processing and Data Communications	V							
	7. Robotics Technology and Industrial Automation	V							
	8. Cloud Computing and Edge Computing	V							
	9. Application of Blockchain in Education	V							
	10. Application of IoT in Education	V							
	11. 5G Technology and Future Wireless Communications	V							
	12. Intelligent Control Systems and Smart Devices	V							

STUDY MATERIALS		No CPL							
		CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
	13. Principles of Medical Electronics: Technological Transformation for the Future of Healthcare	V							
	14. Machine Learning and Deep Learning in Engineering	V			V				
	15. Expert Systems	V			V				
	16. Security and Ethics in AI Applications	V			V				
	17. Data Science and Big Data Analytics for Engineering Research	V			V				
3. Research, Entrepreneurship, and Professionalism in Electronics Engineering and Informatics engineering	1. Research Methodology in Electronics Engineering and Informatics engineering				V	V		V	
	2. Technology Project Management in Electronics Engineering and Informatics engineering				V	V	V	V	V
	3. Technology Entrepreneurship and Digital Startups				V	V	V	V	V
	4. Fundamental Statistics for Data Analysis	V							
	5. Use of Statistical Software for Research and Its Applications in Education and Technology	V							V
	6. Principles of the Philosophy of Science in Establishing	V				V			V

STUDY MATERIALS		No CPL							
		CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
	Scientific Truth in the Context of Electronics Engineering and Informatics engineering Education								
	7. Research Proposa				V	V	V	V	
	8. Scientific Writing				V	V	V	V	
	9. Academic Ethics	V				V	V	V	

Each CPL item needs to be checked whether it contains the ability and study materials, along with the context according to the level. Check whether the study materials are in accordance with the disciplines developed in the study program and whether the study materials are in accordance with the learning needs of students according to the level of the study program. If the answers to the two questions are appropriate, then the CPL items will then be used as the basis for the formation of the course.

2. Establishment of Courses

i. Changes and Determination of Courses in the Old Curriculum Based on the Results of Evaluation

Changes in the new curriculum are carried out by taking into account the renewal of the scientific vision, the objectives of the study program, and the profile of graduates that are more relevant to the needs of the times. Some of the courses that previously existed are now being re-included in the new curriculum, but with adjustments to the materials and approaches to better suit technological developments and industry demand s. The redesignation of the old courses aims to ensure that the fundamental scientific foundations are maintained, while the updating of the materials still reflects the latest trends and needs in the field of engineering education and informatics engineering.

Along with these changes, some courses that are considered no longer relevant or less effective to achieve the desired graduate learning outcomes (CPL) are removed or replaced with courses that are more applicable and in accordance with the latest technological developments. Some courses have also undergone substantial changes in the materials or teaching approaches, such as the addition of a focus on the latest technologies such as artificial intelligence (AI), the Internet of Things (IoT), and data-driven learning. This change was made so that the curriculum can prepare students with competencies that are in accordance with the challenges and opportunities in the Industrial Revolution 4.0 and 5.0 era. The determination and changes of courses can be seen in Table 13.

Table 13. Determination of Courses based on Evaluation Results

Course Code	Course Name	Determination and Evaluation of Course Changes	Equivalent New Course Title
PEI80201	Philosophy of Science	The course title and content were adjusted to meet current needs and developments.	Philosophy of Science and Professional Ethics
PEI80202	Statistics	Retained, with an adjustment to the number of credit units (SKS).	Statistics

Course Code	Course Name	Determination and Evaluation of Course Changes	Equivalent New Course Title
PEI80203	Research Methodology Education	The course title and content were adjusted to meet current needs and developments, and the number of credit units (SKS) was adjusted.	Research Methodology
PEI80204	Education and Training Management	The course title and content were adjusted to meet current needs and developments.	Vocational Education and Training Management
PTI8202	Technology Enhanced Learning (TEL)	Removed, as it is already covered at KKN Level 6 (Bachelor's/S1) and may also be considered integrated within Multimedia Systems.	-
PEI80205	Learning Methodology Vocational	The course title and content were adjusted to meet current needs and developments.	Vocational Curriculum Design and Learning Methodology
PEI80206	Vocational Learning Evaluation and Assessment	Retained	Vocational Learning Evaluation and Assessment
PEI80207	Technopreneurship and Digital Startups	Retained	Technopreneurship and Digital Startups
PEI80208	Information Systems Management	Retained	Information Systems Management
PEI80209	Artificial Intelligence	Retained	Artificial Intelligence
PEI802010	Deep Learning and Natural Language Processing	Retained	Deep Learning and Natural Language Processing
PEI802011	Multimedia System	Retained	Multimedia System
PEI802012	Thesis Proposal and Seminar	Retained, with an adjustment to the number of credit units (SKS).	Master's Thesis Proposal and Seminar
PEI802013	Scientific Writing	**Note:** Retained, with an adjustment to the number of credit units (SKS).	Science Writing
PEI81001	Master's Thesis	**Note:** Retained, with an adjustment to the number of credit units (SKS).	Master's Thesis
PTI8210	Intelligent Control Systems	Retained.	Intelligent Control Systems and Smart Devices
PEI80217	Multidimensional Signal Processing Techniques	The course title and content were adjusted to meet current needs and developments.	Digital Signal and Image Processing
PTI8212	Electronic System Design	Removed, as it is already covered at KKN Level 6 (Bachelor's/S1).	-
PEI80222	Computer Network Management	Retained.	Computer Network Management
PEI80222	User Experience Design	Retained.	User Experience Design (UI/UX)
PEI80221	Advanced Programming for Software Engineering	The course title and content were adjusted to meet current needs and developments.	Advanced Programming for Software Engineering
PEI80218	Internet of Things	The course title and content were adjusted to meet current needs and developments.	Embeded Sistem and Internet of Things (IoT)

Course Code	Course Name	Determination and Evaluation of Course Changes	Equivalent New Course Title
PEI80216	Robotika	The course title and content were adjusted to meet current needs and developments.	Robotics and Industrial Automation
PTI8218	Teknologi Seluler	The course title and content were adjusted to meet current needs and developments.	5G Technology and Wireless Communications
PEI80215	Medical Electronics	The course title and content were adjusted to meet current needs and developments.	Healthcare Technology and Medical Electronics
PEI80211	Multimedia Systems	Retained.	Multimedia Systems
PTI8222	Web Application	Retained.	Web Application
PEI80219	Big Data	Data Mining merged with big data	Data Mining and Big Data
PEI80219	Data Mining	Data Mining merged with big data	Data Mining and Big Data
PEI80225	Education Science	Retained.	Education Science
PEI80226	Educational Psychology	Retained.	Educational Psychology

ii. Formation of Courses based on CPL

In the development of a new study program curriculum, the stages of formation of new courses are required. The formation of new courses is based on several CPL items charged to it. The mechanism for the formation of new courses can be assisted by using the matrix in Table 14.

Table 14. Formation of Courses based on CPL

COURSE (Bahasa Indonesia)		Course (English)	CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
Course Pondasi Keilmuan										
PEI80201	Filsafat Ilmu and Etika Profesi	*Philosophy of Science and Professional Ethics*	V	V	V		V			
PEI80202	Statistika	*Statistics*			V			V		
PEI80203	Metodologi Penelitian	*Research Methodology*		V	V			V		
Course Keahlian										
WAJIB										
PEI80204	Management education and pelatihan vokasional	*Vocational Education and Training Management*		V	V	V			V	
PEI80205	Desain Curriculum and Metodologi Learning Vocational	*Vocational Curriculum Design and Learning Methodology*		V	V	V				
PEI80206	Evaluation and Asesmen	*Vocational Learning*		V	V	V				

COURSE (Bahasa Indonesia)		Course (English)	CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
	Learning Vocational	*Evaluation and Assessment*								
PEI80207	Teknoprener and Startup Digital	*Technopreneurship and Digital Startups*	V						V	V
PEI80208	Management Sistem Informasi	*Information Systems Management*	V	V	V	V				
PEI80209	Kecerdasan Buatan (AI)	*Artificial Intelligence*	V					V		V
PEI80210	Deep Learning and Natural Language Processing	*Deep Learning and Natural Language Processing*	V					V		V
PEI80211	Sistem Multimedia	*Multimedia Systems*	V	V		V				
PEI80210	Management jaringan komputer	*Computer Network Management*	V			V		V		
PEI80211	Sistem Embeded and Internet of Things (IoT)	*Embeded Sistem and Internet of Things*	V			V				
PEI80212	Proposal and Seminar Tugas Akhir Magister	*Master's Thesis Proposal and Seminar*			V	V	V	V	V	
PEI80213	Penulisan Karya Ilmiah	*Academic Writing*					V	V		
PEI81001	Tugas Akhir Magister	*Master's Thesis*	V		V			V	V	
PILIHAN										
PEI80214	Teknologi Seluler and Komunikasi Nirkabel	*Cellular and Wireless Communication Technologies*	V			V				V
PEI80215	Teknologi Kesehatan and Elektronika Medis	*Healthcare Technology and Medical Electronics*	V							V
PEI80216	Robotika and Automasi Industri	*Robotics and Industrial Automation*	V					V		V
PEI80217	Pengolahan Sinyal and Citra	*Signal and Image Processing*	V					V		V
PEI80218	Sistem Embeded and Internet of Things (IoT)	*Embeded Sistem and Internet of Things*	V			V				

COURSE (Bahasa Indonesia)		Course (English)	CPL1	CPL2	CPL3	CPL4	CPL5	CPL6	CPL7	CPL8
PEI80219	Penambangan Data and Big Data	*Data Mining and Big Data*	V							
PEI80220	User Experience Design (UI/UX)	*User Experience Design (UI/UX)*	V	V			V	V		
PEI80221	Pemrograman Lanjut untuk Rekayasa Perangkat Lunak	*Advanced Programming for Software Engineering*	V							
PEI80222	Management jaringan komputer	*Computer Network Management*	V			v		v		
PEI80223	Desain and Pengembangan Aplikasi Web	Web Application Design and Development	V		V					
PEI80225	Keamanan Siber and Blockchain	*Cybersecurity and Blockchain*	V							
Matriculation										
PEI80225	Ilmu Education	*Education Science*		V	V					
PEI80226	Psikologi Education	*Educational Psychology*		V	V					

The way to form a new course as presented in Table 14 is as follows:

(a) Select a few CPL items and mark them on the table cells, as the basis for the formation of eyes lectures.

(b) Study materials contained by the CPL that are charged to the course, Furthermore, it is described as learning material with breadth and depth according to the needs of the study program level

(c) Make sure that each item of the CPL Study Program has been charged to all courses, in the rightmost column (Number) you can find the number/distribution of CPL items in each course.

(d) The last two lines may be used to estimate the time required for achieve the CPL charged in the course, then converted in the number of credits (1 credit = 170 minutes or 45 hours per semester).

iii. Determination of the Amount of Credits

The amount of credit weight of a course is interpreted as the time needed by students to be able to have the abilities formulated in a course. The determining elements for the estimated amount of credit weight include: the level of ability that must be achieved; the depth and breadth of the learning material that must be mastered; and the learning methods/strategies chosen to achieve these abilities. The semester credit unit as formulated in the Minister of Education and Culture Research and Technology Number 53 of 2023 is the measure of the time of learning activities charged to students per week per semester in the learning process through various forms of learning and the amount of recognition for the success of students' efforts in participating in curricular activities in a

study program. The learning load of 1 (one) semester credit unit is equivalent to 45 (forty-five) hours per semester.

G. CURRICULUM STRUCTURE AND COURSE DISTRIBUTION

1. Curriculum Structure

The organization of courses in the curriculum structure needs to be carried out carefully and systematically to ensure that the learning stages of students are appropriate, ensuring that learning is carried out efficiently and effectively to achieve the CPL of the Study Program. The organization of courses in the curriculum structure consists of horizontal organizations and vertical organizations. The organization of horizontal courses in the semester is intended for the expansion of students' discourses and skills in a broader context. While the vertical organization of courses in the semester level is intended to provide into the mastery of abilities according to the level of learning difficulty to achieve the CPL of the study program that has been set.

The following is an example of the presentation of course organization in the curriculum structure.

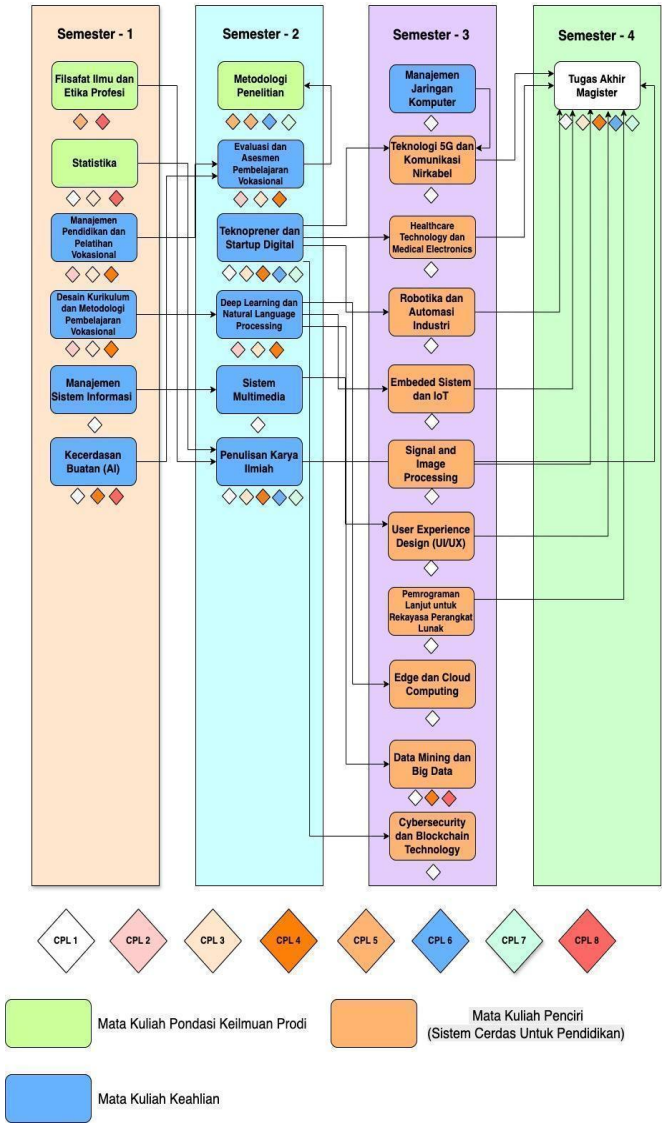

Figure 2. Course Organization of the Master of Electronics Engineering Education Study Program Computer Science

The curriculum of the Master of Electronics and Informatics Engineering Education Study Program is designed with a learning load of 44 credits and 4 credits of matriculation courses for prospective students who come from non-educational undergraduate graduates. Details of Course Groups and the number of credits are presented with the following details

Table 15. Course Groups and credit amounts

No	Course	Credit Units
1.	Scientific Foundation Course Study Program (MKPKP)	6
2.	Required Specialization Courses (MKK Required)	30
3.	Elective Skills Course (MKK Elective)	10
4.	Matriculation Courses (MK Matriculation)	4
Total Credits		**44-54**

Table 16. Course Curriculum Structure and Credit Amount

NO	CODE	COURSE	SEMESTER DAN CREDIT				TOTAL CREDIT
			1	2	3	4	
I. Scientific Foundation Course Study Program (MKPKP)							
1	PEI80201	*Philosophy of Science and Professional Ethics*	2				6
2	PEI80202	*Statistics*	2				
3	PEI80203	*Research Methodology*		2			
Total Credit			**4**	**2**	**0**	**0**	**6**
II. Expertise Course (MKK)							
REQUIRED							
1	PEI80204	*Vocational Education and Training Management*	2				30
2	PEI80205	*Vocational Curriculum Design and Learning Methodology*	2				
3	PEI80206	*Vocational Learning Evaluation and Assessment*		2			
4	PEI80207	*Technopreneurship and Digital Startups*		2			
5	PEI80208	*Information Systems Management*	2				
6	PEI80209	Kecerdasan Buatan (AI) *Artificial Intelligence*	2				
7	PEI80210	*Deep Learning* and *Natural Language Processing* *Deep Learning and Natural Language Processing*		2			
1	PEI80211	Sistem Multimedia *Multimedia Systems*	2				
2	PEI80212	Proposal and Seminar Tugas Akhir Magister *Master's Thesis Proposal and Seminar*		2			
3	PEI80213	Penulisan Karya Ilmiah *Academic Writing*		2			
4	PEI81001	Tugas Akhir Magister *Master's Thesis*			10		
TOTAL CREDIT REQUIRED MKK			**10**	**10**	**10**		**30**
ELECTIVE							
1	PEI80214	Teknologi Seluler and Komunikasi Nirkabel Cellular and Wireless Communication Technologies	2				8
2	PEI80215	Teknologi Kesehatan and Elektronika Medis *Healthcare Technology and Medical Electronics*		2			
3	PEI80216	Robotika and Automasi Industri *Robotics and Industrial Automation*	2				
4	PEI80217	Pengolahan Sinyal and Citra *Signal and Image Processing*		2			

NO	CODE	COURSE	SEMESTER DAN CREDIT				TOTAL CREDIT
			1	2	3	4	
5	PEI80218	Sistem Tertanam and Internet of Things (IoT) *Embeded Sistem and Internet of Things*		2			
6	PEI80219	*Penambangan Data* and *Big Data* *Data Mining and Big Data*		2			
7	PEI80220	User Experience Design (UI/UX) *User Experience Design (UI/UX)*		2			
8	PEI80221	Pemrograman Lanjut untuk Rekayasa Perangkat Lunak *Advanced Programming for Software Engineering*	2				
9	PEI80222	Management jaringan computer *Computer Network Management*	2				
10	PEI80223	Desain and Pengembangan Aplikasi Web *Web Application Design and Development*	2				
11	PEI80218	Keamanan Siber and *Blockchain* *Cybersecurity and Blockchain*		2			
Total of Credits for Elective Courses			**4**	**4**	**10**	**0**	**22**
Total Credit without Matriculation			**18**	**16**	**10**	**0**	**44**

III. Course Matriculation (MKM) - Specifically for students whose bachelor's (S1) degree is non-education

NO		COURSE	SEM & CREDIT				TOTAL CREDIT
			1	2	3	4	
1	PEI80221	Ilmu Education *Education Science*	2				4
2	PEI80223	Psikologi Education *Educational Psychology*		2			
Total Credit Matriculation Course			**2**	**2**			**4**
Total Credit with Matrirculation			**20**	**18**	**10**	**0**	**48**

2. Course Distribution

To facilitate its implementation, the curriculum structure needs to be presented in the distribution of courses every semester. The following is an example of the presentation of course distribution each semester.

Table 3. Course Distribution of the Master's Program in Electronics and Informatics Engineering Education Computer Science

Code MK	Course	SKS			
		Jml	T	P	L
Semester 1					

Code MK	Course	SKS			
		Jml	T	P	L
PEI80201	Philosophy of Science and Professional Ethics	2	2	0	0
PEI80202	Statistics	2	2	0	0
PEI80203	Vocational education and training management	2	2	0	0
PEI80205	Vocational Learning Curriculum Design and Methodology	2	2	0	0
PEI80208	Information Systems Management	2	2	0	0
PEI80209	Artificial Intelligence (AI)	2	2	0	0
PEI80211	Multimedia System	2	2	0	0
PEI80214	Mobile Technology and Wireless Communication	2	2	0	0
PEI80216	Robotics and Automations	2	2	0	0
PEI80221	Advanced Programming Software Engineering	2	2	0	0
PEI80222	Computer Network Management	2	2	0	0
PEI80223	Web Application Design and Development	2	2	0	0
PEI80225	Educational Sciences	2	2	0	0
Quantity		**26**	**26**	**0**	**0**
Semester 2					
PEI80203	Research Methodology	2	2	0	0
PEI80206	Evaluation and Assessment of Learning Vocational	2	2	0	0
PEI80207	Technopranomers and Digital Startups	2	2	0	0
PEI80210	Deep Learning and Natural Language Processing	2	2	0	0
PEI80212	Proposal and Seminar Thesis	2	2	0	0
PEI80213	Scientific Writing	2	2	0	0

Code MK	Course	SKS			
		Jml	T	P	L
PEI80215	Health Technology and Medical Electronics	2	2	0	0
PEI80217	Signal Processing and Digital Image	2	2	0	0
PEI80218	Embeded Sistem and Internet of Things (IoT)	2	2	0	0
PEI80219	Data Mining and Big Data	2	2	0	0
PEI80220	User Experience Design	2	2	0	0
PEI80224	Cybersecurity and Blockchain	2	2	0	0
PEI80226	Phychology Educational	2	2	0	0
Quantity		**26**	**26**	**0**	**0**
Semester 3					
PEI81001	Thesis	10	10	0	0
Quantity		**10**	**10**	**0**	**0**

H. LEARNING PROCESS

The learning process in the Master of Education in Electronics and Informatics Engineering Study Program is carried out by referring to the National Standards for Higher Education which includes the characteristics of the learning process, learning process planning, and the implementation of the learning process, and the student learning burden. The characteristics of the learning process include interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative, and student centered. The learning process plan is prepared for each course and presented in a semester learning plan (RPS) developed by lecturers independently or together in a group of areas of expertise.

The implementation of the learning process takes place in the form of interaction between lecturers, students, and learning resources in a certain learning environment. The implementation of the learning process is carried out using a variety of learning methods: group discussions, simulations, case studies, collaborative learning, cooperative learning, project-based learning, problem-based learning, or other learning methods, which can effectively facilitate the fulfillment of graduate learning outcomes. Each course can use one or a combination of several learning methods and be accommodated in a form of learning in the form of: (1) lectures, (2) responses and tutorials, (3) seminars, (4) practicum or field practice, (5) internships, (6) research, (7) humanitarian projects, (8) entrepreneurship, (9) student exchanges, and /or (10) other forms of community service. These forms of learning accommodate students' interests and potential to develop themselves as part of learning independence to achieve the desired learning outcomes.

Learning in the Master of Electronics and Informatics Engineering Education Study Program has taken advantage of technological advances. Several courses have developed online lectures that can be used in full or blended learning and can be accessed through the Learning Management System (BeSmart UNY) on the http://besmart.uny.ac.id/v2/ page. Students are also required to be able to utilize technology through various available applications.

Student learning load is expressed in the amount of semester credit units (credits). One credit of lecture activities is equivalent to 45 hours per semester. This is equivalent to 170 (one hundred and seventy minutes: 50 minutes of face-to-face, 60 minutes of structured assignments, and 60 minutes of independent activities) of study activities per week per semester. Each course has at least 1 (one) credit weight. Semester is a unit of time for effective learning activities for 16 (sixteen) weeks.

The learning process is aimed at fulfilling the competency achievements of the study program in accordance with the Graduate Learning Outcomes and Course Learning Outcomes. The achievement of these competencies requires the implementation of a learning process with a student-centered system (student learning center). Learning emphasizes on strengthening personality, social, pedagogic and professional competencies.

Learning can be carried out with a face-to-face/meeting system, including structured assignment e-learning, independent assignments and other equivalent activities, seminars, practice and research as well as community service. Learning can also be done with blended learning or a full e-learning model. Overall learning amounted to 16 meetings per semester. Students are required to attend lectures for at least 75% of the face-to-face lectures held.

The implementation of learning in principle concerns three stages: the preliminary stage, the core activity/presentation, and the closing. Related to the principle of complete learning, learning activities are a process of facilitating students to gain learning experience and completeness in accordance with the achievement of competencies that have been determined. Therefore, a contextual approach with activities that encourage students to be active, innovative, creative, inspiring, and build a fun atmosphere, is a learning process that continues to be developed. The perspective of character, national values and entrepreneurial spirit are an inseparable part of building the meaning of learning. Through the learning process developed, the success of students is determined not only based on hard skills, intellectual abilities (achievement index), but also soft skills by looking at cognitive abilities, character, personality and morality.

I. ASESSMENT

Learning assessment is an important part of the curriculum to see the success of students in completing the learning outcomes that have been determined. In accordance with Permendikbud Number 53 of 2023 concerning the Higher Education Quality Assurance System related to learning assessment standard, the Master of Education in Electronics and Informatics Engineering Study Program carries out an assessment process based on the principles of educational, authentic, objective, accountable, and transparent. Learning assessment includes two aspects, namely process assessment and learning outcome assessment. Process assessment is used to gain an understand ing of how students are involved in the lecture process, including aspects of personality and character. The assessment of results is aimed at getting an overview of competency achievements (CPL completeness) after participating in the learning process.

Process assessment is used to see student involvement in lectures including aspects of soft skills in terms of participation in lecture activities, the ability to articulate ideas, evoke responsibility and independence, bring out a spirit of solidarity and cooperation skills, and encourage increased student motivation. Process assessment is carried out by observation methods, peer assessment, and portfolio. This assessment is carried out during the lecture process as one of the components that determines the final grade.

Outcome assessment is used to assess students' ability to achieve competencies that are learning outcomes. Assessment of results is carried out through a competency test for each sub-competency or sub-CPMK taught, mid-semester exam, practical exam, and final semester exam. The method of assessing results is carried out by written exams, essay/paper writing, oral exams, practical exams and portfolios.

Various assessment techniques can be carried out, including observation, participation, demonstrations, written tests, oral tests, and questionnaires. Learning process assessment instruments can be in the form of rubrics and /or outcome assessments in the form of portfolios. The final result of the assessment is an integration of various assessment techniques and instruments used.

Measurement and assessment need to target as much as possible all domains of abilities developed in each course, both in the form of knowledge, attitudes, and skills. Assessment is carried out through various methods, both test and non-test so that the results are authentic and according to the type of ability or learning outcomes of the course, including the possibility of conducting non-test assessments that include the 4Ps (Performance, Product, Project, and Portfolio). In accordance with SN-Dikti, measurement/assessment at all levels of higher education must pay attention to aspects of validity, reliability, comprehensiveness, character aspects, and sustainability.

Assessment reporting is in the form of qualifications for student success in taking a course which is stated in a range of numbers and letters in accordance with applicable academic regulations. Students with high academic achievement are students who have a semester achievement index (IPS) greater than 3.50 (three point five zeros) and meet academic ethics.

Note:

CPL measurement is carried out with an Outcome-Based Assessment (OBA) approach to ensure that each student achieves the set competencies.

- CPL is not measured directly, but is measured through a more specific CPMK (Course Learning Outcomes).
- Each course must have a CPMK that contributes to a specific CPL.
- Each CPMK must have a measurable and relevant assessment to the CPL.
- The form of assessment must be diverse according to the level of competence (attitude, knowledge, general skills, special skills).
- The cumulative evaluation is carried out after students have completed all courses related to a particular CPL

Methods used:

- Student Portfolio → Assess student learning outcomes from assignments, projects, and reports during studies.
- Final Competency (Capstone Project, Thesis, or Comprehensive Exam) → Students work on major projects that reflect mastery of CPL.
- Tracer Study and User Satisfaction Survey → CPL Evaluation after students graduate, involving industry and academia.
- CPL (Graduate Learning Outcomes) scoring is carried out by converting individual student achievements in relevant courses.

$$Skor\ CPL = \sum \frac{Nilai\ mata\ kuliah\ x\ bobot\ kontribusi}{\Sigma Bobot\ kontribusi}$$

Table 4. The Weight of CPMK's Contribution to CPL in Assessment

MK	CPL	CPMK	Cognitive					Partisipattory		CPL (%)	Weight Contribution
			Presencei (%)	Quiz (%)	Task (%)	UTS (%)	UAS (%)	Study Case (%)	Team Based Project (%)		
PEI80201	1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	5	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80202	3	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	3	02	2	2	3,75	2	2,5	5	7,5	24,75	
	3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	6	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80203	2	01	2	2	0	2	2,5	5	7,5	21	100
	2	02	2	2	0	2	2,5	5	7,5	21	
	3	03	2	2	0	2	2,5	5	7,5	21	
	6	04	0	0	15	0	0	11	11	37	
PEI80204	2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	3	02	2	2	3,75	2	2,5	5	7,5	24,75	
	4	03	2	2	3,75	2	2,5	5	7,5	24,75	
	7	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80205	2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	3	02	2	2	3,75	2	2,5	5	7,5	24,75	
	4	03	2	2	3,75	2	2,5	5	7,5	24,75	
	3	04	2	2	3,75	2	2,5	6	7,5	25,75	

MK	CPL	CPMK	Cognitive					Partisipattory		CPL (%)	Weight Contribution
			Presencei (%)	Quiz (%)	Task (%)	UTS (%)	UAS (%)	Study Case (%)	Team Based Project (%)		
PEI80206	2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	3	02	2	2	3,75	2	2,5	5	7,5	24,75	
	3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	4	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80207	1	01	2	2	0	2	2,5	5	7,5	21	100
	8	02	2	2	0	2	2,5	5	7,5	21	
	8	03	2	2	0	2	2,5	5	7,5	21	
	7	04	0	0	20	0	0	8	9	37	
PEI80208	2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	4	02	2	2	3,75	2	2,5	5	7,5	24,75	
	3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	1	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80209	1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-6	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-8	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80210	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-6	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-8	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80211	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100

MK	CPL	CPMK	Cognitive					Partisipattory		CPL (%)	Weight Contribution
			Presencei (%)	Quiz (%)	Task (%)	UTS (%)	UAS (%)	Study Case (%)	Team Based Project (%)		
	-4	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-2	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-4	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80212	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-4	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-6	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80213	-6	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-6	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-5	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-6	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI81001	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-8	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-1	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80214	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-6	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-8	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80215	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	

MK	CPL	CPMK	Cognitive					Partisipattory		CPL (%)	Weight Contribution
			Presencei (%)	Quiz (%)	Task (%)	UTS (%)	UAS (%)	Study Case (%)	Team Based Project (%)		
	-6	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-5	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80216	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-6	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-8	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80217	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-1	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-1	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80218	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-1	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-1	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80219	-1	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-1	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-1	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-1	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80220	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	03	2	2	3,75	2	2,5	5	7,5	24,75	

MK	CPL	CPMK	Cognitive					Partisipattory		CPL (%)	Weight Contribution
			Presencei (%)	Quiz (%)	Task (%)	UTS (%)	UAS (%)	Study Case (%)	Team Based Project (%)		
	-4	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80221	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-2	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80222	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80223	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80224	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80225	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	03	2	2	3,75	2	2,5	5	7,5	24,75	

MK	CPL	CPMK	Cognitive					Partisipattory		CPL (%)	Weight Contribution
			Presencei (%)	Quiz (%)	Task (%)	UTS (%)	UAS (%)	Study Case (%)	Team Based Project (%)		
	-3	04	2	2	3,75	2	2,5	6	7,5	25,75	
PEI80226	-2	01	2	2	3,75	2	2,5	5	7,5	24,75	100
	-2	02	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	03	2	2	3,75	2	2,5	5	7,5	24,75	
	-3	04	2	2	3,75	2	2,5	6	7,5	25,75	

J. CURRICULUM QUALITY ASSURANCE

The quality assurance system implemented is an outcome-based quality assurance system, which is a monitoring and evaluation system to ensure continuous quality improvement and ensure the achievement of standard and learning outcomes that have been set by the education program. The Output-Based Quality Assurance System is a system that ensures the determination of learning standard/outcomes at the beginning and ends by ensuring the achievement and improvement of these learning standard/achievements in a systematic and sustainable manner.

In line with the implementation of the Internal Quality Assurance System of Higher Education, curriculum quality assurance in the Master of Electronics and Informatics Engineering Education Study Program is carried out in line with the implementation of the Quality Assurance system at the Faculty of Engineering level by implementing a quality assurance cycle in the form of determination, implementation, evaluation, control and improvement (PPEPP). The following are the steps to ensure the quality of the curriculum in line with the quality assurance system of higher education:

1. Determination of the Curriculum
   - The determination of the curriculum is carried out by the leadership of the university (every at least 4-5 years) by determining the profile, objectives of the study program, CPL, courses and their weights, and an integrated curriculum structure
   - The determination of the curriculum is carried out by the formulation/assurance of stand ard documents. Guides, manuals, POBs, and forms can be added
2. Curriculum Implementation
   - The implementation of the curriculum is the implementation of standard that have been set
   - The implementation of the curriculum is carried out through the learning process, by paying attention to the achievement of CPL, both in graduates (CPL), CPL at the MK level (CPMK) or CPL at each stage of learning in lectures (Sub-CPMK).
   - The implementation of the curriculum refers to the RPS prepared by lecturers or lecturer teams by paying attention to the achievement of CPL at the MK, CPMK, and SubCPMK levels.
   - Sub-CPMK and CPMK at the course level must support the achievement of the CPL charged in each course.

3. Curriculum Evaluation
    - Curriculum evaluation is carried out against the standard that have been set
    - Formative evaluation is carried out to see the achievement of CPL. Evaluation of CPL achievement is carried out through an evaluation of the achievement of CPMK and Sub CPMK which is determined at the beginning of the semester by lecturers/lecturer teams and study programs.
    - Evaluations are also carried out on the form of learning, learning methods, assessment methods, RPS, and supporting learning tools
    - Summative evaluation is carried out periodically every 4-5 years, involving internal and external stakeholders, reviewed by experts in the field of study program, industry, association, and in accordance with the development of science and technology and user needs
4. Curriculum Control
    - Control of curriculum implementation is carried out every semester with indicators of CPL achievement measurement results.
    - Curriculum control is carried out by the Study Program and monitored and assisted by the quality assurance unit/institution of Higher Education.
5. Curriculum Improvement
    - Curriculum improvement is based on the results of curriculum evaluation, both formative and summative

K. COURSE DESCRIPTION

Scientific Foundation Course Study Program (MKPKP)

COURSE	**:**	**Philosophy of Science and Professional Ethics**
COURSE CODE	**:**	**PEI80201**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Prof. Dr. Putu Sudira, MP**

COURSE DESCRIPTION

This course provides a philosophical and ethical foundation for students in understand ing, developing, and applying science responsibly in the field of electronics engineering and informatics engineering education. Students will study the nature of science from a philosophical perspective, covering aspects of ontology, epistemology, and axiology, as well as understand ing the dynamics of scientific development in historical contexts and scientific paradigms. In addition, this course equips students with an in-depth understand ing of professional ethics, including moral responsibility, ethical principles, and the application of codes of ethics in academic practice, research, and technological professionalism. It is hoped that students will be able to build a critical, reflective, and ethical framework of thinking in scientific and professional decision-making.

Study Material/Topic:

1. The nature and scope of philosophy of science
2. Ontology, epistemology, and axiology of science
3. Structure and characteristics of science and differentiators from non-scientific knowledge
4. Scientific paradigms: rationalism, empiricism, positivism, and constructivism
5. The thoughts of important figures in the philosophy of science (Popper, Kuhn, etc.)
6. The relationship between science, technology, and values in engineering education
7. Basic principles of general ethics and professional ethics
8. Professional code of ethics in engineering and education
9. Ethics in scientific research and publication
10. Ethical dilemmas and decision-making in scientific and professional practice.

Reference:

1. Chalmers, A. F. (2013). *What is this thing called science?* (4th ed.). Hackett Publishing: Indianapolis, IN.
2. Martin, M. W., & Schinzinger, R. (2010). *Ethics in engineering* (4th ed.). McGraw-Hill: New York, NY.
3. Resnik, D. B. (2020). *The ethics of science: An introduction*. Routledge: New York, NY.
4. Okasha, S. (2016). *Philosophy of science: A very short introduction* (2nd ed.). Oxford University Press: Oxford, UK.
5. Lynch, M. P. (2019). *Know-it-all society: Truth and arrogance in political culture*. Liveright Publishing Corporation: New York, NY.
6. Surajiyo. (2019). *Filsafat ilmu: Sebuah pengantar populer* (Cet. ke-6). Bumi Aksara: Jakarta.
7. Zubair, A. (2017). *Etika profesi: Konsep and kasus* (Edisi revisi). Pustaka Pelajar: Yogyakarta.

8. Muhaimin. (2020). *Rekonstruksi education nasional dalam perspektif filsafat and etika profesi*. Kencana: Jakarta.
9. Fahmi, I. (2018). *Etika bisnis and tanggung jawab sosial*. Alfabeta: Band ung.

COURSE	**:**	**Statistics**
COURSE CODE	**:**	**PEI80202**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Ir. Masduki Zakarijah, M.T.**

COURSE DESCRIPTION

This course is designed to equip students with conceptual understand ing and practical skills in the application of statistics as a tool of scientific analysis, especially in the context of research and development in the field of Electronics Engineering Education and Informatics engineering. The study covers descriptive and inferential statistics, including data collection techniques, presentation, processing, and interpretation of quantitative data in a systematic and objective manner. Students are directed to be able to apply statistical methods in hypothesis formulation, model testing, and data-based decision-making, with the support of relevant statistical analysis software. With an integrative and applicable approach, this course encourages the mastery of in-depth data analysis to support research, innovation, and policymaking in technology-based engineering education.

Study Material/Topic:

1. statistics in research.
2. sampling design.
3. data presentation.
4. probability.
5. random variable.
6. population estimation.
7. hypothesis testing.
8. analysis of variants.
9. Multiple regression analysis; inverse high order matrix.
10. path analysis.
11. factor analysis (exploratory factor analysis/EFA and confirmatory factor analysis/CFA).

Reference:

1. DeCoursey W.J. (2003). Statistics and Probability for Engineering Applications with Microsoft® Excel. Boston: Newnes.
2. Gall, Meredith D. Gall, Joyce P. & Borg, Walter R. (2003). Educational research, an introduction, 7ed. Boston: Pearson Education Inc.
3. Pedhazur, Elazar J. Schmelkln, Uora Pedhazur. (2003). Measurement, Design, and Analysis An Integrated Approach. New Jersey: Lawrence Erlbaum Associates, Publishers.;
4. Quirk, Thomas J., (2016). Excel 2016 for Educational and Psychological Statistics, A Guide to Solving Practical Problems. Switzerland: © Springer International Publishing
5. Winkler, Othmar W. (2009).; A Foundation of Descriptive Statistics. Washington: Springer-Verlag Berlin Heidelberg
6. Ryan, T. P. (2013). *Modern engineering statistics* (2nd ed.). Hoboken, NJ: Wiley.
7. Leon-Garcia, A. (2008). *Probability, statistics, and rand om processes for electrical engineering* (3rd ed.). Upper Saddle River, NJ: Pearson Education.

8. Ellingson, S. W. (2020). *Electromagnetics, volume 2*. Blacksburg, VA: Virginia Tech Publishing. https://doi.org/10.21061/electromagnetics-vol-2
9. Lane, D. M. (2013). *Online statistics education: A multimedia course of study*. Houston, TX: Rice University.
10. Santoso, I. B. (2013). *Statistika untuk teknik informatika*. Malang: UIN-Maliki Press.
11. Mundir. (2012). *Statistik education*. Jember: STAIN Jember Press.
12. Universitas Negeri Malang. (2019). *Buku statistik 2019*. Malang: Universitas Negeri Malang.
13. Program Studi Sarjana Teknik Elektro Universitas Diponegoro. (2022). *Buku pedoman Program Studi Sarjana Teknik Elektro 2022*. Semarang: Universitas Diponegoro.

COURSE	**:**	**Research Methodology**
COURSE CODE	**:**	**PEI 80302**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Umi Rochayati, M.T.**

COURSE DESCRIPTION

This course aims to equip students with a comprehensive understand ing of the philosophical foundations, approaches, and techniques in scientific research that are relevant to the field of electronics engineering and Informatics engineering education. Students will systematically study the stages of research, starting from problem identification, goal formulation, literature review, theoretical framework development, research design and methods (quantitative, qualitative, and mixed), data collection and analysis techniques, to the preparation of scientific reports. Emphasis is placed on the ability to design quality research proposals, in accordance with scientific principles and academic ethics. The main output of this course is a thesis research proposal, which will be the basis for students to carry out advanced research for thesis preparation as part of the master's program graduation.

Study Material/Topic:

1. Introduction to research methodology
2. Philosophical foundations and research paradigms
3. Formulation of research problems and objectives
4. Literature review and theoretical framework
5. Research design and methods
6. Data collection techniques
7. Data analysis techniques
8. Validitas, reliabilitas, and trustworthiness
9. Ethics in research
10. Preparation and presentation of thesis research proposals

Reference:

1. Creswell, John. W. 2014. *Research design: qualitative, quantitative, and mixed method approach.* Thousand Oaks: SAGE Publications, Inc.
2. Lodico, M.G., D.T. Spaulding, K. H. Voegtle. 2010. *Methods in educational research: from theory to practice-2nd ed*., San Fransisco: 2010 by John Wiley & Sons, Inc.
3. Rauner, Felix & Rupert Maclean. 2008. *Handbook of technical and vocational education and training research.* Bremen: Springer Science Business Media B.V.
4. Scott, David and Robin Usher. 2011. *Researching education: data, methods and theory in educational enquiry-2nd ed.* London: Continuum International Publishing Group
5. Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approach* (5th ed.). Los Angeles, CA: SAGE Publications.
6. Neuman, W. L. (2014). *Social research methods: Qualitative and quantitative approaches* (7th ed.). Boston, MA: Pearson Education.
7. Flick, U. (2018). *An introduction to qualitative research* (6th ed.). London: SAGE Publications.

8. Babbie, E. R. (2020). *The practice of social research* (15th ed.). Boston, MA: Cengage Learning.
9. Hardani, S. P., et al. (2020). *Metode penelitian kualitatif & kuantitatif*. Yogyakarta: Pustaka Ilmu.
10. Sukardi. (2008). *Metodologi penelitian education: Kompetensi and praktiknya*. Jakarta: Bumi Aksara.
11. Zhiqun Zhao & Felix Rauner. 2014. *Areas of Vocational Education Research.* New York: Springer-Verlag Berlin Heidelberg.

Expertise Course (MKK)

COURSE	**:**	**Vocational Education and Training Management**
COURSE CODE	**:**	**PEI80204**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURE IN CHARGE	**:**	**Dr. Umi Rochayati, M.T.**

COURSE DESCRIPTION

This course discusses the concepts, principles, and practices of management in the implementation of vocational education and training (VET), particularly in the fields of electronics engineering and informatics engineering. The course primarily focuses on the planning, implementation, supervision, evaluation, and development of vocational education programs that are adaptive to industry needs and technological advancements. Students will learn strategies for resource management, competency-based curriculum development, and the integration of technology in training systems. The course also emphasizes the importance of collaboration between educational institutions and the workplace in developing professional workforce readiness and competitiveness in the digital era.

Study Material/Topic:

1. Concept and Philosophy of Vocational Education
2. Legal and Policy Foundations of VET in Indonesia
3. Management Curriculum Vocational Berbasis Kompetensi
4. Vocational Program Planning and Development
5. Resource Management in Vocational Education
6. Evaluation and Monitoring of VET Programs
7. Industrial and Workplace Relations (IDUKA)
8. Innovation and Digitalization in Vocational Education
9. Work-Based Learning Management
10. Research and Development in Vocational Education and Training (VET)

Reference:

1. Hadion, W. (2020). *Management EducationVokasi*. ResearchGate. https://www.researchgate.net/publication/342522924_Management_Education_Vokasi
2. Hana, H., & Yulian. (n.d.). *Management EducationVokasi and Management Pelatihan Keterampilan*. Gramedia. https://ebooks.gramedia.com/id/buku/manajemen-education-vokasi-dan-manajemen-pelatihan-keterampilan
3. Harahap, M. F., Hasibuan, A. R., & Pulungan, E. R. (2022). *Model Management Pelatihan EducationVokasi*. Universitas Negeri Medan. https://digilib.unimed.ac.id/id/eprint/53369/3/Book.pdf
4. Nugroho, Y. (2022). Optimalisasi Educationand Pelatihan Vokasi di Indonesia. *Jurnal Ilmu Administrasi Publik (JIAP)*, 9(2), 123–137. https://jurnal.stialan.ac.id/index.php/jpap/article/view/680/442
5. Almatin, I. N. (2021). *Management EducationVocational dalam Meningkatkan Life Skill Siswa di SMA Sunan Giri Menganti Gresik* (Skripsi, Universitas Islam Negeri Sunan Ampel). https://digilib.uinsa.ac.id/71060/1/Irsyadatun%20Ni%27mah%20Almatin_D03217022.pdf

6. Wibowo, D. S., & Widiastuti, E. (2021). Management Program Vocational bagi Peserta Didik Berkebutuhan Khusus. *Jurnal EducationKhusus*, 17(3), 45–53. https://ejournal.unesa.ac.id/index.php/jurnal-education-khusus/article/view/64051/48400
7. GIZ Indonesia. (2022). *Buku Pand uan Vokasi*. https://vokasi.net/wp-content/uploads/2022/06/1.-Buku-Pand uan-Vokasi-Full.pdf

COURSE	**:**	**Curriculum Design and Learning Methodology**
COURSE CODE	**:**	**PEI80205**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Prof. Dr. Putu Sudira, MP**

COURSE DESCRIPTION

This course integrates the concept of curriculum design and the selection of effective learning strategies/methods in the context of technical and vocational education. Students will analyze the relationship between curriculum design, student characteristics, learning objectives, and teaching methods. The scope of the material includes learning system design, active learning approaches, project-based, problem-based, and work-based learning.

Study Material/Topic:

1. The relationship between curriculum and learning strategies
2. Design of adaptive and collaborative learning systems
3. Selection of Methods: PBL, PJBL, inquiry learning, flipped classroom
4. Technology in vocational learning (e-learning, simulation, VR/AR)
5. Semester learning plan and learning activity unit (UKBM)
6. Learning assessment and competency achievement evaluation
7. Application of innovative learning models for engineering and vocational education

Reference:

1. Sudira, P. (2016). *TVET Abad XXI: Filosofi, Teori, Konsep and Strategi Learning Vocational.* Yogyakarta: UNY Press.
2. Ornstein, A. C., & Hunkins, F. P. (2017). *Curriculum: Foundations, Principles, and Issues* (7th ed.). Boston: Pearson.
3. Majid, A. (2014). *Perencanaan Learning: Mengembangkan Stand ar Kompetensi Guru.* Band ung: Remaja Rosdakarya.
4. Print, M. (1993). *Curriculum Development and Design.* Sydney: Allen & Unwin.
5. Tyler, R. W. (1949). *Basic Principles of Curriculum and Instruction.* Chicago: University of Chicago Press.
6. Joyce, B., Weil, M., & Calhoun, E. (2015). *Models of Teaching* (9th ed.). Boston: Pearson.
7. Uno, H. B. (2009). *Model Learning: Menciptakan Proses Belajar Mengajar yang Kreatif and Efektif.* Jakarta: Bumi Aksara.
8. Taba, H. (1962). *Curriculum Development: Theory and Practice.* New York: Harcourt Brace & World.
9. Arends, R. I. (2012). *Learning to Teach* (9th ed.). New York: McGraw-Hill.
10. Anderson, L. W., & Krathwohl, D. R. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* New York: Longman.

COURSE	**:**	**Evaluation and Assesment of Vocational Learning**
COURSE CODE	**:**	**PEI80206**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Nuryake Fajaryati, M. Pd**

COURSE DESCRIPTION

This course integrates the concept of curriculum design and the selection of effective learning strategies/methods in the context of technical and vocational education. Students will analyze the relationship between curriculum design, student characteristics, learning objectives, and teaching methods. The scope of the material includes learning system design, active learning approaches, project-based, problem-based, and work-based learning.

Study Material/Topic:

1. The concepts of measurement, assessment, evaluation, in relation to the assessment of vocational learning.
2. types of assessments.
3. authentic valuation includes valuation with portfolio.
4. assessment for learning improvement.
5. the concept of validity and reliability.
6. how to develop tests and assessment instruments.
7. analysis/instruction.
8. empirical practice of item analysis using relevant programs.

Reference:

1. Ebel, R. L. 1979. Essentials of educational measurement (3rd ed.). Englewood Cliffs, NJ: Prentice- Hall, Inc.
2. Popham, W. J. 1995. Classroom assessment: What teachers need to know, Boston, M.A: Allyn and Bacon, Inc.
3. Sax, G, 1980 Principles of educational and psychological measurement and evaluation (2nd ed.). San Francisco, CA: Wadsworth Publishing Co.
4. Groundlund, N.E. 1982. Constructing Achievement Test (3rd. Ed.). Englewood Cliffs, NJ: Prentice Hall Inc.;
5. Groundlund, N.E. 1976. Measurement and evaluation in teaching (3rd ed.). Englewood Cliffs, NJ: Prentice Hall Inc.
6. Allen, M.J. & Yen, W, M. 1979. Introduction to measurement theory. Monterey CA: Brooks/Cole Publishing Company.;
7. Nunnally, J. C. (1978). Psychometric theory. New York: McGraw-Hill Bool Company.

COURSE	**:**	**Technopreneurship and Digital Startup**
COURSE CREDIT	**:**	**PEI80207**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
	:	**Dr. Ir. Satriyo Agung Dewanto, M. Pd**

COURSE DESCRIPTION

This course discusses the concepts, principles, and practices of technopreneurship in the digital era, with an emphasis on developing innovative technology-based ideas and transforming these ideas into sustainable startups. Students will learn the characteristics of technopreneurs, digital business opportunity mapping, digital business models (such as Business Model Canvas and Lean Startup), market validation, funding strategies, and startup growth management. The learning process encourages students' analytical and creative abilities in designing and presenting prototypes of startups based on informatics engineering and electronics. This course also instills the values of leadership, collaboration, and resilience in facing the dynamics of the digital business world. The final output of this course is a digital startup business design that is ready to be developed further.

Study Material:

1. Basic concepts of technopreneurship and digital entrepreneurship
2. Characteristics and competencies of successful technopreneurs
3. Identify opportunities and map technology-based problems
4. Product Innovation and Startup Idea Validation
5. Model bisnis digital: Business Model Canvas dan Lean Startup
6. Design and development of Minimum Viable Product (MVP)
7. Digital marketing strategy and customer growth
8. Financial planning and startup funding sources
9. Team management and startup culture
10. Preparation of business proposals and presentations of digital startups

Reference:

1. Blank, S., & Dorf, B. (2020). *The startup owner's manual: The step-by-step guide for building a great company*. Hoboken, NJ: Wiley.
2. Maurya, A. (2012). *Running lean: Iterate from plan A to a plan that works* (2nd ed.). Sebastopol, CA: O'Reilly Media.
3. Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. New York, NY: Crown Business.
4. Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Hoboken, NJ: Wiley.
5. Judijanto, L., Karmagatri, M., Lutfi, M. A., Sepriano, S., Pipin, S. J., Erwin, E., Indrayani, N., Nugraha, U., & Lukmana, H. H. (2024). *Pengembangan startup digital: Referensi sukses memulai bisnis di era industri 4.0 and society 5.0*. Jakarta: Green Pustaka Indonesia.
6. Tarmon, R. I. (2024). *Kewirausahaan berbasis teknologi: Menciptakan inovasi di era digital*. Medan: CV. Idebuku.

7. Sudirman, A., Marganingsih, A., Widaningsih, N., Saleh, L., Tasnim, M., Lawi, A., Ulfah, M., Wardhana, A., Musdalifah, M., & Rahayu, R. A. F. (2023). *Technopreneurship: Inovasi and kreativitas digitalisasi bisnis*. Jakarta: Media Sains Indonesia.
8. Pratama, V. Y., Abadi, M. T., Aini, M. H., Mubarok, M. S., & Alghiffary, M. (2023). *Technopreneurship bisnis digital*. Pekalongan: UIN Gus Dur Press

COURSE	**:**	**Information Systems Management**
COURSE CODE	**:**	**PEI80206**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Priyanto, M. Kom.**

COURSE DESCRIPTION

This course discusses the concepts, roles, and managerial strategies in the management of information systems (SI) to support the achievement of organizational goals, especially in the context of education and technology. Students will understand how information systems are designed, implemented, and integrated in business processes and technology-based educational institutions. The main focus includes informatics engineering infrastructure management, SI/IT strategic planning, information governance and security, and information systems project management. Learning also directs students to be able to analyze organizational needs for information systems, as well as design technology-based solutions efficiently and sustainably. With a theoretical and practical approach, this course aims to produce graduates who are able to make strategic decisions in the management and utilization of information systems optimally.

Study Material/Topic:

1. information systems, organizations, and strategies.
2. Ethical and social issues in information systems.
3. Information systems management in the global economy.
4. Strategic use of informatics engineering.
5. Strategic Information System Planning
6. Designing the IT architecture of the organization.
7. Managing telecommunications.
8. Managing the organization's information resources.
9. Managing partnership-based IT operations.
10. Technology to develop effective systems.
11. Management problems in system development.
12. Managing information security.
13. Supporting information-centric decision-making.
14. Supports IT-enabled Collaboration.
15. Support knowledge work

Reference:

1. Bui, M.S. (2014). Information Systems Management. Eighth Edition. London: Pearson Education Limited.;
2. Laudon, K.C. and Jane, P. L. (2018). Management Information Systems, Managing the Digital Firm. Fifteenth Edition. London: Pearson Education Limited

COURSE	**:**	**Artificial Intelligance**
COURSE CODE	**:**	**PEI80207**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGER	**:**	**Dr. Ir. Fatchul Arifin, M.T.**

COURSE DESCRIPTION

This course aims to provide an in-depth understanding of the basic principles, methods, and application of Artificial Intelligence (AI) in the development of intelligent systems. The system is capable of performing various tasks such as decision-making, classification, prediction, and adaptive learning. Students will learn a variety of techniques in AI, including fuzzy logic systems, regression (linear, logistic, polynomial), as well as various algorithms such as naïve Bayes, K-Nearest Neighbor (KNN), decision tree, random forest, and support vector machine (SVM). The learning process combines theory with practice, where students will implement algorithms using the Python programming language as well as utilize an open-source AI platform. In addition, students will be encouraged to design and implement AI-based solutions in relevant contexts, such as in the fields of electronics engineering and Informatics engineering, education systems, industrial automation, and data-driven technology applications.

Study Material/Topic:

1. Introduction to Artificial Intelligence (AI)
2. Logika Fuzzy (Fuzzy Logic Systems)
3. Regressions (Linear, Logistics, Polynomial)
4. Algoritma Naïve Bayes
5. K-Nearest Neighbor (K-NN)
6. Decision Tree
7. Random Forest
8. Support Vector Machine (SVM)
9. Evolutionary Algorithms
10. Reinforcement Learning
11. Rule-Based Systems
12. Applications of AI in Education and Industry

Reference:

1. Graupe D., Principles of Artificial Neural Networks 3rd Edition, World Scientific, 2013.
2. Russell, S. J., & Norvig, P. (2020). *Artificial intelligence: A modern approach* (4th ed.). Hoboken, NJ: Pearson.
3. Jang, J. S. R., Sun, C. T., & Mizutani, E. (1997). *Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence*. Upper Saddle River, NJ: Prentice Hall.
4. Mueller, J. P., & Massaron, L. (2020). *Artificial intelligence for dummies*. Hoboken, NJ: Wiley.
5. Marr, B. (2019). *Artificial intelligence in practice: How 50 successful companies used AI and machine learning to solve problems*. Hoboken, NJ: Wiley.
6. Kurzweil, R. (2024). *The singularity is nearer: When we merge with AI*. New York, NY: Penguin Books.

7. Arifin, Fatchul, Sagala, R. S., & Winursito, A. (2025). *Membangun kecerdasan buatan (AI) dengan pemrograman visual*. Yogyakarta: UNY Press.
8. Azmi, Z. (2024). *Kecerdasan buatan and implementasinya*. Yogyakarta: Deepublish.
9. Sukamto, A. (2023). *Kecerdasan buatan: Teori and penerapan AI di berbagai bidang*. Jakarta: Media Sains Indonesia.
10. Sutrisno, H. (2023). *Kecerdasan buatan dalam education: Peran guru, literasi digital, and pengembangan teori kualitatif*. Yogyakarta: UGM Press.
11. Prayogo, D. (2022). *Dasar-dasar machine learning and kecerdasan buatan*. Band ung: Informatika

COURSE	**:**	**Deep Learning and Natural Language Processing**
COURSE CODE	**:**	**PEI80208**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Suprapto, MT, Ph. D**

COURSE DESCRIPTION

This course discusses the development of intelligent systems based on deep learning and natural language processing. Students will study the architecture of deep neural networks, including convolutional neural networks (CNN), recurrent neural networks (RNN), long short-term memory (LSTM), and transformer-based models such as BERT and GPT. In addition, this course also examines fundamental NLP concepts such as tokenization, stemming, word embedding (Word2Vec, GloVe), sentiment analysis, and language modeling. Learning includes theoretical approaches as well as programming practices using Python and modern libraries such as TensorFlow, PyTorch, and Hugging Face. Students are expected to be able to design, implement, and evaluate deep learning models for natural language processing, as well as apply them in various technological contexts, including digital education, systems automation, and language-based artificial intelligence.

Study Material/Topic:

1. Basic concepts of Deep Learning
2. Deep Neural Networks Architecture (DNN, CNN, RNN, LSTM)
3. Attention Mechanism dan Transformer
4. Pre-Trained Model (Pretrained Models): BERT, GPT, dll.
5. Fundamental of Natural Language Processing
6. Tokenisasi, Stemming, Lemmatization
7. Text Representation: Word2Vec, GloVe, FastText
8. Analysis Sentimen and Klasifikasi Teks
9. Language Modeling and Text Generation
10. NLP Implementation with Python (TensorFlow, PyTorch, Hugging Face)

Reference:

1. Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). *Attention is all you need*. In *Advances in Neural Information Processing Systems* (Vol. 30). Red Hook, NY: Curran Associates, Inc.
2. Jurafsky, D., & Martin, J. H. (2023). *Speech and language processing* (3rd ed., draft). Upper Saddle River, NJ: Prentice Hall. https://web.stanford.edu/~jurafsky/slp3/
3. Brownlee, J. (2022). *Deep learning for natural language processing*. Victoria, Australia: Machine Learning Mastery.
4. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. Cambridge, MA: MIT Press.
5. Goldberg, Y. (2017). *Neural network methods for natural language processing*. San Rafael, CA: Morgan & Claypool Publishers.
6. Wibowo, A. (2023). *Natural language processing: Teori and implementasi menggunakan Python*. Yogyakarta: Deepublish.

7. Maulana, D. (2022). *Pemrograman deep learning dengan TensorFlow and Keras*. Band ung: Informatika.
8. Arifin, F., Sagala, R. S., & Winursito, A. (2025). *Membangun kecerdasan buatan (AI) dengan pemrograman visual*. Yogyakarta: UNY Press.
9. Hidayatullah, A. (2023). *Deep learning: Teori and penerapan untuk pemula*. Jakarta: Elex Media Komputindo.
10. Ramdhani, M. A. (2021). *Machine learning and deep learning untuk pemula*. Band ung: Media Sains Indonesia.

COURSE	**:**	**Multimedia System**
COURSE CODE	**:**	**PEI80209**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Prof. Herman Dwi Surjono, Ph. D**

COURSE DESCRIPTION

Multimedia Systems is a course that discusses the concept, technology, and application of multimedia systems in the fields of education and engineering. Students will learn the fundamentals of multimedia data representation such as text, audio, images, animation, and video, as well as multimedia data compression and transmission techniques. This course also covers multimedia system architecture, hardware and software integration, and the development of interactive multimedia applications for learning purposes. In addition, students are encouraged to design and evaluate the latest technology-based multimedia systems, taking into account pedagogical, ergonomic, and effectiveness aspects in the context of engineering education and Informatics engineering. Through this course, students are expected to be able to develop innovative multimedia solutions that support technology-based learning and training processes.

Study Material/Topic:

1. Introduction and Basic Concepts of Multimedia Systems
2. Data Representation and Format in Multimedia
3. Multimedia Data Compression and Encoding Techniques
4. Multimedia System Hardware and Software
5. Design and Development of Interactive Multimedia Applications
6. Multimedia Implementation in Digital Learning
7. Latest and Innovative Multimedia Technology
8. Management and Management of Educational Multimedia Projects
9. Evaluation of the Effectiveness of Multimedia Systems and Media
10. Ethics, Law and Regulation in Multimedia System

Reference:

1. Tay Vaughan. (2014). *Multimedia: Making It Work* (8th Edition). McGraw-Hill Education.
2. Li, Z., & Drew, M. S. (2004). *Fundamentals of Multimedia*. Pearson Education.
3. Steinmetz, R., & Nahrstedt, K. (2004). *Multimedia Systems*. Springer.
4. Mayer, R. E. (2009). *Multimedia Learning* (2nd Edition). Cambridge University Press.
5. Nugroho, A. P. (2018). *Pengantar Sistem Multimedia*. Deepublish.

COURSE	**:**	**Master's Final Project Proposals and Seminars**
COURSE CODE	**:**	**PEI80303**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Prof. Herman Dwi Surjono, Ph. D**

COURSE DESCRIPTION

This course is designed to equip students with the ability to design, compile, and present Final Project/Master's research proposals in a systematic and scientific manner. Students are directed to identify research problems relevant to the field of Electronics and Informatics Engineering Education, formulate research objectives and questions, critically review the literature, and choose the right methodology. In this lecture, academic writing strategies, ethics of scientific publications, and effective presentation techniques for the purpose of proposal seminars were also discussed. This course is an important part of preparing students to complete their master's final project independently, in a structured, and quality manner.

Study Material/Topic:

1. Fungsi and struktur proposal penelitian magister
2. Penentuan topik and rumusan masalah penelitian
3. Studi literatur and identifikasi kesenjangan riset (research gap)
4. Perumusan tujuan, hipotesis, and pertanyaan penelitian
5. Penentuan pendekatan and metodologi penelitian (kuantitatif, kualitatif, mixed method)
6. Teknik penulisan akademik and penggunaan referensi ilmiah (Mendeley/Zotero)
7. Etika penelitian and publikasi ilmiah
8. Penyusunan kerangka proposal and timeline riset
9. Teknik presentasi ilmiah and komunikasi akademik
10. Simulasi seminar proposal and umpan balik pembimbing/penguji

Reference:

1. Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications.
2. Punch, K. F. (2014). *Introduction to Social Research: Quantitative and Qualitative Approaches* (3rd ed.). SAGE Publications.
3. Riduwan. (2015). *Metode & Teknik Menyusun Proposal Penelitian*. Alfabeta.
4. Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Pearson Education.
5. Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to Design and Evaluate Research in Education* (10th ed.). McGraw-Hill Education.
6. Day, R. A., & Gastel, B. (2016). *How to Write and Publish a Scientific Paper* (8th ed.). Cambridge University Press.
7. American Psychological Association. (2020). *Publication Manual of the APA* (7th ed.). APA.
8. Sugiyono. (2022). *Metode Penelitian Education: Pendekatan Kuantitatif, Kualitatif, and R&D*. Alfabeta.
9. Buku Pand uan Tesis Program Pascasarjana – Fakultas Teknik/Universitas Anda (tergantung institusi)

10. Artikel and jurnal terkini dari IEEE Xplore, ScienceDirect, SpringerLink, atau SINTA

COURSE	**:**	**Writing Scientific Papers**
COURSE CODE	**:**	**PEI80304**
CREDIT CODE	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Suprapto, MT, Ph. D**

COURSE DESCRIPTION

This course is designed to equip students with the knowledge and skills in writing quality scientific papers that meet national and international publication standards. Students will learn the structure of writing scientific articles, academic argumentation techniques, the use of relevant references, and citation procedures that are in accordance with academic ethics. The main focus of learning is to produce scientific articles that are ready to be sent to SINTA indexed journals (1–3) or Scopus. In addition, students will also be trained to use supporting tools such as reference managers, journal templates, and plagiarism detection tools.

Study Material/Topic:

1. Introduction and Introduction to Scientific Writing
2. Structure of Scientific Writing
3. Data Writing and Presentation Techniques
4. Use of References and Citations
5. Ethics of Scientific Publications
6. Choosing the Right Journal for Publication
7. Article Submission and Review Process
8. Editing and Revision of Scientific Articles
9. Plagiarism Management and Writing Ethics

Reference:

1. Shaikh, (2017). Seven steps to publishing in a scientific journal, Elsevier. Available in https://www.elsevier.com/ connect/7-steps-to-publishing-in-a-scientific-journal
2. D. Le, (2015). How to write an English paper," Publishing workshop, Hanoi.
3. H. Kim, (2015). How to index journal in Scopus & WoS, The 2nd Asian Science Editors' Conference and Workshop, Hanoi Univ. of Sci. and Tech., Vietnam.
4. Springer, (2016). Publishing Your Research: Writing a scientific paper and submitting to the right journal.
5. Wallace S., (2011). How To Write and Submit an Academic Paper in 18 Weeks, revised 4th Edition, A Textbook for Taiwanese Academic Writers., Wallace Academic publishing.
6. Zakaria M.P. (2017). How to Publish: From Raw Data to Pages of High Impact Journals, Faculty of Environmental Studies, UPM, Founding Coordinator for the Center of Excellence in Environmental Forensics.
7. Day, R.A. (2011). *How to Write and Publish a Scientific Paper* (7th ed.). Cambridge University Press.
8. Neville, C. (2010). *The Complete Guide to Referencing and Avoiding Plagiarism*. McGraw-Hill Education.

9. American Psychological Association (APA). (2020). *Publication Manual of the American Psychological Association* (7th ed.).

COURSE	**:**	**Master's Thesis**
COURSE CODE	**:**	**PEI81001**
CREDIT LOAD	**:**	**10**
SEMESTER	**:**	**3**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	

COURSE DESCRIPTION

This course is a final project at the master's level which can be in the form of a thesis, prototype, project, or other relevant final project form, in accordance with the field of Electronics Engineering Education and Informatics engineering. The goal is to equip students with the ability to conduct research, write scientific papers, and develop original ideas based on scientific studies. Through this course, students are expected to be able to compile quality scientific papers that are relevant to actual issues in the field of engineering education and informatics engineering, both in the context of learning, media development, and applied technology innovation. This activity is designed to meet the learning outcomes at KKNI level 8, by emphasizing critical thinking skills, complex problem solving, and publication of research results in national and international accredited scientific journals.

Study Material/Topic:

1. Literature review and search for scholarly sources
2. Data collection and analysis techniques
3. Ethics of research and scientific publications
4. Project implementation, prototype development, or experiment
5. Writing a thesis report or project report according to academic rules
6. Preparation of scientific articles for publication in accredited journals
7. Presentation and defense of research results in front of examiners (thesis hearing)
8. Development of research-based innovations in the field of engineering education and information technology

COURSE	**:**	**Mobile Technology and Wireless Communication**
COURSE CODE	**:**	**PEI80212**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Ir. Eko Marpanaji, MT**

COURSE DESCRIPTION

This course discusses in depth the principles, architecture, and evolution of mobile technology and modern wireless communication systems. The material covers the basics of radio communication, mobile systems generation 1G to 5G, frequency spectrum management, mobility management, dual access techniques (FDMA, TDMA, CDMA, OFDMA), as well as the development of IP-based networks and mobile core network architectures.
In addition, students will study aspects of mobile network design and optimization, wireless channel modeling, as well as contemporary issues such as device-to-device (D2D) communication, Internet of Things (IoT), 5G and beyond (6G) networks, as well as the integration of mobile systems with Wi-Fi networks and other technologies.

Study Material/Topic:

1. The Evolution of Mobile Communication Technology (1G to 5G)
2. Basic Concepts of Wireless Communication
3. 5G Network Architecture
4. Key Technologies in 5G
5. IoT and M2M Communication in the 5G Era
6. The Adoption of 5G in the World of Education and Industry
7. Security and Ethical Issues on 5G Networks
8. 5G Technology Policy and Regulation
9. Global Case Studies and Studies
10. 5G-Based Solution Research or Design Mini Project

Reference:

1. Andrews, J. G., Buzzi, S., Choi, W., Hanly, S. V., Lozano, A., Soong, A. C. K., & Zhang, J. C. (2014). What will 5G be? IEEE Journal on Selected Areas in Communications, 32(6), 1065–1082. https://doi.org/10.1109/JSAC.2014.2328098
2. Dahlman, E., Parkvall, S., & Skold, J. (2020). 5G NR: The Next Generation Wireless Access Technology (2nd ed.). Academic Press. ISBN: 978-0128143230
3. Gupta, A., & Jha, R. K. (2015). A survey of 5G network: Architecture and emerging technologies. IEEE Access, 3, 1206–1232. https://doi.org/10.1109/ACCESS.2015.2461602
4. Chen, S., & Zhao, J. (2014). The requirements, challenges, and technologies for 5G of terrestrial mobile telecommunication. IEEE Communications Magazine, 52(5), 36–43. https://doi.org/10.1109/MCOM.2014.6815891
5. Kurniawan, Y., & Utomo, B. P. (2023). *Pemanfaatan Teknologi 5G and Transformasi Konektivitas*. Prosiding Seminar Nasional LWSA, Universitas Sumatera Utara. [Link PDF] (https://talentaconfseries.usu.ac.id/lwsa/article/download/1667/1405)

6. West Science Press. (2023). Dampak Implementasi Teknologi 5G di Era Konektivitas Cepat. Jurnal Bisnis and Management, 2(3), 45–54. [Link PDF] (https://wnj.westscience-press.com/index.php/jbmws/article/download/556/510)
7. AWS. (2024). Apa itu 5G? - Penjelasan tentang Teknologi 5G. Amazon Web Services. [Link](https://aws.amazon.com/id/what-is/5g/)
8. Cloud Computing.id. (2023). Apa itu 5G? Pengertian, Cara Kerja and Perbedaan Dengan 4G. [Link](https://www.cloudcomputing.id/pengetahuan-dasar/apa-itu-5g-perbedaan-4g)
9. IME FTUI. (2023). Perkembangan 5G Saat Ini di Indonesia. Institut Teknologi FTUI. [Link] (https://ime.eng.ui.ac.id/perkembangan-5g-saat-ini-di-indonesia/)
10. Telkom University. (2023). Manfaat and Fitur Utama Massive MIMO 5G dalam Sistem Komunikasi. Program Studi Teknik Telekomunikasi, Fakultas Teknik Elektro. [Link](https://bte.telkomuniversity.ac.id/manfaat-dan-fitur-utama-massive-mimo-5g-dalam-sistem-komunikasi/).

COURSE	**:**	**Health Technology and Medical Electronics**
COURSE CODE	**:**	**PEI80213**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Ir. Fatchul Arifin, M.T.**

COURSE IN CHARGE

This course discusses the concept, design, and application of electronic technology in the health and medical fields. The main focus is on the use of electronic systems, biomedical sensors, monitoring devices, and informatics engineering to support the diagnosis, therapy, and management of modern health services.
Students will learn the working principles of electronic-based medical devices, the integration of medical data, as well as the safety and regulation aspects of medical devices. In addition, this course also equips students with the ability to design innovative solutions in the field of technology-based healthcare, both for hospitals, clinics, and digital health services.
This course is very important in answering the challenges of the development of industry 4.0 in the health sector, as well as encouraging the birth of professionals who are able to contribute to the development of effective and ethical medical technology.

Study Material/Topic:

1. Basic concepts of health technology and medical electronic systems
2. Sensors and actuators in medical applications (e.g.: ECG, EEG, pulse oximeter, etc.)
3. Design and working principle of electronic medical devices
4. Sistem monitoring patients dan wearable health devices
5. Integration of informatics engineering in the health system (e-health, telemedicine)
6. Medical data management and digital health system interoperability
7. Security, privacy, and regulation in medical electronic devices (e.g.: ISO, FDA)
8. Biomedical signal and image processing technology
9. Latest innovations and trends in healthcare technology (AI, IoT, big data in healthcare)
10. Ethics and legal aspects in the development of health technology

Reference:

1. Webster, J. G. (2018). *Medical Instrumentation: Application and Design* (5th ed.). John Wiley & Sons.
2. Carr, J. J., & Brown, J. M. (2001). *Introduction to Biomedical Equipment Technology* (4th ed.). Pearson Education.
3. Khand pur, R. S. (2014). *Biomedical Instrumentation: Technology and Applications* (3rd ed.). McGraw-Hill Education.
4. Enderle, J. D., Blanchard, S. M., & Bronzino, J. D. (2012). *Introduction to Biomedical Engineering* (3rd ed.). Academic Press.
5. Rangayyan, R. M. (2002). *Biomedical Signal Analysis: A Case-Study Approach*. IEEE Press.
6. Nasr, M., Boudjellal, M., & Zemmouri, R. (2021). Smart healthcare in the age of AI: Recent advances, challenges, and future prospects. *Healthcare Technology Letters, 8*(5), 111–120. https://doi.org/10.1049/htl2.12029

7. Topol, E. (2015). *The Patient Will See You Now: The Future of Medicine is in Your Hand s*. Basic Books.
8. Istepanian, R. S. H., & Woodward, B. (2016). *m-Health: Fundamentals and Applications*. Wiley-IEEE Press.
9. Dey, N., Ashour, A. S., & Balas, V. E. (2018). *Internet of Things and Big Data Analytics for Healthcare*. Springer.
10. Glaser, J. (2021). *Healthcare Information Technology Exam Guide for CompTIA Healthcare IT Technician and HIT Pro Certifications*. McGraw-Hill.

COURSE	**:**	**Automation and Robotics Industri**
COURSE CODE	**:**	**PEI80214**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Muslikhin, Ph. D**

COURSE DESCRIPTION

This course is designed to provide an in-depth understanding of the principles, design, and implementation of robotics and automation systems in a modern industrial environment. Students will learn the basic theory and practical application of robotic systems used in the automation of manufacturing processes, from mechanical structures, actuators, and sensors to industrial robotic control and programming techniques.
In addition, this course also explores the latest technological developments such as collaborative robots (cobots), machine vision systems, as well as the integration of artificial intelligence (AI), Internet of Things (IoT), and data-based control systems in the context of smart manufacturing and industry 4.0. Students will be trained to design and evaluate automation solutions considering energy efficiency, productivity, job safety, and system flexibility. This course also encourages the integration of theory and practice through case studies, simulations, and adaptive robotic system design projects based on modern technology.

Study Material/Topic:

1. Introduction to Robotics and Automation
2. Robotic System Components
3. Industrial Automation System
4. Sistem Automasi Industri
5. Advanced Robotics
6. Intelligent Robotics and Vision System
7. Collaborative Robots (Cobots) and Human-Robot Interaction
8. Industri 4.0 and Smart Manufacturing

Reference:

1. Craig, J. J. (2018). *Introduction to Robotics: Mechanics and Control* (4th ed.). Pearson. ISBN: 978-0133489798
2. Spong, M. W., Hutchinson, S., & Vidyasagar, M. (2020). *Robot Modeling and Control* (2nd ed.). Wiley. ISBN: 978-1119527624
3. Mikell P. Groover. (2019). *Automation, Production Systems, and Computer-Integrated Manufacturing* (5th ed.). Pearson. ISBN: 978-0134605463
4. KUKA Robotics. (2023). *Robot Programming Manual & Automation Technology Whitepapers*. https://www.kuka.com
5. ABB Robotics. (2023). *Collaborative Robots & Automation Solutions.* https://new.abb.com/products/robotics
6. Universal Robots. (2023). *Cobots in Smart Manufacturing.* https://www.universal-robots.com
7. Mohan, C. (2022). *Industrial Automation and Robotics: An Introduction*. Springer. https://doi.org/10.1007/978-981-16-4152-2

8. Siciliano, B., & Khatib, O. (Eds.). (2016). *Springer Handbook of Robotics* (2nd ed.). Springer. ISBN: 978-3319325521
9. *IEEE Transactions on Industrial Informatics* – jurnal terkini mengenai robotika industri and automasi. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=9424
10. Zhang, Y., & Wang, L. (2023). *Machine Learning-Enhanced Robotics in Smart Manufacturing*. Journal of Manufacturing Systems, 66, 678-689. Link

COURSE	**:**	**Signal and Digital Image Processing**
COURSE CODE	**:**	**PEI80215**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr Aris Nasuha, MT**

COURSE IN CHARGE

This course discusses the concepts, techniques, and applications of digital signal and image processing in an integrated manner. The main focus is on the analysis and processing of one-dimensional signals (such as audio and biomedical signals) as well as the processing of two-dimensional imagery (such as images and videos), with a digital algorithm-based approach.
Students will learn various signal transformations (Fourier, Laplace, and Wavelet), filtering techniques, segmentation, image quality improvement, feature extraction, and implementation in computer-based systems. This course also emphasizes the use of software and programming languages such as MATLAB, Python (NumPy, SciPy, OpenCV), as well as signal and image processing libraries to support the simulation process and algorithm development. In addition, students will be introduced to the application of signal and image processing in fields such as health (biomedicine), security, robotics, machine vision, communication, and artificial intelligence.

Study Material/Topic:

1. Basics of Digital Signal Processing
2. Signal Transformation
3. Signal and Image Filtering
4. Digital Image Processing
5. Segmentation and Feature Extraction
6. Signal and Image Processing Applications
7. Programming and Simulation
8. Artificial Intelligence in Signal and Image Processing

Reference:

1. Rafael C. Gonzalez & Richard E. Woods (2018). *Digital Image Processing* (4th ed.). Pearson. ISBN: 9780133356723
2. Alan V. Oppenheim & Ronald W. Schafer (2010). *Discrete-Time Signal Processing* (3rd ed.). Pearson. ISBN: 9780131988421
3. Anil K. Jain (1989). *Fundamentals of Digital Image Processing.* Prentice-Hall. ISBN: 9780133361659
4. S. W. Smith (2003). *The Scientist and Engineer's Guide to Digital Signal Processing.* California Technical Publishing. (Tersedia gratis di: https://www.dspguide.com)
5. Emmanuel C. Ifeachor & Barrie W. Jervis (2002). *Digital Signal Processing: A Practical Approach* (2nd ed.). Prentice Hall. ISBN: 9780201596199
6. Gonzalez, Woods, & Eddins (2020). *Digital Image Processing Using MATLAB.* Pearson. ISBN: 9780130085190

7. IEEE Signal Processing Magazine
https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=79
8. Scikit-Image Documentation (Python)
https://scikit-image.org/docs/stable/

COURSE	**:**	**Data Mining and Big Data**
COURSE CODE	**:**	**PEI80216**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER ON CHARGE	**:**	**Ir. Hand aru Jati, M.M., M.T. Ph.D.**

COURSE DESCRIPTION

The Data Mining course is designed to provide an in-depth understanding of the concepts, techniques, and applications in data mining that are relevant to technology development and informatics engineering education. Students will learn the process of extracting knowledge from large data sets through statistical methods, machine learning, and artificial intelligence. Topics covered include the KDD (Knowledge Discovery in Databases) process, classification, clustering, association, and anomaly detection, as well as evaluation of model results. In addition, students will be equipped with the ability to process data practically using modern data mining software such as RapidMiner, Weka, and Python libraries (scikitlearn, pandas). This course also integrates an ethical approach in data management and privacy. It also emphasized real applications in the world of education, engineering, business, and technology research. Through case studies and final projects, students will be able to design and implement innovative and applicative data mining-based solutions. This course is important as a foundation in the development of intelligent systems and data-driven decision-making.

Study Material/Topic:

1. Introduction to Data Mining – Definition, benefits, and scope of data mining.
2. KDD Process – Stages in extracting knowledge from data.
3. Data Preprocessing – Data cleaning, transformation, and normalization.
4. Classification: Basic Concepts – Supervised learning methods and classification introduction.
5. Decision Tree & Rule-Based – Algoritma pohon kedecision and aturan.
6. Naive Bayes & K-NN – Classification based on probabilitas and farak
7. Clustering: Basics and Concepts – Unsupervised grouping of data.
8. Classification Evaluation – Measurement of the performance of the classification model.
9. K-Means & Hierarchical – Implementation of Clustering algorithms.
10. Data Association – Introduction of association rules and market basket analysis.
11. Apriori & FP-Growth – Algoritma for Generating Assosiation Rules.
12. Outlier Detection – Identify anomalous data and its applications.
13. Text Mining – Processing of text data for classification and analysis.
14. Real Application – Case study of the application of data mining in various fields.
15. Ethics & Privacy – Issues of ethics, security, and bias in data mining.
16. Final Project Presentation – Presentation of project results and final evaluation.

Reference:

1. Han, J., Pei, J., & Kamber, M. (2022). *Data Mining: Concepts and Techniques* (4th ed.). Morgan Kaufmann.
2. Aggarwal, C. C. (2021). *Data Mining: The Textbook* (2nd ed.). Springer.
3. Tan, P.-N., Steinbach, M., Karpatne, A., & Kumar, V. (2020). *Introduction to Data Mining* (2nd ed.). Pearson.

4. Zaki, M. J., & Meira Jr., W. (2020). *Data Mining and Machine Learning: Fundamental Concepts and Algorithms* (2nd ed.). Cambridge University Press.
5. Witten, I. H., Frank, E., Hall, M. A., & Pal, C. J. (2021). *Data Mining: Practical Machine Learning Tools and Techniques* (5th ed.). Morgan Kaufmann.
6. Pang-Ning, T., Steinbach, M., & Kumar, V. (2023). *Data Mining and Analysis: Foundations and Algorithms* (2nd ed.). Pearson.
7. Chapman, P., Clinton, J., Kerber, R., Khabaza, T., Reinartz, T., Shearer, C., & Wirth, R. (2021). *CRISP-DM: A Methodology for Data Mining*. SPSS Inc.
8. Kotu, V., & Deshpand e, B. (2020). *Data Science: Concepts and Practice* (2nd ed.). Morgan Kaufmann.
9. Tsai, C.-F. (2021). *Applied Data Mining for Business and Industry* (3rd ed.). Wiley.
10. Provost, F., & Fawcett, T. (2020). *Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking* (2nd ed.). O'Reilly Media.**s**

COURSE	**:**	**User Experience Design**
CODE COURSE	**:**	**PEI80217**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Ratna Wardani, MT.**

COURSE DESCRIPTION

The User Experience Design (UI/UX) course discusses the principles and practices of user experience design that aim to create an effective, efficient, and enjoyable application and website interface for users. Students will learn user-centered design methodologies, including user research techniques, persona creation, wireframing, prototyping, and usability testing. The material also covers aspects of user psychology, human-computer interaction (HCI), as well as responsive design for various devices. In addition, students will develop skills in using design tools such as Figma, Adobe XD, and Sketch, as well as understand the importance of inclusive design and accessibility. With a project-based approach, students will design, test, and evaluate digital interfaces to ensure an optimal user experience, improve user satisfaction, and support business or educational goals.

Study Material/Topic:

1. Introduction to User Experience Design (UX)
2. User Interface (UI) Design Basics
3. User Psychology and User Needs
4. User Research Methods
5. Personas and User Mapping
6. Wireframing and Prototyping
7. User Flow and Interaction Design
8. Responsive Design and Accessibility
9. Usability Testing and UX Evaluation
10. Visual Design in UX
11. UI/UX Design Tools and Software
12. Design for Multiple Platforms (Web, Mobile, Desktop)
13. Current Trends in UX/UI Design
14. UX/UI Design Case Studies and Projects

Reference:

1. Nielsen, J., & Norman, D. (2020). *Designing for the User Experience*. Pearson Education.
2. Garrett, J. J. (2020). *The Elements of User Experience: User-Centered Design for the Web and Beyond* (2nd ed.). Pearson.
3. Krug, S. (2020). *Don't Make Me Think: A Common-Sense Approach to Web Usability* (3rd ed.). New Riders.
4. Cooper, A., Reimann, R., & Cronin, D. (2020). *About Face: The Essentials of Interaction Design* (4th ed.). Wiley.
5. Kuniavsky, M. (2021). *Observing the User Experience: A Practitioner's Guide to User Research* (2nd ed.). Morgan Kaufmann.
6. Saffer, D. (2021). *Microinteractions: Designing with Details*. O'Reilly Media.

7. Moggridge, B. (2020). *Designing Interactions*. MIT Press.
8. Norman, D. A. (2021). *The Design of Everyday Things* (Revised and Expand ed Edition). Basic Books.
9. Tullis, T. S., & Albert, W. (2021). *Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics* (2nd ed.). Elsevier.
10. Yao, X., & Sun, H. (2022). *User Experience Design: A Practical Introduction to UX Design*. Springer.

COURSE	**:**	**Advanced Programming for Software Engineering**
CODE COURSE	**:**	**PEI80218**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Nurkhamid, M. Kom., Ph. D**

COURSE DESCRIPTION

The Advanced Programming for Software Engineering course is designed to provideAn in-depth understanding of advanced programming techniques used in modern software development. Students will learn a variety of programming concepts, including complex data structures, efficient algorithms, and software design patterns. The main focus is also on the application of object-oriented programming techniques, functional programming, and software engineering principles in the development of large and complex systems. The course also covers topics related to software testing, source code management, and the application of DevOps principles in software development. Students will be exposed to software development projects, which include needs analysis, design, implementation, and testing, to equip them with the skills necessary in professional software engineering practice.

Study Material/Topic:

1. Object-Oriented Programming (OOP) Concepts
2. Advanced Data Structures and Algorithms
3. Software Design Patterns
4. Functional Programming
5. Software Testing
6. Source Code Management
7. DevOps Principles in Software Development
8. Software Architecture
9. Multithreading and Parallel Application Development
10. Software Development Frameworks and Technologies

Reference:

1. Bloch, J. (2021). *Effective Java* (3rd ed.). Addison-Wesley.
2. Freeman, E., & Robson, E. (2021). *Headfirst Design Patterns: A Brain-Friendly Guide* (2nd ed.). O'Reilly Media.
3. Fowler, M. (2020). *Refactoring: Improving the Design of Existing Code* (2nd ed.). Addison-Wesley.
4. Martin, R. C. (2021). *Clean Code: A Handbook of Agile Software Craftsmanship*. Prentice Hall.
5. Beck, K. (2022). *Test-Driven Development: By Example*. Addison-Wesley.
6. Gamma, E., Helm, R., Johnson, R., & Vlissides, J. (2020). *Design Patterns: Elements of Reusable Object-Oriented Software*. Addison-Wesley.
7. Sommerville, I. (2020). *Software Engineering* (10th ed.). Pearson.
8. Bass, L., Clements, P., & Kazman, R. (2021). *Software Architecture in Practice* (4th ed.). Addison-Wesley.
9. McConnell, S. (2020). *Code Complete: A Practical Handbook of Software Construction* (2nd ed.). Microsoft Press.

10. Larman, C. (2021). *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development* (3rd ed.). Pearson.

COURSE	**:**	**Computer Network Management**
CODE COURSE	**:**	**PEI80210**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. phil. Rahmatul Irfan, M.T.**

COURSE DESCRIPTION

The Computer Network Management course discusses the principles, techniques, and tools used to manage network infrastructure effectively and efficiently. Materials include network topology, management protocols (such as SNMP), traffic monitoring, bandwidth settings, and network security. Students will be introduced to various network management and monitoring tools, such as Wireshark, PRTG, Zabbix, and others, as well as the implementation practices of Software Defined Networking (SDN) and cloud networking. This course also emphasizes network performance analysis, fault detection, device management, and documentation and reporting. Students are expected to be able to apply the concept of network management in educational and industrial environments, with an adaptive approach to the latest technology. Through project-based learning, case studies, and hands-on practice, students will have the skills to design, manage, and evaluate network systems that are reliable, secure, and as needed.

Study Material/Topic:

1. Basic Concepts of Network Management
2. Network Topology and Architecture
3. Protocol Management Jaringan (SNMP, NetFlow, etc.)
4. Network Monitoring and Analysis Tools (Wireshark, PRTG, Zabbix)
5. Network Device Management and Automated Configuration
6. Network Security (Firewall, IDS/IPS, VPN)
7. Software Defined Networking (SDN)
8. Cloud Networking and Virtualisasi
9. Network Auditing and Documentation
10. Disaster Recovery and Fault Management

Reference:

1. Stallings, W. (2020). *Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud*. Pearson.
2. Tanenbaum, A. S., & Wetherall, D. J. (2021). *Computer Networks* (6th ed.). Pearson.
3. Forouzan, B. A. (2021). *Data Communications and Networking* (6th ed.). McGraw-Hill.
4. Bejtlich, R. (2021). *The Practice of Network Security Monitoring*. No Starch Press.
5. Kurose, J. F., & Ross, K. W. (2021). *Computer Networking: A Top-Down Approach* (8th ed.). Pearson.
   Liu, C. H., & Cohn, M. (2022). *Network Management: Principles and Practice*. Wiley.
6. Ahmad, N. F., & Rahman, A. (2023). *Management Jaringan Komputer*. Andi Publisher.

COURSE	**:**	**Web Application Design and Development**
CODE COURSE	**:**	**PEI80220**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Adi Dewanto, M. Kom.**

COURSE DESCRIPTION

This course discusses principles and practices in designing and developing modern web applications that are interactive, dynamic, and responsive. Students will learn client-side and server-side development technologies, database management, application testing, and deployment processes. A project-based approach is used to develop web applications that can be applied in the field of education and industry, while instilling pedagogical values in building functional and educational digital solutions

Study Material/Topic:

1. Introduction to Web Applications and their Architectures (Client-server, 3-tier, MVC, REST API)
2. User Interface (UI) and User Experience (UX) Design
3. Front-End Programming: HTML5, CSS3, JavaScript, Framework (React, Vue.js)
4. Back-End Programming: PHP (Laravel), JavaScript (Node.js + Express), Python (Django/Flask)
5. Database Management: MySQL, PostgreSQL, MongoDB
6. Web Application Security: Validation, authentication, protection from XSS, CSRF, SQL Injection
7. Web Application Testing and Debugging
8. Application Deployment: Hosting, GitHub, Vercel/Netlify, VPS, Docker
9. Educational Web App Development
10. Modern Web Technology Trends: Progressive Web Apps (PWA), WebAssembly, WebRTC

Reference:

1. MDN Web Docs. (2024). *Web development documentation*. Mozilla. https://developer.mozilla.org
2. Flanagan, D. (2020). *JavaScript: The Definitive Guide* (7th ed.). O'Reilly Media.
3. Freeman, E., & Robson, E. (2014). *Headfirst HTML and CSS* (2nd ed.). O'Reilly Media.
4. Nixon, R. (2018). *Learning PHP, MySQL & JavaScript* (5th ed.). O'Reilly Media.
5. Duckett, J. (2014). *Web Design with HTML, CSS, JavaScript and jQuery Set*. Wiley.
6. W3Schools. (2024). *Web development tutorials*. https://www.w3schools.com
7. Katz, M., & Hahn, M. (2022). *Fullstack Vue: The Complete Guide to Vue.js*. Fullstack.io.
8. Hartl, M. (2022). *Ruby on Rails Tutorial* (7th ed.). Addison-Wesley.
9. CodeAcademy & FreeCodeCamp online resources (2023–2024)
1. Suhendro, A. (2023). *Pemrograman Web Dinamis dengan Laravel and Vue.js*. Informatika Band ung.

COURSE	**:**	**Cybersecurity and Blockchain**
CODE COURSE	**:**	**PEI80221**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**2**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Agus Qomaruddin Munir M.Cs.**

COURSE DESCRIPTION

The Cyber Security and Blockchain course is designed to provide a conceptual and technical understanding of cybersecurity and blockchain technology which is increasingly crucial in the digital era. Students will learn the basic principles of information security, cyber threats and attacks, cryptography, risk management, and data security policies and regulations. On the other hand, blockchain technology was introduced as a decentralized solution in maintaining the integrity and transparency of data through a secure and immutable ledger system. Students will understand blockchain architecture, consensus, smart contracts, and their applications in areas such as education, finance, and IoT. With a theoretical and practical approach, students are expected to be able to design secure systems, identify potential security gaps, and implement blockchain-based solutions to support digital transformation in the fields of engineering and education. This course also instills awareness of the importance of ethics, privacy, and legal compliance in the development and use of technology.

Study Material/Topic:

1. Introduction to Cyber Security – The basic concepts and importance of cybersecurity.
2. Cyber Threats – Types of attacks such as malware, phishing, and DDoS.
3. CIA Triad – Confidentiality, Integrity, and Availability in System.
4. Dasar cryptographers – Encrypts, decryptions, dan rabbits cryptographers.
5. Network Security – Firewall, IDS, and operating system security.
6. Risk Management – Identify threats and control access.
7. Ethics and Regulation – Legal, data privacy, and security standards.
8. Introduction to Blockchain – The basic concepts and benefits of blockchain technology.
9. Blockchain Structure – Blok, hash, and algorithm consensus.
10. Smart Contract – Concept and implementation with Ethereum.
11. Blockchain Cryptography – Hashing and digital signatures.
12. Blockchain Applications – Case studies in various fields.
13. Blockchain and IoT – Integration for intelligent systems.
14. Threats to the Blockchain – Attacks and security solutions.
15. Type Blockchain – Publik vs privat, and New Technology.
16. Project Presentation – Solution presentation and final evaluation.

Reference:

1. Stallings, W. (2022). *Computer Security: Principles and Practice* (5th ed.). Pearson.
2. Bishop, M. (2021). *Computer Security: Art and Science* (2nd ed.). Addison-Wesley.
3. Schneier, B. (2020). *Applied Cryptography: Protocols, Algorithms, and Source Code in C* (20th Anniversary ed.). Wiley.
4. Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2020). *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction*. Princeton University Press.

5. Antonopoulos, A. M. (2022). *Mastering Bitcoin: Programming the Open Blockchain* (2nd ed.). O'Reilly Media.
6. Bashir, I. (2021). *Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications* (3rd ed.). Packt Publishing.

Matriculation Course

COURSE	**:**	**Education Science**
CODE COURSE	**:**	**PEI80222**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Ir. Satriyo Agung Dewanto, M. Pd**

COURSE DESCRIPTION

This course is a comprehensive introduction to the basic concepts, scope, and application of education, designed specifically for students with non-educational backgrounds (e.g. engineering, Informatics engineering, and electrical engineering). The main objective of this course is to equip students with a basic understanding of the educational process as a foundation for designing, developing, and implementing effective and humanistic learning in the context of vocational education and technology.
In this course, students will explore various educational foundations (philosophical, psychological, and sociological), learning theories, student characteristics, and basic approaches and strategies in learning. Emphasis is placed on how educational concepts can be applied in the context of engineering and Informatics engineering education, including project-based learning, technology integration in teaching, and challenges and opportunities in the era of the Industrial Revolution 4.0 and 5.0.

Study Material/Topic:

1. Definition, Purpose, and Function of Education
2. Philosophy and Foundations of Education
3. Learning Theories: Behaviorism, Cognitivism, Constructivism
4. Student Development and Its Implications in Learning
5. Role and Competence of Teachers/Lecturers
6. Curriculum Concepts and Learning Planning
7. Basic Strategies in the Teaching-Learning Process
8. Education in the Digital Era and the Industrial Revolution 4.0
9. Ethics and Social Responsibility in Engineering Education
10. Vocational and Professional Education Case Studies

Reference:

1. Tilaar, H. A. R. (2012). *Pengantar Ilmu Education*. Rineka Cipta.
2. Dahar, R. W. (2011). *Teori-Teori Belajar*. Erlangga.
3. Sagala, S. (2010). *Konsep and Makna Learning*. Alfabeta.
4. Joyce, B., Weil, M., & Calhoun, E. (2014). *Models of Teaching*. Pearson.
5. Sanjaya, W. (2016). *Perencanaan and Desain Sistem Learning*. Kencana.
6. OECD (2021). *Trends Shaping Education 2022*. https://www.oecd.org/education/trends-shaping-education-2022-bb29d643-en.htm

COURSE	**:**	**Educational Psychology**
CODE COURSE	**:**	**PEI80223**
CREDIT LOAD	**:**	**2**
SEMESTER	**:**	**1**
NUMBER OF MEETING	**:**	**16 X Meeting**
LECTURER IN CHARGE	**:**	**Dr. Nuryake Fajaryati, M.Pd**

COURSE DESCRIPTION

The Educational Psychology course provides a foundation for psychological understanding of the learning and learning process in the context of education, especially engineering education and Informatics engineering. This course is designed as part of the matriculation program for students with non-educational backgrounds, in order to have a psychological perspective in designing and implementing an effective, humanistic, and learning process according to the characteristics of students. Key topics include learning theory and motivation, learners' cognitive and social development, individual differences in learning, learning styles, and psychological implications in the assessment of learning outcomes. Students will be guided to understand how psychological factors can affect learning success as well as how to apply psychological principles in the context of engineering, vocational, and digital technology-based learning classes.

Study Material/Topic:

1. Basic Concepts of Educational Psychology
2. Cognitive and Social Development of Students
3. Individual Differences in Learning
4. Learning Theory
5. Motivation in Learning
6. Learning Difficulties and Intervention Strategies
7. Self-Regulation and Metacognition
8. Psychology-Based Assessment and Evaluation
9. Applications of Psychology in the Digital Environment and the 21st Century
10. Application of Educational Psychology in Engineering & Informatics engineering Learning Design

Reference:

1. Woolfolk, A. (2021). *Educational Psychology* (14th Edition). Pearson.
2. Slavin, R. E. (2020). *Educational Psychology: Theory and Practice* (12th Edition). Pearson.
3. Santrock, J. W. (2018). *Educational Psychology* (6th Edition). McGraw-Hill.
4. Ormrod, J. E. (2017). *Human Learning* (7th Edition). Pearson.
5. Miller, P. H. (2016). *Theories of Developmental Psychology* (6th Edition). Worth Publishers.
6. Suparno, P. (2012). *Teori-Teori Belajar dalam Psikologi Education*. Penerbit Universitas Sanata Dharma.
7. Suryabrata, S. (2014). *Psikologi Education*. RajaGrafindo Persada.
8. OECD (2021). *21st Century Learning: Research, Innovation and Policy*. https://www.oecd.org/education/ceri/21stcenturylearnin

APPENDICES

Table of Curriculum Conversion: MPTEI 2020 Curriculum to PTEI 2025 Curriculum

Course Curriculum 2020		**Course Curriculum 2025**	
Course Code	**Course Name**	**Course Code**	**Course Name**
PAS8201	Filsafat Ilmu	PEI80201	Filsafat Ilmu and Etika Profesi *Philosophy of Science and Professional Ethics*
PAS8202	Statistika	PEI80301	Statistika *Statistics*
PAS8303	Metodologi Penelitian Education	PEI80302	Metodologi Penelitian *Research Methodology*
PTI8201	Education and Pelatihan Vocational	PEI80202	Management education and pelatihan vokasional *Vocational Education and Training Management*
PTI8202	Technology Enhanced Learning (TEL)	PEI80205	Teknopreneur and Startup Digital *Technopreneurship and Digital Startups*
PTI8203	Metodologi Learning Vocational	PEI80203	Desain Curriculum and Metodologi Learning Vocational *Vocational Curriculum Design and Learning Methodology*
PTI8204	Evaluation Educationand Pelatihan Vocational	PEI80204	Evaluation and Asesmen Learning Vocational *Vocational Learning Evaluation and Assessment*
PTI8205	Management Sistem Informasi	PEI80206	Management Sistem Informasi *Information Systems Management*
		PEI80219	Komputasi Edge and Cloud
PTI8206	Kecerdasan Buatan	PEI80207	Kecerdasan Buatan *Artificial Intelligence*
		PEI80218	*Deep Learning* and *Natural Language Processing* *Deep Learning and Natural Language Processing*
PTI8307	Proposal and Seminar Tesis	PEI80303	Proposal and Seminar Tugas Akhir Magister *Master's Thesis Proposal and Seminar*
PTI8208	Penulisan Karya Ilmiah	PEI80304	Penulisan Karya Ilmiah *Academic Writing*
PTI8609	Tesis	PEI81001	Tugas Akhir Magister *master's Thesis*
PTI8210	Sistem Kendali Cerdas	PEI80217	Robotika and Automasi Industri *Robotics and Industrial Automation*
PTI8217	Robotika		
PTI8212	Perancangan Sistem Elektronik		

PTI8211	Teknik Pemrosesan Sinyal Multidimensi	PEI80215	Pengolahan Sinyal and Citra *Signal and Image Processing*
PTI8212	Perancangan Sistem Elektronik	PEI80218	Sistem Tertanam and Internet of Things (IoT) *Embedded Systems and Internet of Things (IoT)*
PTI8213	Management Jaringan Komputer	PEI80210	Management jaringan komputer *Computer Network Management*
PTI8214	User Experience Design	PEI80217	*User Experience Design (UI/UX)* *User Experience Design (UI/UX)*
PTI8215	Management Proyek Perangkat Lunak	PEI80218	Pemrograman Lanjut untuk Rekayasa Perangkat Lunak *Advanced Programming for Software Engineering*
PTI8216	Internet of Things	PEI80211	Sistem Tertanam and Internet of Things (IoT) *Embedded Systems and Internet of Things (IoT)*
PTI8218	Teknologi Seluler	PEI80212	Teknologi Seluler and Komunikasi Nirkabel Cellular and Wireless Communication Technologies
PTI8219	Elektronika Medis	PEI80213	Teknologi Kesehatan and Elektronika Medis *Healthcare Technology and Medical Electronics*
PTI8220	Sistem Multimedia	PEI80209	Sistem Multimedia *Multimedia Systems*
PTI8222	Aplikasi berbasis Web	PEI80220	Desain and Pengembangan Aplikasi Web *Web Application Design and Development*
PTI8221	Big Data	PEI80216	*Data Mining* and *Big Data* *Data Mining and Big Data*
PTI8223	Data Mining		
MDK6201	Ilmu Education	PEI80222	Ilmu Education *Education Science*
MDK6202	Psikologi Education	PEI80223	Psikologi Education *Educational Psychology*
PTI8213	Management Jaringan Komputer	PEI80224	Keamanan Siber and Blockchain *Cybersecurity and Blockchain*