



Curriculum Document of
**MASTER PROGRAMME IN
COMPUTER SCIENCE**

POSTGRADUATE PROGRAMME

Universitas Pendidikan Ganesha
2021

1. IDENTITY OF THE STUDY PROGRAMME

| | | |
|----|----------------------------------|---|
| 1 | Name of Study Programme, Level | Computer Science, Master Degree |
| 2 | Address | 2nd Floor, Postgraduate Building Udayana Street No. 11 Singaraja, Banyuasri, Buleleng District, Buleleng Regency, Bali 81116 |
| 3 | Regency/City | Singaraja |
| 4 | Postal code | 81116 |
| 5 | Phone number | (+62362) 32558 |
| 6 | Fax Number | (+62362) 32558 |
| 7 | Email address | ilkom@undiksha.ac.id |
| 8 | Website address | http://pasca.undiksha.ac.id/ilmu-komputer |
| 9 | Degree given | M.Kom. (Master of Computer Science) |
| 10 | Year and Decree of Establishment | The Decree of the Director-General of Higher Education, The Indonesian Ministry of National Education, Number 1058/E.E2/DT/2013 |
| 11 | Year and Decree of Accreditation | The Decree of the BAN-PT Number 0824/SK/BAN-PT/Akred/M/III/2017 |

2. LEADERSHIP OF THE STUDY PROGRAMME

| | | |
|---|--------------------------|-------------------------------|
| 1 | Name | Dr. Gede Indrawan, S.T., M.T. |
| 2 | Position | Head of the Study Programme |
| 3 | Decree of Assignment | 2916/UN48/KP/2019 |
| 4 | Assignment start date | December, 16 2019 |
| 5 | Assignment complete date | December, 16 2023 |

A. RATIONALE

In the Industrial Revolution Era 4.0, higher education institutions will experience rapid and dynamic development. Therefore, the higher education institutions, including the Computer Science Study Programme, must overcome these future challenges by carrying out their duties, functions, and roles as well as possible. To meet these developments, the Study Programme must collaborate with other higher education institutions both inside and outside Indonesia.

Education is a vital part of the existence and development of a nation's civilization. Without a good education, the future of the country and nation needs to be questioned. The situation of education in Indonesia is increasingly gaining important attention from the state and professional associations in line with the demands to increase the nation's competitiveness and professionalism. Various government regulations, including professional regulations, encourage education stakeholders to improve managing their institutions.

Meanwhile, in the national context, Computer Science education is carried out to develop intact and skilled Indonesian human resources in their fields. Indonesian who are intact are human beings with the character of Pancasila (the ideology of Indonesia), or human beings who believe in God, are humane and Indonesian-minded, togetherness conscious, and have social justice awareness. This character is a socio-spiritual capital for the Indonesian and at the same time acts as an added value to take part in the international world.

The Computer Science foundation is in line with creating value through innovation or improvement. It deals with human, social, and purposeful artificial systems. The Computer Science Study Programme can participate in the development of science and technology and the development of the world community by developing a curriculum that is in line with market needs.

Rapid changes in all sectors of life, especially in the world of work, encourage higher education institutions to equip their graduates with the ability to adapt and creativity to keep up with these rapid changes and developments. Moreover, there are high labor market needs for Computer Science graduates, both at the undergraduate, master, and doctorate levels. This is why we should encourage the master's programme in Computer Science to make a paradigm shift in preparing the curriculum. Not only to focus on the content that must be studied but also to emphasize what abilities graduates must have so they can deal with future life better and improve their quality of life.

The curriculum is a program compiled and implemented to achieve an educational goal in the form of a detailed course, syllabus, learning design, and evaluation system of success that is carried out (actual curriculum) in a period of an educational degree. The preparation of this course is adjusted to the circumstances and abilities of each level of education in the delivery of education and employment needs.

The length of time in a curriculum is usually adjusted to the aims and objectives of the implemented education system. This curriculum is intended to direct education towards the direction and objectives intended in overall learning activities.

One of the efforts of educational institutions in responding to the needs of the users of its graduates is to make changes to the concept of curriculum in higher education institutions, from Content-based Curriculum to Competence-Based Curriculum. Curriculum change is a logical consequence of the dynamic nature of education, always moving to follow and adjust to changes in the underlying factors, both philosophical, psychological, sociological, science and technology, and other factors. With the hope that this new curriculum can accommodate students' interests, most of whom are currently sociologically in the stage of generation Z, a generation that lives and is raised in the digital age, with all the complexities that accompany it.

It is realized that changes in a curriculum are often only focused on changing documents, but the implementation of learning, the creation of a learning atmosphere, ways of evaluating/assessing learning, often do not change. So, it can be said that curriculum changes only happen at the level of concepts or changing the documents. This can be seen in the old education system, where the curriculum was only an input aspect. However, with a broader perspective, the curriculum can act as: (i) Higher education institutions' management policies to determine the direction of education; (ii) Philosophy that will color the formation of society and the academic atmosphere; (iii) Patron or Learning

Pattern; (iv) The atmosphere or climate formed as the results of higher education institutions' managerial interactions in achieving its learning goals; (v) Quality references from the quality assurance process; and (vi) Measuring the success of the higher education institution in producing graduates that are advantageous to society.

The renewal of the concept of higher education curriculum as outlined in Decree of the Minister of National Education No.232/U/2000 and No.045/U/2002 has several fundamental changes, including (i) outcomes of higher education institutions, are the competence of a person to be able to do a set of smart, responsible actions as a prerequisite in carrying out tasks in certain fields of work, (ii) the curriculum of the Study Programme is the core curriculum compiled by higher education institutions together with stakeholders and professionals and determined by the higher education institutions involved, (iii) Changes in the curriculum also mean changes in learning, so that the learning process carried out in higher education institutions is not just a process of transfer of knowledge, but is a process of equipping in the form of a method of inquiry of someone competent in working in the community.

Thus, the change in the curriculum is based on the mastery of science and skills (KBI), by the Decree of the Minister of Education and Culture No.056/U/1994, to the competency-based curriculum (KBK), according to the Decree of the Minister of National Education No.232/U/2000, has several expectations of excellence, those are: "Educational outcomes are expected to be under social needs, industrial/business needs, and professional needs; which means that outcomes are the ability to integrate intellectual skills, knowledge and affective behavior in a whole." Changes in the curriculum affect the roles and tasks of lecturers as the main implementer of the curriculum. The efforts to empower and strengthen the competence of lecturers become very important to harmonize with the various demands of change. No matter how great the curriculum will be implemented, if it is not supported by the empowerment and habituation of the lecturer, it seems that it will only result in mere waste.

The organization of the curriculum in the master programme in Computer Science is carried out through a SWOT analysis and Tracer Study also the Labor Market Signals with the stages of curriculum organization based on the Indonesian National Qualification Framework (KKNI, <http://kkni.kemdikbud.go.id/>). The master programme in Computer Science's curriculum was developed by looking at the opportunities that students and graduates' interest in continuing to study in the master programme in Computer Science is increasing, and it is supported by the existence of the National Education System regulations that provide the flexibility in the Study Programme to develop curriculum continuously. The importance of continuously reviewing curriculum development by monitoring the curriculum's suitability with scientific development and the needs of industry/business institutions. The importance of developing minimum quality standards for teaching and measuring the performance of sustainable learning and teaching activities.

Curriculum development faces various challenges such as changes in the demands of the world of work that are faster than the curriculum changes, and the curriculum is no longer appropriate to the circumstances, changes in the demands of science and technology that require continuous curriculum improvements. The curriculum needs to be designed to accommodate the needs of students and the users of the graduates and adapt to the quicker changes of science demands and the necessity to develop a curriculum that is relevant to the conditions of employment.

The curriculum developed has some advantages, including a flexible and designed curriculum by considering the interests of the stakeholders and relevant to the vision, mission, and objectives of the Study Programme, which is derived from the university's vision, mission, and objectives. The curriculum has high inter-subject links. The high interest of students to explore Computer Science makes it easier for the teaching and learning process. Methods of attractive material delivery also support the suitability of learning material with the course's objectives. The measurement of the performance of teaching and learning activities is carried out periodically. It is important to develop a better curriculum with high inter-subject links and various competencies. The curriculum is flexible and designed by considering the stakeholders' interests. In the development of curriculum, some obstacles are found, including the limited time spent by students to practice directly in the field, the lack of learning facilities and infrastructure under curriculum demands, the lack of available facilities to maintain lecturer-student interactions in the university, and the lack of conducive design for community service. The importance

of adjusting curriculum content that is adaptive to the demands of conditions in the workplace needs to maximize the use of facilities and infrastructure that support learning.

B. STUDY PROGRAMME PROFILE DESCRIPTION

The Master Programme in Computer Science of The Postgraduate Programme of Universitas Pendidikan Ganesha (Undiksha) was established based on The Decree of The Director-General of Higher Education, The Indonesian Ministry of National Education, Number 1058/E.E2/DT/2013 about the opening of The Master Programme in Computer Science of The Postgraduate Programme of Undiksha. This Study Programme carries out its main functions and tasks by supporting the: 1) National Medium Term Development Plan (RPJMN), where Information and Communication Technology (ICT) is one of the research focus areas of The Indonesian Ministry of Research, Technology, and Higher Education; and 2) Undiksha's Development Strategic Plan 2011-2016 and 2017-2021 with one of the focus is on the ICT.

As a continuation programme for the Bachelor degree in Computer Science, in 2017, the Study Programme received a B score for accreditation from the national accreditation agency for higher education (BAN-PT) through The Decree of the BAN-PT Number 0824/SK/BAN-PT/Akred/M/III/2017. The study programme includes the study of Data Science, Artificial Intelligence, Machine Learning, Mobile Computing, the Internet of Things, and Information Systems. Graduates of the Study Programme are expected to have career prospects as a professional (in a government institution or private company), or a lecturer/researcher (in a university or a research institution), who have excellent moral ethics, integrity, leadership, communication skill, problem-solving skill, decision-making skill, and knowledge in the field of Computer Science.

The Master Programme in Computer Science of Postgraduate Programme of Undiksha seeks to develop themselves in accordance with the development of Computer Science standards at national, regional, and international levels through partnership strategies with various national and international institutions, including Kasetsart University, Thailand (<http://pasca.undiksha.ac.id/ilmu-komputer/en/workshop-on-writing-an-academic-article-publishing-in-credible-international-journal/>), University of La Rochelle, Perancis (<http://pasca.undiksha.ac.id/ilmu-komputer/en/studium-generale-kuliah-umum-image-processing/>), Universitas Indonesia (<http://pasca.undiksha.ac.id/ilmu-komputer/en/research-sharing-on-software-engineering/>), University of Groningen, Belanda (<http://pasca.undiksha.ac.id/ilmu-komputer/en/kuliah-tamu-dosen-universitas-groningen/>), dan Mariano Marcos State University, Philippines (<http://pasca.undiksha.ac.id/ilmu-komputer/en/visiting-professor-di-mariano-marcos-state-university/>) in the form of guest lectures, publications, joint research, and visiting professors. Membership with professional associations, including the Indonesian Association of Higher Education Informatics and Computers (APTİKOM, <https://aptikom.or.id/>), The International Association of Engineers (IAENG, <http://iaeng.org/>), Institute of Electrical Electronics Engineers (IEEE, <https://ieee.org/>), and Association for Computing Machinery (ACM, <https://acm.org/>). Meanwhile, the collaboration with government and private institutions is carried out through research by students.

C. VISION AND MISSION

Vision

To be a Leading Superior Study Program Based on the *Tri Hita Karana* (Three Causes to Prosperity) Philosophy in Asia by 2045.

Mission

1. Organize dignified education and teaching to produce competitive, collaborative, and characterized resources in the Computer Science study programme.
2. Organize competitive, collaborative, and characterized research for the development and application of science and technology in the Computer Science study programme.
3. Organize competitive, collaborative, accommodating, and innovative community service in the Computer Science study programme.

D. OBJECTIVES

Study programme objectives based on Program Educational Objectives (PEO).

| PEO | Description |
|-------------------------|--|
| PEO-1 (academic) | Graduates who can continue their higher education at Universities with a national or international reputation in Computer Science or other relevant fields. |
| PEO-2 (professional) | Graduates can develop themselves as professionals or lecturers/researchers and become a reference source in Computer Science or other relevant fields. |
| PEO-3 (social) | Graduates who can develop their potential in Computer Science or other relevant fields, also skilled in solving complex problems. |
| PEO | Indicator |
| PEO-1 (academic) | <ol style="list-style-type: none">1. Continuing education in the master's programme in Computer Science or other relevant fields.2. Having the opportunity to obtain competitive scholarships to continue higher education from national or foreign institutions/organizations. |
| PEO-2 (professional) | <ol style="list-style-type: none">1. Working as a professional in Computer Science and other relevant fields.2. Obtaining a professional certificate as a lecturer in Computer Science or other relevant fields.3. Become a resource person at scientific forums, both local, national, and international, in Computer Science or other relevant fields.4. Occupy an organizational leadership position in the community in the field of Computer Science or other relevant fields, with exemplary values that are educative and religious. |
| PEO-3 (social) | <ol style="list-style-type: none">1. Actively involved in the professional development of the community in Computer Science or other relevant fields.2. Actively involved in research and community service activities, especially in Computer Science or other relevant fields. |

E. PROFILE OF GRADUATE

| Profile | Description |
|-----------------------|--|
| Professionals | Professionals (in government or company) have excellent moral ethics, integrity, and knowledge in Computer Science. |
| Lecturers/researchers | Lecturers/researchers (in university or research institution) who have moral ethics, integrity, and knowledge in Computer Science. |

F. PROGRAMME LEARNING OUTCOMES

| 1. ATTITUDE | |
|-------------------|--|
| PLO1 | Demonstrate scientific, educational, and religious attitudes and behaviors that improve the quality of life in society, nation, and state-based on academic norms and ethics based on Tri Hita Karana values. |
| 2. KNOWLEDGE | |
| PLO2 | Ability to design, implement, and develop computer-based systems used in work, education, and research. |
| PLO3 | Ability to analyze, evaluate, and recommend computer-based systems used in work, education, and research. |
| 3. GENERAL SKILLS | |
| PLO4 | Able to integrate learning and innovation skills, mastery of technology and information, career development, and life skills to become lifelong learners. |
| PLO5 | Able to apply logical, critical, systematic, and innovative thinking in the development or implementation of science and technology that pays attention to and applies humanities values following their field of expertise. |
| 4. SPECIAL SKILLS | |
| PLO6 | Ability to propose structured and systematic computer-based solutions to problems in society. |
| PLO7 | Ability to apply basic concepts of logic, mathematics, algorithms, and data structures to develop computer-based systems. |
| PLO8 | Ability to analyze the quality, investment techniques, governance, control, and audit of Information Systems / Information Technology (IS/IT) in line with organizational strategy. |

G. LEARNING PROCESS

The learning process in the study program is intended to meet the outcomes as outlined in the National Higher Education Standards (SNPT) No.44/2015, and then update with Regulation of the Ministerial Regulation of Education and Culture (*Permendikbud*) No.3/U/2020. The learning process in the study program is based on the principle of: (1) interactive, (2) holistic, (3) integrative, (4) scientific, (5) contextual, (6) thematic, (7) elective, (8) collaborative, and (9) student-centered. The definition of the eight characteristic principles as stated in subsection 11 Ministerial Regulation of Education and Culture No.3/U/2020 about the standard of the learning process.

The learning process in the study program certainly cannot be separated from the policies that have been set on the standard of the learning process at university in Ministerial Regulation of Education and Culture No.3/U/2020. In general, it consists of (1) planning process, (2) learning interaction process, and (3) evaluation. Regarding the learning planning process, a planning document is prepared for each course, which is known as Semester Lesson Plan (RPS). RPS made by the lecturers of each course independently. In principle, the RPS must contain:

1. Name of study program, name and course code, semester, credits, name of supporting lecturer.
2. Graduate learning outcomes charged to courses.
3. The final capabilities are planned at each learning stage to meet the learning outcomes of graduates.
4. Study materials related to the abilities to be achieved.
5. Learning methods.
6. The time provided to achieve the ability at each stage of learning.
7. Student learning experiences are embodied in the tasks that students must do for one semester.
8. Criteria, indicators, and assessment weights, as well as a list of references used.

Regarding the process of interaction between lecturers and students, according to the National Higher Education Standards (SNPT), with 16 times the number of face-to-face meetings, including Mid Semester Test (UTS) and End Semester Test (UAS). The presence of lecturers and students must meet at least 75% of the standard number of meetings.

Several learning methods can be used, including group discussions, simulations, case studies, collaborative learning, cooperative learning, project-based learning, problem-based learning, or other learning methods, which can effectively fulfill graduate learning outcomes. Each lecturer is given the freedom to implement one of these methods in the study program or to combine several methods. The forms of lectures used in the study program are face-to-face lectures, tutorial responses, seminars, and projects, covering design, implementation, and development aspects.

H. ASSESSMENT

The assessment process begins with an agreement made by the lecturer in charge of the course with students in a lecture contract. In general, the lecture contract concerns what both lecturers and students have to do while the lecture lasts for one semester. The lecture contract also contains an agreed assessment mechanism. The forms of assessment that can be carried out are (1) Quizzes, (2) individual or group assessments (usually in the form of the final results of certain projects or assignments), (3) Mid Semester Test (UTS), (4) End Semester Test (UAS), and (5) Attitude and Participation.

For study programs, the assessment is carried out with the following composition:

| Component s | Process Assessment | Product Assessment | |
|----------------|--|-------------------------|---------------------------|
| | | Test I | Test II |
| Aspects | 1. Presence 2. Activities in the learning process 3. Completion of assignments in class 4. Quiz | Mid Semester Test (UTS) | Final Semester Test (UAS) |
| Weight (%) | 60 | 15 | 25 |

For the final assessment reference, the "Five Scale (Between) Range" is used as follows:

| Percentile Score | Score (Number) | Score (Alphabet) |
|------------------|----------------|------------------|
| 85 - 100 | 4,00 | A |
| 80 - 84 | 3,75 | A- |
| 75 - 79 | 3,25 | B+ |
| 70 - 74 | 3,00 | B |
| 65 - 69 | 2,75 | B- |
| 60 - 64 | 2,50 | C+ |
| 55 - 59 | 2,00 | C |
| 40 - 54 | 1,00 | D |
| 0 - 39 | 0 | E |

I. CURRICULUM STRUCTURE

Based on the MBKM curriculum (<http://dikti.kemdikbud.go.id/wp-content/uploads/2020/04/Buku-Panduan-Merdeka-Belajar-Kampus-Merdeka-2020>) of Undiksha postgraduate programme 2020 and Vice-Rector I Circular Letter 5683/UN48.1/TU/2021, the study programme curriculum categorizes courses as follow:

- 1. Core Study Courses (42 credits): (a) Compulsory Courses and Elective Courses.**
- 2. Courses for non-educational background or Aanvullen Courses** (matriculation courses for students from non-linear fields of study, a maximum of 12 credits, if any).

| No. | Course | | Code | credits) | Semester |
|--|---|---|-----------|--------------|----------|
| 1 | Core Study Courses: Compulsory Courses | | | | |
| | 1. | Numeric Computation | KOM220101 | 3 | I |
| | 2. | Algorithm Design and Analysis | KOM220102 | 3 | I |
| | 3. | Data Science | KOM220103 | 3 | I |
| | 4. | Artificial Intelligence | KOM220104 | 3 | I |
| | 5. | Research Methodology and Scientific Writing | KOM220105 | 2 | I |
| | 6. | Capita Selecta | KOM220206 | 2 | II |
| | 7. | Computer and Society | KOM220326 | 3 | III |
| | 8. | Thesis **) | KOM220325 | 8 | IV |
| | Sub total credits | | | 27 | |
| | Core Study Courses: Elective Courses ***) | | | | |
| | 1. | Elective Course 1 | | 3 | II |
| | 2. | Elective Course 2 | | 3 | II |
| | 3. | Elective Course 3 | | 3 | II |
| | 4. | Elective Course 4 | | 3 | II |
| | 5. | Elective Course 5 | | 3 | III |
| | Sub total credits | | | 15 | |
| Total credits | | | | 42 | |
| 2 | Aanvullen Courses****) | | | | |
| | 1. | Programming Algorithms and Data Structures | KOM220127 | 3 | I |
| | 2. | Basic Software Engineering | KOM220128 | 3 | I |
| | 3. | Basic Database Technology | KOM220229 | 3 | II |
| | 4. | Basic Mobile Computing | KOM220230 | 3 | II |
| | Sub total credits | | | 12 | |
| Total credits with Aanvullen Courses (maximal) | | | | 54 | |

| No. | Provided Elective Course | Code | credits) | Semester |
|-----|--|-----------|--------------|----------|
| 1. | Human and Computer Interaction | KOM220207 | 3 | II |
| 2. | Software Engineering | KOM220208 | 3 | II |
| 3. | Advanced Database Technology | KOM220209 | 3 | II |
| 4. | Mobile Computing | KOM220210 | 3 | II |
| 5. | Internet of Things | KOM220211 | 3 | II |
| 6. | Digital Image Processing | KOM220212 | 3 | II |
| 7. | Computer Vision | KOM220213 | 3 | II |
| 8. | Machine Learning | KOM220214 | 3 | II |
| 9. | Medical Informatics | KOM220215 | 3 | II |
| 10. | Soft Computing | KOM220216 | 3 | II |
| 11. | Parallel Programming | KOM220217 | 3 | II |
| 12. | Information Retrieval | KOM220218 | 3 | II |
| 13. | Advanced Information System | KOM220219 | 3 | II |
| 14. | Knowledge Management | KOM220220 | 3 | II |
| 15. | e-Business and e-Gov | KOM220221 | 3 | II |
| 16. | Information Systems Strategic Planning | KOM220222 | 3 | II |
| 17. | Information Security | KOM220223 | 3 | II |
| 18. | Information Technology Investment Management | KOM220224 | 3 | II |

Notes:

*) Credit Hours

**) Can be taken at Semester III

***) Can be taken based on provided elective courses. The selection was based on the agreement between class participants

****) Taking six credits for students from non-linear fields of study but have work experience in the computer field, 12 credits for those who do not have work experience in the computer field.

Curriculum Structure in Gantt Chart

| 1st Year | | 2nd Year | |
|--|---|-------------------------------------|-----------------------|
| 1st Semester | 2nd Semester | 3rd Semester | 4th semester |
| Numeric Computation (3 credits) | Capita Selecta (2 credits) | Computer and Society (3 credits) | Thesis (8 credits) |
| Algorithm Design and Analysis (3 credits) | Elective Course 1 (3 credits) | Elective Course 5 (3 credits) | |
| Data Science (3 credits) | Elective Course 2 (3 credits) | | |
| Artificial Intelligence (3 credits) | Elective Course 3 (3 credits) | | |
| Research Methodology and Scientific Writing (2 credits) | Elective Course 4 (3 credits) | | |
| Programming Algorithms and Data Structures (3 credits) | Basic Database Technology (3 credits) | | |
| Basic Software Engineering (3 credits) | Basic Mobile Computing (3 credits) | | |

Legend

| | | |
|--------------------|------------------|-------------------|
| Compulsory Courses | Elective Courses | Aanvullen Courses |
|--------------------|------------------|-------------------|

Courses Description

| No. | Course | Description |
|-----|-------------------------------|---|
| 1. | Numeric Computation | Numerical computing courses are courses that provide opportunities for students to be able to solve mathematical problems numerically. This course discusses error, interpolation, numerical derivation and integration, ordinary differential equations (initial value problems), and partial differential equations and analyzes current issues in the application of numerical computing in various fields. |
| 2. | Algorithm Design and Analysis | The algorithm design and analysis course cover how to transform problems into input, process, and output of computer processing. Students analyze the algorithms made to choose the right algorithm to be implemented into the program and optimize the algorithm. Problems that often arise in computing will be examples of discussion cases, such as searching, sorting, matrix operations, graphs, and optimization problems. |

| | | |
|----|--------------|---|
| 3. | Data Science | This course discusses data understanding, data exploration, and data mining in text, multimedia, or web-based. This course also teaches the right method for data processing to be used as a decision support consideration for top-level management. |
|----|--------------|---|

| No. | Course | Description |
|-----|---|--|
| 4. | Artificial Intelligence | This course discusses intelligent systems theory, implementation, and design using algorithms and artificial intelligence techniques. Several intelligence techniques are described in this lecture, including Artificial Neural Network (ANN), fuzzy logic, Support Vector Machine (SVM), and several optimization techniques with their implementation so that students can apply these techniques effectively and efficiently in real cases. |
| 5. | Research Methodology and Scientific Writing | This course discusses advanced research methodology and scientific writing topics such as methodology and research design in preparing a thesis, the validity and reliability of research instruments, advanced data analysis techniques, and international standard scientific papers. |
| 6. | Capita Selecta | This course discusses the latest topics related to Computer Science by conducting a literature review of scientific journals or software products so that it sparks the emergence of student thesis research ideas and innovations. |
| 7. | Computer and Society | This course discusses advanced topics related to computer technology in supporting community work productivity, such as digital literacy, digital crime, information security, e-government, industry 4.0, and society 5.0. |
| 8. | Thesis | The thesis is a research activity consisting of a series of Thesis Proposal Seminar, Pre-Thesis Sessions, and Thesis Sessions. Thesis Proposal Seminar is a prerequisite for thesis, wherein these activities are carried out to determine the thesis research topic along with literature studies, consultation with supervisors, and presentation of Thesis research proposals. The thesis examination occurs orally with an examining committee consisting of 3 examiners and two thesis supervisors. |
| 9. | Human and Computer Interaction | This course provides the concept of human and computer interaction, especially in software interfaces, UX design, and research, to get feedback from users to create an interface that suits user needs. Students also learn about interface design according to the latest trends in this course. |
| 10. | Software Engineering | This course discusses the variety and methodologies in software development and project management, including the management of the personnel involved. Determine the appropriate methodology to be applied to a software project based on the scale and characteristics of the project. Students also study current issues in software project management. |
| 11. | Advanced Database Technology | This course covers advanced topics related to database technology such as enhanced entity relationships, query optimization and processing, introduction to parallel and distributed databases, decision-making systems with data warehouses, and data mining. |
| 12. | Mobile Computing | This course discusses the development of mobile-based software starting from architecture, platform analysis, basic analysis (native, hybrid, webView), and data sources used in the software. So that students can understand the development of mobile software that is effective, efficient, uses the latest technology, and is in accordance with the problems faced. |
| 13. | Internet of Things | This course discusses infrastructure and frameworks in IoT development. The material discussed is machine to machine, wireless sensor network, Internet of Things, Network Programming, IoT Platform, IoT Hardware, Middleware, Web Service. |
| 14. | Digital Image Processing | This course discusses advanced topics related to machine learning such as Dimensionality Reduction, Clustering, Regression, and Classification Techniques, Reinforcement Learning and is accompanied by advanced case studies of the use of machine learning. |

| No. | Course | Description |
|-----|--|---|
| 15. | Computer Vision | This course discusses advanced topics related to technology related to the applicative implementation of advanced image processing related to the recognition process in digital images or videos with advanced techniques from feature selection, clustering, classification, approaches in computer vision. |
| 16. | Machine Learning | This course discusses advanced topics related to machine learning such as Dimensionality Reduction, Clustering, Regression, and Classification Techniques, Reinforcement Learning and is accompanied by advanced case studies of the use of machine learning. |
| 17. | Medical Informatics | This course discusses advanced topics related to computer science in computing, managing, and analyzing information in the medical world, such as knowledge management, decision support systems, digital images, computer vision, and information retrieval. |
| 18. | Soft Computing | This course discusses advanced topics related to soft computing such as evolving ANN, Evolutionary algorithms, and neuro-fuzzy accompanied by analytical and implementation case studies of soft computing. |
| 19. | Parallel Programming | This course discusses advanced topics related to parallel programming in solving large-scale computational problems. In this Constitutional Court, it will be explained further how the model, design, and hardware are needed. |
| 20. | Information Retrieval | This course discusses advanced topics related to information retrieval technology by analyzing user behavior and habits regarding information needs and searches, such as inverted index, IR model, classification, clustering, and advanced applications in text summarization and sentiment analysis. |
| 21. | Advanced Information System | This course discusses advanced topics related to advanced information systems in their design, development, and evaluation, such as enterprise SCM, ERP, CRM, Scrum development models, and extreme programming and enterprise system management and evaluation. |
| 22. | Knowledge Management | This course discusses advanced topics related to knowledge management ranging from creation, acquisition, representation, dissemination, use, and reuse, and implementation in organizations and advanced innovations related to knowledge management. |
| 23. | e-Business and e-Gov | This course discusses advanced topics related to e-Business and e-Gov, such as 1) e-Business Infrastructure and Strategy, 2) e-Gov Masterplan, and 3) E-Gov Evaluation. |
| 24. | Information Systems Strategic Planning | This course discusses advanced topics related to information systems strategic planning, which will explore topics related to the latest methodologies/frameworks in developing and evaluating IS/IT strategic planning such as EgovQual, SPBE, EA, COBIT ITIL, and ETOM. |
| 25. | Information Security | This course discusses advanced topics related to information security such as Threats and Attack Modes, Cryptographic Models, Access Control, Identification and Authentication, Network Security, Operating System (OS) Security, Intrusion Detection and Prevention Systems, and Privacy Laws, Penalties, and Privacy Issues. |
| 26. | Information Technology Investment Management | This course discusses advanced topics related to IS/IT investment management, such as Information Economics, Generic IS/IT Business Value, Real Options, Economic Value Added, and Balanced Scorecard methods. |