



**Kampus
Merdeka**
INDONESIA JAYA



MODULE HANDBOOK

**INFORMATICS
UNDERGRADUATE
PROGRAM**

UPN "VETERAN" JAWA TIMUR

2023

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Religion

Module name	Islamic Religion	
Module level	Undergraduate	
Code	UV21001	
Courses (if applicable)	Islamic Religion	
Semester	1	
Lecturer	UPN "Veteran" Jawa Timur Islamic Religion Lecturers Team	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory ; 1 st semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Discussion group, case study, collaborative learning	
Workload	1. Lectures: 2 sks x 50 = 100 minutes (1 hours 40 minutes) per week. 2. Exercises and Assignments: 2 x 60 = 120 minutes (2 hours) per week. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week	
Credit points	2 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	This course provides students with competencies to understand fundamental concepts in Islam and their implementation in daily life, oriented towards enhancing their comprehensive integrative thinking and fostering a sense of nationalism.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to uphold religious norms and human values in accordance with patriotism characters.	
	CO2 Students are able to critically and innovatively analyze socio-religious and nationalism problems.	
	CO3 Students are able to compromise cultural, religious, and belief diversity in accordance with islamic values.	
	CO4 Students are able to implement a harmonious life in accordance with the Pancasila values and the 1945 constitution.	
	CO5 Students are able to implement the value of "Hubbul wathon minal Iman" (loving one's homeland is a part of faith).	
	CO6 Students are able to show performance in accordance with applicable academic attitude and professional ethics.	
Content	<p>These are the topics covered, including :</p> <ol style="list-style-type: none"> 1. Religion: Concept explanation, types, and scope. 2. God: Concept, history, and scientific facts regarding the existence of God. 3. Faith and Taqwa: Definition, formation process, indication, correlation, and implementation in everyday life. 4. Man : The essence of humans as steward of Allah and its implications within society and civic life. 5. Law : Human Rights, and Democracy from an Islamic perspective and the practical implementation in Indonesia. 	

	<ol style="list-style-type: none"> 6. Islamic Culture: Explanation of Islamic culture and civilization, Islamic values within Indonesian culture, and the reality of cultural, religious, and state negotiations in Indonesia. 7. Ethics, morality, and akhlak : Characteristics, distinction, and implementation within society and civic life. 8. Worship : Definition, legal basis, obligatory, purpose, significance, application, and its role in individuals, within society and civic life. 9. Inter-religious harmony : The concept of Islam as a blessing to the world, the concept of islamic unity(ukhuwah islamiyah), human solidarity (ukhuwah insyaniyah), national unity (ukhuwah wathoniyah), and harmony within Indonesia’s religious and cultural pluralism. 10. Harmony in Indonesia's Diversity: Cultural and Religious Diversity in Indonesia, Challenges of Harmony Amidst Cultural and Religious Pluralism.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Pendidikan Agama Islam, TIM MKPK Agama Islam UPN "Veteran" Jatim • Pendidikan Agama Islam Perguruan Tinggi. Dr.Syahidin, M.Pd., Dr.Andi Hadiyanto, M.A., Penerbit Kementrian P dan K, 2014 • Wilfred C Smith, Memburu Makna Agama (Bandung: Mizan , 2004) • Sa'id al-Qahtani, 'Aqidatu al-Muslimin fi Dhaw'I al-Kitab wa al-Sunnah (2008) • Karen Armstrong, Sejarah Tuhan (Bandung: Mizan, 2011) • Abdillah Toha, Buat Apa Beragama (Bandung: Mizan, 2020) • Zaghlul An-Najjar, Sains dalam Hadis (Jakarta: Amzah, 2011) • Nidhal Guessoum, Islam's Quantum Question: Reconciling Muslim Tradition and Modern Science (2011) • Kuntowijoyo, Islam sebagai Ilmu: Epistemologi, Metodologi, dan Etika (Yogyakarta: Tiara Wacana, 2006) • Ahmad Farid, Quantum Takwa (Solo: Pustaka Arafah, 2008) • Said Hawa, Allah Jalla Jalaluhu (Cairo: Maktabah Darussalam, 1990) • M. Quraish Shihab, Islam yang Saya Pahami: Keragaman itu Rahmat (Tangerang, Lentera Hati, 2019) • Fahrudin Faiz, Menjadi Manusia Menjadi Hamba (Jakarta: Mizan Publika, 2020) • Ahmad Syafi'i Ma'arif, Islam dalam Bingkai Keindonesiaan dan Kemanusiaan (Bandung: Mizan, 2015) • . Gesta Bayuadhy, Tradisi-Tradisi Adiluhung para Leluhur Jawa: Melestarikan Berbagai Tradisi Jawa Penuh Makna (Jakarta: Buku Kita, 2015) • Muhamad Rafi'i, Islam Nusantara Perspektif Abdurrahman Wahid: Pemikiran dan Epistemologinya (Malang: Literasi Nusantara, 2019) • Burhanul Islam Az-Zarnuji, Ta'lim al-Muta'allim (Beirut: Al-Matkab al-Islamiy, 1981) • Ibn al-Qoyyim al-Jauziy, Mulakkhosh Kitab al-Fawaid (2009) • Mohammad Fadhilah Zein, Adab sebelum Ilmu (Jakarta, 2021)

	<ul style="list-style-type: none"> • Ali Zainal 'Abidin 'Abd al-Rahman Al-Jufri, al-Insaniyyah qabla al-Tadayyun (Abu Dhabi: Dar Al Faqih, 2015) • Zaenal Abidin, Fiqih Ibadah (Sleman: Deepublish, 2020) • Saidurrahman, Arifinsyah, Nalar Kerukunan: Merawat Keragaman Bangsa Mengawal NKRI (Jakarta: Kencana, 2018) • Waleed El-Ansary, David K. Linnan, Siti Ruhaini Dxuhayatin, Paripurna P. Sugarda, Harkistuti Harkriswono (ed.), Kata Bersama Antara Muslim dan Kristen (Yogyakarta: Gadjah Mada University Press, 2019) • Ghozali, Imam (Ed.). Akhlakul Karimah: Percikan Pemikiran Dosen Pendidikan Agama Islam Indonesia tentang Implementasi Akhlak dalam Kehidupan (Yogyakarta: Penerbit Bintang Pustaka Madani, 2021)
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Pancasila Education

Module name	Pancasila Education	
Module level	Undergraduate	
Code	IF21007	
Courses (if applicable)	Pancasila Education	
Semester	1	
Lecturer	General Course Teaching Team (Tim MKU)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 1st semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Discussion, collaboration, and case-study	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	2 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	Students are able to understand and explain the values of Pancasila so that they can demonstrate religious attitudes and uphold the values of humanity based on religion, morals, and ethics. Additionally, this course encourages students to contribute to the improvement of the quality of life in society, nation, and state based on Pancasila.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Students are able to understand and explain the concept, urgency, and essence of Pancasila as the foundation of the Republic of Indonesia.	PLO1, PLO2
Content	The material studied in this course includes : The Ideology of Pancasila, History of Pancasila, Pancasila as the foundation of Republic of Indonesia, Pancasila as the state ideology, Pancasila as a philosophical system, Pancasila as an ethical system, and Pancasila as the basis for the development of knowledge values.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.	
Reading List	<ul style="list-style-type: none"> • Textbook for the General Compulsory Course, Directorate General of Learning and Student Affairs, Ministry of Research, Technology, and Higher Education of the Republic of Indonesia, in the year 2016. • Textbook for the General Compulsory Course, Directorate General of 	

	<p>Learning and Student Affairs, Ministry of Research, Technology, and Higher Education of the Republic of Indonesia, in the year 2016.</p> <ul style="list-style-type: none">• Other supporting books, such as 'Pendidikan Pancasila' by Kaelan and books by Yudi Latief, etc.
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English

Module name	English	
Module level	Undergraduate	
Code	UV21010	
Courses (if applicable)	English	
Semester	1	
Lecturer	Dwi Wahyuningtyas, S.Pd., M.A. (PIC) UPN "Veteran" Jawa Timur English Lecturer Team	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 1st semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion, simulation, case study, collaborative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	This course has been designed to enhance students' proficiency in English, encompassing both general and academic contexts. It aims to provide them with the skills necessary to communicate effectively, both orally and in writing, to support their academic endeavors and to develop their soft skills, with a particular focus on teamwork and public speaking.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Students are capable of communicating effectively and professionally in English, both orally and in writing, to support their field of study knowledge and enhance their soft skills, particularly in the areas of teamwork and public speaking.	PLO2, PLO7
Content	Basic English grammar such as; Subject, object, to be, verb, noun, adjective, pronoun, and modals. Basic English tenses such as: simple past tense, simple present tense, simple future tense, simple progressive tense and simple perfect tense.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	

Reading List	<ul style="list-style-type: none">• Azar, B.S & Hagen, S.A. (2009). Understanding and Using English Grammar (4thEd). New York: Pearson Longman• Baxter, S & Bloom, B. (2015). Pearson Test of English General, Skills Boosters. Essex: Pearson Education Ltd.• Murphy, Raymond. (2012). English Grammar in Use. Cambridge: Cambridge University Press• Wigati, et al. (2021) General English for Upper Intermediate. Surabaya: UPN Veteran Jatim Press• https://breakingnewsenglish.com/• https://www.ted.com/talks• https://www.readingrockets.org/• https://breakingnewsenglish.com/
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Computer Architecture

Module name	Computer Architecture	
Module level	Undergraduate	
Code	IF221101	
Courses (if applicable)	Computer Architecture	
Semester	1	
Lecturer	Andreas Nugroho S, S.Kom, M.Kom (PIC) Firza Prima Aditiawan, S.Kom., MTI Eka Prakarsa Mandyartha, ST, M.Kom Dr. Eng. Ir. Dwi Arman Prasetya, ST., MT., IPU	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 1st semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion group, case study, collaborative-learning, cooperative learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	In this course, students learn basic operation of computer, the organization and function of each component as well as the concept of pipelining as one type of parallel processing, sequence of execution of the instruction, I/O, operating system support, basic concepts of high performance computer architecture.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Accuracy in explaining the relationship between computer organization and computer architecture, both in terms of the required software and hardware components in a computer system, either through individual work or as part of a team collaboration.	PLO5, PLO8
Content	The basics of computer operation, the components that make up a computer and their functions, the sequence of executing an instruction, I/O (Input/Output), operating system support, the fundamental concept of high-performance computer architecture, which includes RISC and pipelining.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	

Reading List	<ul style="list-style-type: none">• William Stallings, Computer Organization and Architecture: designing for performance, Prentice Hall, 8 Th ed, 2003.• D. Patterson and J. Hennessy, Computer Organization & Design: The Hardware/Software Interface, 5/e, Morgan Kaufman Publisher, 2014.• Hennessy and Patterson, Computer Architecture, A Quantitative Approach, Second Edition, Morgan Kaufmann, 1996.• Roosta, Seyed H,. Parallel Processing and Parallel Algorithms : Theory and Computation. Springer-Verlag, New York, 2000.
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Computational Mathematics

Module name	Computational Mathematics	
Module level	Undergraduate	
Code	IF221102	
Courses (if applicable)	Computational Mathematics	
Semester	1	
Lecturer	Andreas Nugroho S, S.Kom, M.Kom (PIC) Agung Mustika Rizki, S.Kom., M.Kom. Eka Prakarsa Mandyartha, ST, M.Kom. Pratama Wirya Atmaja, S.Kom., M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory ; 1 st semester	
Type of teaching, contact hours	Lectures, < 60 students	
Teaching Methods	discussion group, simulation, case study, collaborative learning, cooperative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	In this course, students learn number systems, logic, sets, combinatorics, probability, trigonometry, coordinate systems, linear algebra, vectors, matrices, modular arithmetic, derivatives, and integrals.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Accuracy in Calculating, demonstrating, and solving problems related to mathematics, especially calculus, supported by appropriate concepts, formulas, methods, and reasoning	PLO5
Content	Number Systems; Theory Sets and Propositional Logic; Permutations and Combinations; Probability; Trigonometry; Coordinate System; Linear Algebra; Vector; Matrix; Modular Arithmetic; Derivative; Integral.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.	
Reading List	<ul style="list-style-type: none"> • J. Vince, Foundation Mathematics for Computer Science: A Visual Approach, 2nd ed. Springer International Publishing, 2020. • Purcell, E. J., Varberg, D., & Rigdon, S. E. (2007). Calculus (9th Edition). 	

Ethics and Informatics Competence

Module name	Ethics and Informatics Competence	
Module level	Undergraduate	
Code	IF221103	
Courses (if applicable)	Ethics and Informatics Competence	
Semester	1	
Lecturer	Chrystia Aji Putra, S.Kom, M.T (PIC) Budi Nugroho, S.Kom, M.Kom Henni Endah Wahanani, S.T, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 1st semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion group, simulation, case study, collaborative learning, cooperative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	In this course, students learn how a professional in the IT field behaves and conducts themselves in accordance with the code of ethics in the field of Information Technology.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Accuracy in explaining definition of ethics, the definition of a profession, professionalism, characteristics of professionalism, the nature of a professional code of ethics, the functions of a code of ethics, principles of business ethics, and their role in the field of Information Technology profession.	PLO1, PLO2, PLO3
Content	Definition of professional ethics, computer ethics, online ethics, business ethics, IT profession standards, understanding of employment contracts, cyber law, copyright, patents, electronic information and transactions, electronic transaction security, IT field employment contracts, copyright law, patent law, and the ITE (Information and Electronic Transactions) Law.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	

Reading List	<ul style="list-style-type: none"> • Reynold, George W. Ethics in Information Technology. 3rd Edition. Course Technology. • Halvey, Jhon. K dan Barbara Murphy Melby. Information Technology Outsourcing Transaction, Process, Strategy and Contract. 2nd Edition. Jhon Wiley & Sons Inc. • Surajiyo. 2005. Ilmu Filsafat Suatu Pengantar. Jakarta. Bumi Aksara. • Isnanto, R. R. 2009. Buku Ajar Etika Profesi. Semarang. Universitas Diponegoro • UU Hak Cipta, UU Paten, UU ITE dan UU Ketenagakerjaan. KBBi • Fleddermann, Charles B, 2006, Etika Enjiniring, edisi kedua, Penerbit Erlangga. • Martin, Mike W dan Schinzinger, Roland, 1997, Ethnics in Engineering, Mc Graw Hill, Singapore. • Ramli, Ahmad M, 2006, Cyber Law & Haki Dalam Sistem Hukum di Indonesia, PT Refika Aditama Bandung
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Systems and Information Technology

Module name	Systems and Information Technology	
Module level	Undergraduate	
Code	IF221104	
Courses (if applicable)	Systems and Information Technology	
Semester	1	
Lecturer	Henni Endah Wahanani, S.T, M.Kom (PIC) Muhammad Muharrom A.H, S.Kom., M.Kom. Made Hanindia Prami S, S.Kom, M.Cs. Retno Mumpuni, S.Kom, M.Sc	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 1st semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion group, simulation, case study, collaborative learning, cooperative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	In this course, students learn The basic concepts and developments related to information systems and technology encompass computer hardware and software, computer operating systems, as well as management within organizations and their governance, including Supply Chain Management (SCM), Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Decision Support Systems (DSS), E-Business, Security, and Audit.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Accuracy in explaining and expressing opinions on fundamental concepts, historical development, security concepts, as well as management and audit theories within information systems and technology	PLO5, PLO7
Content	<ul style="list-style-type: none"> • Definitions and roles of information systems and technology; • History and development of computer hardware and software; • Basic concepts and development of computer operating systems; Basic concepts and development of information systems and technology; • Supply Chain Management (SCM) concept; • Enterprise Resource Planning (ERP) concept; • Customer Relationship Management (CRM) concept; • Decision Support Systems (DSS) concept; • E-Business concept and development; • Basic concepts of security and control in information systems and technology; Technology audit and information system concepts.. 	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	

Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • J. Vince, Foundation Mathematics for Computer Science: A Visual Approach, 2nd ed. Springer International Publishing, 2020. • Purcell, E. J., Varberg, D., & Rigdon, S. E. (2007). Calculus (9th Edition).

Civic Education

Module name	Civic Education	
Module level	Undergraduate	
Code	UV21013	
Courses (if applicable)	Civic Education	
Semester	2	
Lecturer	UPN "Veteran" Jawa Timur Leadership Lecturer Team	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion, case study, collaborative learning	
Workload	1. Lectures: 2 sks x 50 = 100 minutes (1 hours 40 minutes) per week. 2. Exercises and Assignments: 2 x 60 = 120 minutes (2 hours) per week. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week	
Credit points	2 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	This course fundamentally addresses Indonesian identity: becoming a citizen with an Indonesian personality, building a sense of nationality, and loving the homeland of Indonesia. Consequently, one can become a good and educated citizen (smart and good citizen) in the life of a democratic society, nation, and country.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand the essence of Citizenship Education in developing the holistic abilities of scholars or professionals and its urgency for the future of the nation.	PLO1, PLO2
	CO2 Students are able to master the substance of citizenship education to have an Indonesian personality, build a sense of nationality, and love the homeland, thus becoming a good and educated citizen (smart and good citizen) in the life of the community, nation, and a democratic country.	PLO1, PLO2
	CO3 Students are able to understand correlation between citizenship education and life values so as to become a citizen with an Indonesian personality who is competitive, disciplined, and actively participates in building a peaceful life based on the Pancasila values.	PLO1, PLO2
	CO4 Students are able to master applications of citizenship concepts to become a good citizen capable of supporting the nation and the country, a democratic citizen who is intelligent, cultured, and responsible for the sustainability of Indonesia by practicing their knowledge, technology, and art.	PLO1, PLO2
	CO5 Students are able to understand contributions of citizenship in shaping attitudes and values: respecting diversity, being able to cooperate, having a sense of responsibility, social sensitivity, and a strong love for the community and the nation	PLO1, PLO2

Content	<ul style="list-style-type: none"> • Introduction to civic education • Nature and challenges of citizenship • Essence and urgency of national identity, as well as dynamics and challenges • Urgency of national integration and its challenges • Values and constitutional norms of the 1945 Constitution, and the dynamics and challenges of the constitution • State and citizen rights and duties, as well as their challenges • Indonesian democracy based on Pancasila and the 1945 Constitution • Human rights • Dynamics and challenges in the just enforcement of law in Indonesia • Dynamics and challenges of the archipelagic outlook • Regional autonomy • World peace; the state's position in the global era; Indonesia's national resilience.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Kemenristekdikti. 2016. Modul Pendidikan Kewarganegaraan Untuk Perguruan Tinggi. Jakarta: Dirjen Belmawa Kemenristekdikti • Armaidly Armawi, Geostrategi Indonesia, Jakarta, Direktorat jenderal Pendidikan Tinggi, 2006 • Azyumardi Azra, paradigma Baru Pendidikan Nasional dan Rekontruksi dan Demokratisasi, Penerbit Kompas, Jakarta, 2002 • Bahar, Dr. Saefrodin, "Konteks Kenegaraan, Hak Asasi Manusia, Pustaka Sinar Harapan, Jakarta, 2000. • Kaelan, Pendidikan Kewarganegaraan, UGM Press, Yogyakarta 2005. • Slamet Soemiarno, Geopolitik Indonesia, Jakarta, Direktorat Jenderal Pendidikan Tinggi, 2006

Indonesian

Module name	Indonesian	
Module level	Undergraduate	
Code	UV21009	
Courses (if applicable)	Indonesian	
Semester	2	
Lecturer	General Course Teaching Team (Tim MKU)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Discussion, collaboration, and case-study	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	2 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	This course is a personality development course in the Indonesian language. After completing this course, students are expected to (1) use the Indonesian language to enrich their thoughts, ideas, and scientific attitudes in various forms of high-quality scientific work (meeting the requirements of objectivity, coherence, cohesion, effectiveness, efficiency, and communicativeness); (2) critically edit various scientific works and improve them based on editing results; (3) utilize proficiency in the Indonesian language to continuously develop themselves both orally and in writing throughout their lives.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Students are able to apply their understanding of the Indonesian language, both in oral communication and in writing scientific works, in accordance with the principles of good and correct language use.	PLO1, PLO2, PLO7
Content	In general, the topics covered in this course include: a) History, functions, and the position of the Indonesian language, b) Language varieties, c) The use of EYD/PUEBI (Indonesian Spelling and Writing Guidelines), d) Effective sentences, e) Formatting of academic papers (KTI), f) Language proficiency, g) Paragraph development, h) Citations and bibliography, i) Scientific presentations.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • Language Development and Supervision Agency. Ministry of Education and 	

	<p>Culture. 2011. Republic of Indonesia Law Number 24 of 2009 concerning the National Flag, Language, State Emblem, and National Anthem.</p> <ul style="list-style-type: none"> • Directorate General of Higher Education, Ministry of Education and Culture, Republic of Indonesia. 2013. Lecture Material for the Indonesian Language Course. • Anggarani, Asih, et al. 2006. Mengasah Keterampilan Menulis Ilmiah di Perguruan Tinggi. Jakarta: Graha Ilmu. • Badudu, J.S. 1982. Pelik-Pelik Bahasa Indonesia. Bandung: Pustaka Prima • Chaer, Abdul. 2006. Tata Bahasa Praktis Bahasa Indonesia. Jakarta: Rineka Cipta. • Departemen Pendidikan Nasional. 2008. Kamus Besar Bahasa Indonesia Pusat Bahasa. Edisi Keempat. Jakarta: PT Gramedia Pustaka Utama. • Dwiloka, Bambang dan Rati Riana. 2005. Teknis Menulis Karya Ilmiah. Jakarta: Rineka Cipta. • Keraf, Gorys. 1993. Komposisi. Ende: Nusa Indah. • Keraf, Gorys. 1992. Argumentasi dan Narasi. Jakarta: Erlangga. • Nasucha, H. Yakub Dkk. 2010. Bahasa Indonesia untuk Penulisan Karya Tulis Ilmiah. Surakarta: Media Perkasa. • Nurjamal, Daeng dan Warta Sumirat. 2010. Penuntun Perkuliahan Bahasa Indonesia. Bandung: Alfa Beta. • Parera, J.D. 1987. Menulis Tertib dan Sistematis. Jakarta: Erlangga. • Samsuri. 1991. Analisis Bahasa. Jakarta: Erlangga. • Sujana, Nana. 1987. Tuntunan Penyusunan Karya Ilmiah. Bandung: Sinar Baru. • Warsiman. 2007. Kaidah Bahasa Indonesia yang Benar untuk Penulisan Karya Ilmiah. Bandung: Dewa Ruchi.
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Digital System

Module name	Digital System	
Module level	Undergraduate	
Code	IF221105	
Courses (if applicable)	Digital System	
Semester	2	
Lecturer	Agung Mustika Rizki, S.Kom, M.Kom. (PIC) Andreas Nugroho S, S.Kom, M.Kom. Henni Endah Wahanani, S.T, M.Kom. M. Muharrom A.H, S.Kom., M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, cooperative learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Computer Architecture	
Courses description	In this course, students learn number systems, describes Boolean function of digital systems and its simplification using some methods, and explains the function and characteristic of digital system components. It also analyses and design digital systems, both combinational and sequential system.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students understand the concept of number systems, methods for simplifying Boolean functions, and logic gates.	PLO3, PLO5
	CO2 Students are able to design both combinational and sequential circuits for solving problems.	PLO3, PLO5
	CO3 Students understand the implementation of both combinational and sequential circuits, including register, counter, and memory	PLO3, PLO5
Content	<ul style="list-style-type: none"> • Number System: Explanation between analog and digital system. Number systems: binary, octal, decimal, hexadecimal, conversion between number system. Coding: 8-4-2-1, BCD, Excess-3, Gray, dan others. • Boolean Algebra and simplification of Boolean function: Logic Gate: OR, AND, NOT, XOR, NAND. Truth table, logic function and its implementation using gates. SOP and POS form. Simplification using Boolean algebra & De Morgan theory. Simplification using K-map and Tabulation method. • Combinational Circuit: Adder, Subtractor, Decoder, Encoder, Multiplexer, Demultiplexer. Design combinational circuit. • Synchronous Sequential Logic: Basic concept of synchronous sequential circuit, SR Latch. SR, JK, D, and T Flip-Flops, State Diagram, Sequential circuit analysis, design using flip-flops. • Register, Counter and Memory: Register, Register with Parallel Load, Shift 	

	<p>Register, Counter, Binary Up-Down Counter, Memory Decoding, memory design, Error Correction, ROM.</p> <ul style="list-style-type: none"> • Algorithmic State Machine (ASM): ASM Chart, ASM Block, Timing Sequence, Circuit design using ASM Chart. • Asynchronous Sequential Logic (ASL): Basic concept of ASL, Transition Table, Flow Table, Race Condition. Example of ASL circuit design, simplification of State and Flow Table..
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Supeno Djanali, Sistem Digital (Ed. 2), ITS Press, 2017. • Mano, Morris & Michael D. Ciletti, Digital Design (5th Ed). Pearson, Prentice Hall, 2013. • Wakerly, John F, Digital Design Principle & Practice (3rd. Ed). Prentice Hall, 1999 • Tan, A.T. Choy, Digital Logic Design (2nd Ed), McGraw-Hill, 2011

Algorithm and Programming

Module name	Algorithm and Programming	
Module level	Undergraduate	
Code	IF221106	
Courses (if applicable)	Algorithm and Programming	
Semester	2	
Lecturer	Retno Mumpuni, S.Kom, M.Sc. (PIC) Made Hanindia Prami S, S.Kom, M.Cs. Fetty Tri Anggraeny, S.Kom, M.Kom. Afina Lina Nurlaili, S.Kom., M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, collaborative learning, cooperative learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	In this course, students learn How to Solve Problems through Logistic Sequencing (Algorithm) and Programming. Algorithms are used to understand how computer programs solve problems through a sequence of logistic steps, starting from understanding the basic concept of algorithms, implementing algorithms into a program, concepts of input, processing, output, branching concepts, branching placement, looping concepts, looping placement, arrays, procedures/functions, recursion, introduction to the C programming language, conditional branching programming, array programming, programming procedures/functions, programming pointer, implementing algorithms that match the above-mentioned concepts as solutions in programming.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Accuracy in explaining Algorithm, discussing examples of algorithms, and following the correct way to create an algorithm.	PLO3, PLO5, PLO8
	CO2 Accuracy in Having a basic programming logic skill to solve simple problems.	PLO3, PLO5, PLO8
	CO3 Accuracy in explaining create programs by applying various basic programming algorithms.	PLO3, PLO5, PLO8
Content	Definitions and roles of information systems and technology; Definition of Algorithms, Basics of Algorithm Design, Basic Algorithm Structure, Input Concept, Processing, Output Concept, Branching Concept, Nested Branching, Looping Concept, Nested Loops, Arrays, Procedures/Functions, Recursion, Introduction to the C Programming Language, Conditional Branching Programming, Array Programming, Procedure/Function Programming, Pointer Programming,	

	Implementation of Algorithms according to the above concepts as solutions in programming..
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Rinaldi Munir, Algoritma dan Teknik Pemrograman, Jilid 1 dan 2, Andi Yogyakarta. • Somashekara, M.T, Guru, D.S., Majunatha, K.S, Peoblem Solving in C Rinaldi Munir, Algoritma dan Teknik Pemrograman, Jilid 1 dan 2, Andi Yogyakarta. • Budi Sutedjo Skom, MM dan Michael AN, SKOM, Algoritma & Teknik Pemrograman , Penerbit Andi Yogyakarta • Pine Chris, Learn To Program, The Pragmatic Bookshelf. Raleigh, North Carolina dallas, Texas • Marick Brian, Everyday Scripting with Ruby, The Pragmatic Bookshelf. Raleigh, North Carolina dallas, Texas

Discrete Mathematics

Module name	Discrete Mathematics	
Module level	Undergraduate	
Code	IF221107	
Courses (if applicable)	Discrete Mathematics	
Semester	2	
Lecturer	Eka Prakarsa Mandyartha, ST, M.Kom. (PIC) Eva Yulia Puspaningrum, S.Kom, M.Kom. Pratama Wirya Atmaja, S.Kom, M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Computational Mathematics	
Courses description	In this course, students learn discrete mathematics concepts as support in science informatics. Students are able to explain the concepts of logic, proof methods, sets, functions, mathematical induction & recursion, relations and can apply them to informatics problems.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Accuracy in understanding and applying discrete mathematics concepts as a support in the field of computer science.	PLO5
Content	Logical concepts, methods of proof, discrete structures including sets and propositions, functions and relations, counting concepts, and recursiveness.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • Kenneth.H. Rosen “ Discrete Mathematics and Its Applications, 7th Edition”, McGraw-Hill, 2012. • Seymour L, Marc Lars, “Theory and Problem Of Discrete Mathematics, 3th Edition”. McGraw-Hill, 2007. • Samuel Wibisono, “Matematika Diskrit Jilid 2”, Graha Ilmu, Yogyakarta, 2008. • Rinaldi Munir, ““Matematika Diskrit Edisi ke-3”, Informatika Bandung, 2005 	

Linear Algebra and Matrices

Module name	Linear Algebra and Matrices	
Module level	Undergraduate	
Code	IF221105	
Courses (if applicable)	Linear Algebra and Matrices	
Semester	2	
Lecturer	Dr. Ir. Kartini, S.Kom, MT. (PIC) Andreas Nugroho S, S.Kom, M.Kom. Henni Endah Wahanani, S.T, M.Kom. M. Muharrom A.H, S.Kom., M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Computational Mathematics	
Courses description	In this course, students learn how to solve the system linear equations (SLE) problem using a computational matrix. SLE can be done using Gaussian elimination, Gauss-Jordan elimination and Cramer's rules. In order to better understand the material for the students, it needs to be implemented into a particular programming language. Matrix operation problem begins with the determinant and continues with the inverse matrix. The determinant can be done using Elementary Row Operations (ERO) and cofactor. Inverse matrix can be done using ERO, cofactors and Pseudo-inverse. Implementations to the program are also required to make students more proficient. In vector space, students learn field equations, parametric equations, symmetric equations, dot product, cross product, and linear transformations. Basis include spans, linear independent, homogeneous linear equations, old basis and new basis, the general solution, basis row space, basis column space, orthonormal bases, gram schmidt. Next is about eigenvalues, students learn about eigenvalue and eigenvector, diagonalization, orthogonal diagonalization (practice using the program). In order to further explore the material, case examples of linear algebra will be given.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand and apply concepts of linear equations, matrices, and vectors, and being able to solve related problems accurately and correctly.	PLO5

	Spaces, Linear Transformations, Eigenvalues, and Eigenvectors, and being able to solve related problems accurately and correctly.	PLO5
Content	<ul style="list-style-type: none"> • System Linear Equations; Gaussian elimination, Gauss-Jordan elimination and Cramer's rules (using program). • Matrix and operation, determinant, determinant using Elementary Row Operations (ERO) and cofactor. • Invers matrix using ERO, cofactors and pseudo-inverse. • Vector space, field equations, parametric equations, symmetric equations, dot product, cross product, and linear transformations. • Basis, spans, linear independent, homogeneous linear equations, old basis and new basis, the general solution, basis row space, basis column space, orthonormal bases, gram Schmidt. • Eigenvalue dan eigen vector, diagonalization, orthogonal diagonalization (using program). • Case example in linear algebra. 	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • Anton, Howard and Rosses, Chris.2004. "Aljabar Linear", Penerbit Airlangga, Jakarta 2004. • Jim Hefferon, Linear Algebra 3th edition, St Michael College, 2017. • David Cherney, Tom Denton, Rohit Thomas and Andrew Waldron, "Linear Algebra", First Edition. Davis California, 2013. 	

Database

Module name	Database	
Module level	Undergraduate	
Code	IF221108	
Courses (if applicable)	Database	
Semester	2	
Lecturer	Afina Lina Nurlaili, S.Kom, M.Kom. (PIC) Dr. Rr. Ani Dijah Rahajoe, S.T, M.Cs. Dr. Eng. Ir. Anggraini Puspita Sari, MT. Made Hanindia Prami S, S.Kom, M.Cs. Retno Mumpuni, S.Kom, M.Sc.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 2nd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Computational Mathematics	
Courses description	In this course, students learn about how to model data and information in the form of charts and diagrams concept of physical and apply it to the database in a DBMS using DDL. Students also learn about the concept of relational algebra and data manipulation language (DML) and its application to manage data and information in a database. Students also learn to create database applications to manipulate data in the database. Concepts and practice are done in the classroom and laboratory individual and group. Case studies are used in lectures is a real.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Understand the stages of the database system development life cycle, the main phases of database design which include conceptual design, logical design, and physical design.	PLO3, PLO8
	CO2 Understand the basic concepts associated with the Entity-Relationship (ER) Model (entities, relationships, and attributes) and Enhanced-ER (EER) Model (class/subclass relationships, specialization and generalization, and categories), and be able to perform basic conceptual designs relational data using ER and EER Models.	
	CO3 Able to design logical databases for relational data models using the conversion algorithm of conceptual database design results (ER/EER schemes) into a set of relations, and be able to refine logical database designs for relational data models using functional dependency and data normalization.	PLO3, PLO8
	CO4 Able to specify data retrieval requests using relational algebra, able	PLO3,

	to create database schemas and tables using SQL commands, and able to define queries, constraints, and updating data in SQL.	PLO8
	CO5 Able to map logical database designs into physical database designs using a specific database management system (DBMS) as a target, and understand physical database design methodologies and be able to apply them to improve database performance through tuning, indexing data, improving database design, and query refinement.	PLO3, PLO8
Content	<ul style="list-style-type: none"> • BASIC CONCEPTS OF INFORMATION MANAGEMENT: differences in the data, information and knowledge; benefit from data and information to support human needs; demonstration of the use of data and information for the organization; identification of issues persistent data usage in organizations; evaluation of the use of small to medium scale applications to meet the real needs of users. • DATABASE SYSTEMS: characteristics that distinguish the database approach with traditional approaches to programming with data files; evolution of database and systems approach; the basic purpose, function model, application components and social impact from database systems ; identification of the main function from DBMS and describing its role in the system database; concept of data independence and importance in the database systems; the use of declarative query language to obtain information from databases; • DATA MODELLING: categories based on the type of concept data model is provided to describe the structure of the database (concept data model, physical data model, and representational data model), modelling concepts and the use of modelling notation (ERD, UML); relational data model, the basic principles of the relational data model, modelling concepts and notation of the relational data model; The main concept of OO model such as identity, type constructor, inheritance, polymorphism, and versioning; differences in relational data model with semistructured data model (DTD, XML Schema). • RELASIONAL DATABASE: relational schema from conceptual model created using the model er; relational database design; the concept of integrity constraints and referential integrity constraints; the use of relational algebra operations from mathematical set theory (union, intersection, difference, and Cartesian product) and relational algebra operations to database (select, restrict, project, join, and division); query in the tuple relational algebra and relational calculus; Functional dependence between two or more attributes that are a subset relations, Decomposition of a schema; lossless-join and dependency preservation properties of a decomposition, Candidate keys, superkeys, and closure of a set of attributes, Normal forms (1NF, 2NF, 3NF, BCNF), Multi-valued dependency (4NF), Join dependency (PJNF, 5NF), Representation theory. • QUERY LANGUAGE: database language, SQL (DDL and DML for define data structure, query, update, boundaries, and integrity); QBE and 4th -gen environments, Explicite Set & NULL, Rename, Aggregate Function & Grouping, Arithmetic Operator & Ordering, VIEW in SQL. 6. DATABASE APPLICATION. 	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% 	

	<ul style="list-style-type: none"> • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Connolly, Thomas; Begg, Carolyn; Strachan, Anne; Database Systems : A Practical Approach to Design, Implementation and Management, 3rd edition, Addison Wesley, 2001. • Elmasri, Ramez; Navathe, Shamkant B.; Fundamentals of Database Systems, The Benjamin/Cummings Publishing Company, Inc., California, 2001. • Fathansyah: Basis Data Revisi Kedua, Informatika, Bandung, 2015.

National Defense

Module name	National Defense
Module level	Undergraduate
Code	UV21011
Courses (if applicable)	National Defense
Semester	3
Lecturer	UPN "Veteran" Jawa Timur
Language	Bahasa Indonesia and English
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester
Type of teaching, contact hours	Lectures, < 60 students,
Teaching Methods	Discussion group, simulation, case study, collaborative learning
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week
Credit points	3 credit points (sks)
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.
Mandatory prerequisites	-
Courses description	This course discusses the understanding, definitions, principles, objectives, and spectrum of national defense, understanding the values, ethics, moral character, and national identity, as well as possessing national defense characteristics such as confidence in the power of Pancasila, love for the homeland, awareness of rights and obligations, willingness to sacrifice, and good, clean, and authoritative governance. It also includes having an anti-corruption spirit and a high social sensitivity in both work and community life.
Learning outcomes and their corresponding PLOs	<p>After completing this module, a student is expected to:</p> <p>CO1 Students are able to elaborate the fundamental concept, scope, principles, purposes, and the spectrum of nationalistic patriotism.</p> <p>CO2 Students are able to comprehend the values, ethics, moral character, and national identity.</p> <p>CO3 Students acquire nationalistic patriotism such as strong belief in the sanctity of Pancasila, love for the homeland, consciousness of rights and responsibilities, and a willingness to sacrifice.</p> <p>CO4 Students acquire an initial capability for national defense.</p> <p>CO5 Students are aware and comprehend the factors that influence national defense awareness, national vigilance, and the policies for fostering national defense awareness.</p> <p>CO6 Students are able to comprehend good, clean, and authoritative governance and maintaining a commitment against corruption.</p> <p>CO7 Students are capable of developing and maintain national defense values in line with their professions</p>
Content	These are the topics covered, including :

	<ol style="list-style-type: none"> 1. Mindset of National Defense Education 2. Concept of National Defense Education. 3. National Character and Identity. 4. JSN 45 and the Spirit of Patriotism. 5. Widya Mwat Yasa and the Identity of UPN 'Veteran' 6. 5 Elements of National Defense Substance 7. National Defense in National Development. 8. Influencing National Defense Awareness. 9. Leadership and Entrepreneurship 10. Military and Non-Military Threats and National Vigilance 11. Policies for Fostering National Defense Awareness 12. Good, Clean, and Authoritative Governance 13. Anti-Corruption 14. Fostering National Defense.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Tim Dosen MPK Dik Bela Negara, 2016. Buku Ajar Pendidikan Bela Negara, UPN "Veteran" Jawa Timur Surabaya • Tim Lembaga Administrasi Negara Republik Indonesia, 2019, Kesiapsiagaan Bela Negara, Lembaga Administrasi Negara Republik Indonesia • Letkol Dr. Kusuma, 2018, Pengantar Bela Negara untuk Perguruan Tinggi, Erlangga • AB Susanto, 2020, Manajemen Bela Negara, Kompas • Tim Dosen Bela Negara, 2020, Bela Negara Dalam Berbagai Perspektif, UPN "Veteran" Jakarta • Hamry Gusman Zakaria, 2016, 5 Pilar Revolusi Mental Untuk Aparatur Negara, Elex Media Komputindo • Bambang Setyo Wahyudi, 2017, Indonesia Mencegah, Upaya Pencegahan Korupsi Oleh Kejaksaan Agung Bidang Perdata dan TUN, Buana Ilmu Komputer • Tim Direktorat Jenderal Potensi Pertahanan, 2018, Tatanan Dasar Bela Negara, Kementerian Pertahanan Republik Indonesia • Yudi Latif, 2017, Negara Paripurna, Historitas, Rasionalitas, dan Akuntabilitas Pancasila., Gramedia Pustaka Utama • Suluh Nuswantara Bakti, 2019, Menggalang Ketahanan Nasional Dengan Paradigma Pancasila, Kompas Media Nusantara • Agus Setiadji, 2016, Firepower Indonesia, Indotech Dharma Digdaya • Tim Kementerian Pertahanan Republik Indonesia, 2015, Buku Putih Pertahanan Indonesia, Kementerian Pertahanan Republik Indonesia • Tim Kementerian Pertahanan Republik Indonesia, 2017, Pedoman Strategis Pertahanan Nirmiliter, Kementerian Pertahanan Republik Indonesia • Peraturan perundang-undangan yang berlaku tentang Pertahanan Negara

Operating System

Module name	Operating System	
Module level	Undergraduate	
Code	IF221113	
Courses (if applicable)	Operating System	
Semester	3	
Lecturer	Hendra Maulana, S.Kom, M.Kom. (PIC) Andreas Nugroho S, S.Kom, M.Kom. Muhammad Muharrom A.H, S.Kom., M.Kom. Pratama Wirya Atmaja, S.Kom, M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning, cooperative learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Digital System	
Courses description	In this course, Operating systems have an important role in managing basic computing resources such as I/O and its peripheral, memory and processor. This course discusses the design and principles of the operating systems managing the computing resource in a computer.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand and apply the basic concepts of operating systems and process life cycles and apply communication between processes.	
	CO2 Students are able to understand and apply multi process and multithreaded synchronization mechanisms.	
	CO3 Students are able to understand and apply the concept of memory management, several page replacement algorithms, paging/segmentation mechanisms and apply several process scheduling algorithms.	
	CO4 Students are able to understand the connection between I/O hardware and I/O software and implement file systems.	
Content	The basic concept of operating systems, process life cycle, interprocess communication. 2. Multiprocess synchronization mechanism and the multithread 3. Memory management, page replacement, paging and segmentation algorithm. 4. Process scheduling and its algorithm 5. Relationship and connectivity between I/O hardwares and I/O softwares. 6. Potential attack types in the operating systems as well as its security measures	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and	One written Midterm assessment (60 minutes) and one final oral exam (30	

Evaluation	minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Silberschatz, Galvin, and Gagne, "Operating System Concep Essentials", ninth edition, John Wiley & Sons 2012. • A.S. Tanenbaum, "Modern Operating System 4th Edition", Publisher Pearson, March 2014 • W. Stalling, "Operating Systems: Internal and Design Principles 8thEdition", Publisher: Pearson; 8 Edition.

Advanced Programming

Module name	Advanced Programming	
Module level	Undergraduate	
Code	IF221111	
Courses (if applicable)	Advanced Programming	
Semester	3	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Fawwaz Ali Akbar, S.Kom, M.Kom Fetty Tri Anggraeny, S.Kom, M.Kom Wahyu Syaifullah J S, S.kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, case study, collaborative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Algorithm & Programming	
Courses description	This course emphasizes on the development of programming skills, especially structured programming. Students are expected to implement every concept related to structured programming, both theoretically and practically. This includes condition selection, looping, functions and procedures, recursive functions, abstract data structures, advanced arrays, files, and pointers.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to provide detailed explanations for each sub-section of computer programming.	PLO3, PLO8
	CO2 Students are able to implement a complete programming algorithm.	PLO3, PLO8
	CO3 Students are able to build implementation of a complete programming algorithm with input and output on a certain case study.	PLO3, PLO8
Content	Sequential flow of control, branching, looping, advanced branching control, looping and branching control, control flow in a programming problem, procedures and functions in programming, recursive functions, abstract data structures, abstract data structures in procedures and functions, pointer concepts, and file concepts.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30%	

forms of examination	<ul style="list-style-type: none"> • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Kjell Bäckman, "Structured Programming with C++", © 2012 Kjell Bäckman & bookboon.com, ISBN 978-87-403-0099-4 • Abdul Kadir, Pemrograman C++, Andi Offset, Yogyakarta • Budi Raharjo, Pemrograman C++, Informatika, Bandung • Adam Bachtiar, Pemrograman C dan C++, Informatika, Bandung

Computational Statistics

Module name	Computational Statistics	
Module level	Undergraduate	
Code	IF221112	
Courses (if applicable)	Computational Statistics	
Semester	3	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Dr. Eng. Ir. Anggraini Puspita Sari, MT Dr. Ir. Kartini, S.Kom, MT Yisti Vita Via, S.ST, M.Kom Dr. Rr. Ani Dijah Rahajoe, S.T, M.Cs	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, case study, collaborative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Algorithm & Programming	
Courses description	This course provides insights and understanding about the concepts of probability, random variables, discrete and continuous variable distributions that underlie statistical theories and their applications, by elaborating on calculation techniques and analysis procedures for various fields.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Students are able to identify and implement appropriate statistical method to solve the given problems.	PLO3
Content	Descriptive statistics, distributions and parameters, data summaries, Bayesian probability and theorem, probability, random variables, probability dan distribution function, expectation: mean and variance, discrete distributions, continuous distributions, sample distributions, statistical inference: estimation, mean and variance testing, one-way analysis of variance (ANOVA), simple linear regression & correlation, nonparametric statistics.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.	

Reading List	<ul style="list-style-type: none">• Walpole, R.E., Pengantar Statistika. Edisi ke-3, Penerbit PT Gramedia Pustaka Utama Jakarta, 1997.• Walpole, R.E., Myers, R.H., Myers S.L. dan Ye, Keying, Probability and Statistics for Engineers dan Scientists, 8th edition Prentice-Hall, 2006
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Data Structure

Module name	Data Structure
Module level	Undergraduate
Code	IF221113
Courses (if applicable)	Data Structure
Semester	3
Lecturer	Muhammad Muharrom A.H, S.Kom., M.Kom. (PIC) Dr. Eng. Ir. Anggraini Puspita Sari, MT. Fawwaz Ali Akbar, S.Kom, M.Kom.
Language	Bahasa Indonesia and English
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester
Type of teaching, contact hours	Lectures, < 60 students,
Teaching Methods	cooperative learning, project-based learning, problem-based learning
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week
Credit points	3 credit points (sks)
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.
Mandatory prerequisites	Programming Algorithm
Courses description	In this course, students learn several structures and related algorithms to organize (store, arrange, order) a data collection in a computer so that it can be used efficiently. Data abstraction is discussed in order to define a particular data structure (linear or nonlinear) with some examples. Lab works with C/C++ programming language are set to implement appropriate data structure in some problem solving.
Learning outcomes and their corresponding PLOs	<p>After completing this module, a student is expected to:</p> <p>CO1 Students are able to abstract data on real problems according to the concept of linear data structures (stack, queue), non-linear (tree, graph) and using C/C++.</p> <p>CO2 Students are able to implement data access on linear static and dynamic data structures, array and linked list, to solve the problems based on order of data entry (LIFO, FIFO) using C/C++</p> <p>CO3 Students are able to explain terminology in graphs, explain and apply topological sort, find the shortest distance and minimum cost spanning tree in a graph..</p> <p>CO4 Students are able to implement hash-tables, to access data based on key-value data mapping using C/C++.</p>
Content	<ul style="list-style-type: none"> Abstract data type: introduction; concepts of storing, arranging and ordering data in linear/non-linear approaches; Linear data structure (stack, queue): push-pop functions in a stack; functions in a queue; empty, full, and top functions for checking the contents of a structure; implementations of stack and queue with array, linked-list and STL

	<p>for problem solving;</p> <ul style="list-style-type: none"> • Non-linear data structure - tree: functions for insertion, deletion, and searching nodes in a tree; binary search tree; graph; traversing algorithms in tree and graph; implementations of tree and graph with array, linked-list and STL for problem-solving; • Sorting algorithms (selection, insertion, bubble, quick, merge) and searching algorithms (binary, hashing) for storing, arranging and ordering data; analysis of algorithms; • Hash table data structure
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Mark Allen Weiss, Data Structures and Algorithm Analysis in C++ (4th edition), Pearson Education, Inc., 2014. • Adam Drozdek, Data Structures and Algorithms in C++ (4th edition), Cengage Learning, USA, 2013. • Michael T. Goodrich, Roberto Tamassia, David Mount, Data Structures and Algorithms in C++, 2nd edition, Wiley, 2011. • Clifford A. Shaffer, Data Structures & Algorithm Analysis in C++ (3rd edition), Dover Publication, Inc, 2011.

Numerical Methods

Module name	Numerical Methods	
Module level	Undergraduate	
Code	IF221113	
Courses (if applicable)	Numerical Methods	
Semester	3	
Lecturer	Dr. Ir. Kartini, S.Kom, MT. (PIC) Eva Yulia Puspaningrum, S.Kom, M.Kom. Yisti Vita Via, S.ST, M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Linear Algebra and Matrices	
Courses description	In this course, students discuss the basic concepts of computation involving errors and learning computational methods for solving problems related to nonlinear equations, simultaneous linear equations, differentiation, and integration.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand concepts of analytical, numerical, linear, and nonlinear methods..	
	CO2 Students are able to understand and apply solutions for linear and nonlinear equations using a programming language.	
	CO3 Students are able to understand and implement differentiation and integration concepts using a programming language.	
Content	Basic concepts of analytical and numerical methods, differences between analytical and numerical methods, fundamental concepts of linear and nonlinear equations, solving linear and nonlinear equations using manual calculations and programming languages, solving differentiation concepts using manual calculations and programming languages, solving integral concepts using manual calculations and programming languages.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% 	

	<ul style="list-style-type: none"> • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Chapra, C. Steven et.al, NUMERICAL METHODS FOR ENGINEERS, 7th Edition, The McGraw-Hill Companies, Inc, 2015. • Munir, Rinaldi, Metode Numerik, Informatika,Bandung, 2015. • Ardi Pujiyanta, Komputasi Numerik dengan Matlab, Penerbit Graha Ilmu, 2007. • Sahid, Pengantar Komputasi Numerik dengan MATLAB, Penerbit Andi, 2005. • Bambang Triatmodjo, Metode Numerik dilengkapi dengan program komputer, Fakultas Teknik Universitas Gajah Mada, 2002. • Suarga, Fisika Komputasi solusi Problema Fisika dengan Matlab, Penerbit Andi, 2005. • Soegeng. R, KOMPUTASI NUMERIK dengan TURBO PASCAL, Penerbit Andi, Yogyakarta, 1995.

Advanced Database

Module name	Advanced Database	
Module level	Undergraduate	
Code	IF221113	
Courses (if applicable)	Advanced Database	
Semester	3	
Lecturer	Retno Mumpuni, S.Kom, M.Sc (PIC) Dr. Rr. Ani Dijah Rahajoe, S.T, M.Cs Sugiarto, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 3rd semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Linear Algebra and Matrices	
Courses description	In this course, students Discussing the basic concepts of computation involving errors and learning computational methods for solving problems related to nonlinear equations, simultaneous linear equations, differentiation, and integration.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand concepts of analytical, numerical, linear, and nonlinear methods..	PLO3,PLO5
	CO2 Students are able to understand and apply solutions for linear and nonlinear equations using a programming language.	PLO3,PLO5
	CO3 Students are able to understand and implementation of differentiation and integration concepts using a programming language.	PLO3,PLO5
Content	Basic concepts of analytical and numerical methods, differences between analytical and numerical methods, fundamental concepts of linear and nonlinear equations, solving linear and nonlinear equations using manual calculations and programming languages, solving differentiation concepts using manual calculations and programming languages, solving integral concepts using manual calculations and programming languages.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% 	

forms of examination	<ul style="list-style-type: none"> • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Chapra, C. Steven et.al, NUMERICAL METHODS FOR ENGINEERS, 7th Edition, The McGraw-Hill Companies, Inc, 2015. • Munir, Rinaldi, Metode Numerik, Informatika,Bandung, 2015. • Ardi Pujiyanta, Komputasi Numerik dengan Matlab, Penerbit Graha Ilmu, 2007. • Sahid, Pengantar Komputasi Numerik dengan MATLAB, Penerbit Andi, 2005. • Bambang Triatmodjo, Metode Numerik dilengkapi dengan program komputer, Fakultas Teknik Universitas Gajah Mada, 2002. • Suarga, Fisika Komputasi solusi Problema Fisika dengan Matlab, Penerbit Andi, 2005. • Soegeng. R, KOMPUTASI NUMERIK dengan TURBO PASCAL, Penerbit Andi, Yogyakarta, 1995.

Computer Network

Module name	Computer Network	
Module level	Undergraduate	
Code	IF221116	
Courses (if applicable)	Computer Network	
Semester	4	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Achmad Junaidi, S.Kom, M.Kom Chrystia Aji Putra, S.Kom, M.T Henni Endah Wahanani, S.T, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 4th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, case study, collaborative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Operating System	
Courses description	In this course, students learn how computer communication works. Student will also study how data can be transmitted from one computer to another is based on the OSI Layer and TCP/IP reference model, network devices, cable types, IP addressing, subnetting, routing protocols (Static and Dynamic Routing), Virtual Local Area Networks (VLAN), and IP management.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to describe the history of computer networks, understand how the communication inter-computer, and are able to identify network devices and diagnose performance issues. (C1, C2, C3, C5)	PLO3
	CO2 Students are able to perform subnetting and configuration on networks. (C2, C3, C4, P2)	PLO3
	CO3 Students are able to identify routing concepts, approach how routing concepts work, and configure them in networks. (C1, C2, P2)	PLO3
	CO4 Students are able to conceptualize VLANs and design IP management within networks across various case studies. (C3, C6, P2, P4, P5, A2)	PLO3
Content	The topics covered in this course include: the history of computer networks, the impact of computer networks on human life, computer network equipment/components, transmission media, network performance (loss, delay, jitter, throughput, loss calculation, delay, jitter, throughput), OSI Reference Model, TCP/IP Reference Model, the role of protocols in computer networks, the functions of each layer in the OSI and TCP/IP models, the advantages of the OSI and TCP/IP reference models on a per-layer basis, binary and hexadecimal	

	numbering, Private and Public IP addresses, addressing schemes, introduction to IP versions 4 and 6 (IPv4 and IPv6), fundamentals of subnetting, comparison of classful and classless addressing, subnetting terminology, network address, broadcast address, usable host addressing, subnetting for Class A, B, and C, concepts and mechanisms of routing in computer networks, introduction to different types of routing protocols, static routing concept in computer networks, dynamic routing concept in computer networks, types of dynamic routing protocols, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP), VLAN principles, VLAN configuration, maintenance, and troubleshooting, routing principles, subnetting, and determination of the number of hosts in a network.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Tanenbaum, Computer Networks, Fourth Edition, Prentice-Hall, 2003. • Jim Kurose, Keith Ross, Computer Networking: A Top Down Approach, sixth edition, Addison-Wesley, 2013 • Stallings, William, Data and Computer Communications, Macmillan Publishing Company, New York, 1993. • Reynders dan Wright, Practical TCP/IP and Networking, Elsevier, 2003 • Sosinsky, Networking Bible, Wiley, Canada, 2009. • Goralski, The Illustrated Network, Morgan Kaufmann, United States, 2009.

Artificial Intelligence

Module name	Artificial Intelligence	
Module level	Undergraduate	
Code	IF221218	
Courses (if applicable)	Artificial Intelligence	
Semester	4	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Dr. Rr. Ani Dijah Rahajoe, S.T, M.Cs Dr. Eng. Ir. Anggraini Puspita Sari, MT Dr. Basuki Rahmat, S.Si, M.T Yisti Vita Via, S.ST, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 4th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, collaborative learning, cooperative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Advanced Programming	
Courses description	This course studies the scientific aspects of artificial intelligence, problem domains, various searching methods, diverse knowledge representations, matching, inference methods (statistical, Bayesian, and fuzzy), and discussions on soft computing with primary topics including fuzzy systems, Artificial Neural Networks (ANN), Deep Learning (DL), and Natural Language Processing (NLP).	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to correctly explain the concepts and terminology within artificial intelligence, and discuss examples of the application of artificial intelligence methods both from published journals and from applications that have been implemented in everyday life.	PLO4, PLO5, PLO6, PLO7, PLO8
	CO2 Students are able to apply and construct each step of artificial intelligence methods, both in theoretical concepts and in practice using programming languages correctly.	PLO4, PLO5, PLO6, PLO7, PLO8
	CO3 Students are able to evaluate and present the performance of searching methods, fuzzy systems, Artificial Neural Networks (ANN), Deep Learning (DL), and Natural Language Processing (NLP) using performance measurement evaluation methods correctly.	PLO4, PLO5, PLO6, PLO7, PLO8
Content	Searching methods, reasoning systems, and fuzzy logic, the concept of learning in	

	Artificial Intelligence, the concept of Artificial Neural Networks (ANN), Deep Learning (DL), and Natural Language Processing (NLP) to solve problems, and their implementation using the Python programming language in Jupyter Notebook.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Russel, Stuart J., Peter Norvig, "Artificial Intelligence, A Modern Approach" 3rd Edition, Prentice Hall, New Jersey, 2010. • Rahmat, B., Nugroho, B., "Pemrograman Deep Learning dengan Python" Indomedia Pustaka, 2021

Web Programming

Module name	Web Programming	
Module level	Undergraduate	
Code	IF221117	
Courses (if applicable)	Web Programming	
Semester	4	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Agung Mustika Rizki, S.Kom, M.Kom Fawwaz Ali Akbar, S.Kom, M.Kom M. Muharrom A.H, S.Kom., M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 4th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Cooperative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	In this course, students will learn about the principles and characteristics of designing and creating a good website as well as how web technologies are being used in contemporary websites.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand the development of web technology and the basics of HTML and CSS.	PLO2,PLO4, PLO6, PLO7, PLO10
	CO2 Students are able to create client-side applications using CSS, CSS Preprocessor and JavaScript.	PLO2,PLO4, PLO6, PLO7, PLO10
	CO3 Students are able to understand the workings of a dynamic web and basic PHP.	PLO2,PLO4, PLO6, PLO7, PLO10
	CO4 Students are able to create dynamic web applications with PHP	PLO2,PLO4, PLO6, PLO7, PLO10
	CO5 Students are able to create web service application/Restful API.	PLO2,PLO4, PLO6, PLO7, PLO10
Content	The material studied in this course includes : Basic HTML tags, Concepts of CSS and implementation in HTML, JavaScript for creating interactive displays, Server-side PHP programming, Concepts of COOKIE and SESSION, File management in web development, CSS Preprocessot for improved CSS writing, Basic concepts of web Conten Management System (CMS), Basic concepts and types of frameworks, Basic concepts of RESTful API with framework, and Combining and applying basic web knowledge to create a comprehensive dynamic web application. This course is project-based, students are to be expected to apply their knowledge through	

	projects and assignments.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • W. Jason Gilmore, Beginning PHP and MySQL (4th Edition): From Novice to Professional, 2010. • Michele E. Davis, Jon A. Phillips, O'Reilly. Learning PHP & MySQL: Step-by-Step Guide to Creating Database-Driven Web Sites, 2007. • W. Jason Gilmore, Beginning PHP and MySQL (4th Edition): From Novice to Professional, 2010. • Lynn Beighley, Michael Morrison., Head First PHP & MySQL, 2006. • http://php.net/manual/en/ [website]

Object Oriented Programming

Module name	Object Oriented Programming	
Module level	Undergraduate	
Code	IF221119	
Courses (if applicable)	Object Oriented Programming	
Semester	4	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Andreas Nugroho S, S.Kom, M.Kom Fawwaz Ali Akbar, S.Kom, M.Kom Wahyu Syaifullah J S, S.kom, M.Kom Sugiaro, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 4th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, cooperative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Advanced Programming	
Courses description	This course covers problem modeling using object-oriented programming concepts (classes, inheritance, overriding, overloading, polymorphism, abstract class), the object's lifecycle in computer memory, testing and debugging techniques, standard libraries in object-oriented programming languages (collections, iterators, GUI). Approaching the end of the course, students will be able to design and implement computational algorithms that ensure information resilience customized for societal needs and sustainable development of technology. The Object-Oriented Programming course is integrated into the Case-Based Method Learning approach.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to distinguish the concept of object-oriented programming and procedural programming. (C2, A2)	PLO3, PLO5, PLO8
	CO2 Students are able to address issues through an object-oriented approach. (C3, P4)	PLO3, PLO5, PLO8
	CO3 Students are able to build object-oriented applications with simple GUIs (Graphical User Interfaces). (C5, P3)	PLO3, PLO5, PLO8
Content	The study materials covered in this course include: class and object concepts, data design (data members), functions (member functions) within a class, class design in Raptor, design of arrays of objects in Raptor, inheritance concepts, subclasses, overriding, overloading, polymorphism, abstract classes, techniques for testing and debugging, pointer and virtual function concepts in object-oriented programming, collections, iterators, and standard libraries in object-	

	oriented programming languages.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Robert Lafore, Object-Oriented Programming in C++ 4th Edition, Sams Publishing, 2002. • Balagurusamy, "Object Oriented Programming with C++", Mc Graw-Hill, 1995. • Rudolv Pecinovsky – Eva (2013), "OOP: Learn Object Oriented Thinking and Programming", Eva & Thomas Brucker Publishing, 2013. • Matthias Felleisen, et al, "How to Design Classes", 2011.

Software Engineering

Module name	Software Engineering	
Module level	Undergraduate	
Code	IF221121	
Courses (if applicable)	Software Engineering	
Semester	4	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Achmad Junaidi, S.Kom, M.Kom Budi Nugroho, S.Kom, M.Kom Hendra Maulana, S.Kom, M.Kom Pratama Wirya Atmaja, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 4th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, collaboration, cooperative learning, case-study, project-based learning, and problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Advanced Programming	
Courses description	In this course students will learn about the concepts and models of software engineering, the role of personnel in the development of software engineering and arranging software planning proposal that consist of requirement analysis, planning, implementation, and software testing.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the concepts and process of software planning.	PLO4,PLO5, PLO7, PLO9, PLO10
	CO2 Students are able to analyze the problems that is able to be solved through the creation of a software.	PLO4,PLO5, PLO7, PLO9, PLO10
	CO3 Students are able to communicate without any problems between developer personnel.	PLO4,PLO5, PLO7, PLO9, PLO10
	CO4 Students are able to arrange a software development project proposal.	PLO4,PLO5, PLO7, PLO9, PLO10
	CO5 Students are Able to design a system according to the results of requirements analysis and create software testing scenarios.	PLO4,PLO5, PLO7, PLO9, PLO10
Content	The material studied by students in this course includes: Basic Concepts in Software Engineering, Activities in Software Development Projects, Software Development Processes, and the use of tools in project management. It covers project planning and cost estimation techniques, feasibility studies, Software Development Life Cycle (SDLC) models, System Engineering, Software	

	Requirement Specification (SRS), principles and templates for SRS, software project requirements, Unified Modeling Language (UML), Data Flow Diagram (DFD), Software Testing & Implementation, and project documentation according to process models and case studies.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Roger S. Pressman, Software Engineering, 8th edition, McGraw-Hill, 2014. • Ian Sommerville, Software Engineering, 9th edition, Pearson, 2010. • Software Engineering Body of Knowledge (SWEBOK). 2004. • Computing and Information Science. Software Engineering Slides. Cornell University. 2009.

System Analysis and Design

Module name	System Analysis and Design	
Module level	Undergraduate	
Code	IF221122	
Courses (if applicable)	System Analysis and Design	
Semester	4	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Afina Lina Nurlaili, S.Kom, M.Kom Budi Nugroho, S.Kom, M.Kom Eka Prakarsa Mandyartha, ST, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 4th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, cooperative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Advanced Database	
Courses description	System Analysis and Design is a course that explores the knowledge of structured design paradigms, context diagrams, data flow diagrams, ER diagrams, system documentation, Object-Oriented Design paradigms, object-oriented software development concepts, object methodologies, notations, and object-oriented diagrams. Implementation of object-oriented diagrams in object-oriented programming languages and/or visual programming.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are capable of designing and implementing software engineering. (C2, A2)	PLO4, PLO7, PLO9
	CO2 Students are proficient in creating software analysis and design based on user requirements. (C3, P4)	PLO4, PLO7, PLO9
Content	Concept of information system design; Information system development planning; Information system design with a structured approach; Information system design with an object-oriented approach	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% 	

examination	<ul style="list-style-type: none"> • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • V. Rajaraman, Analysis and Design of Information Systems, 3rd edition, Prentice-Hall of India Pvt, Ltd, 2011. • Alan Dennis, Barbara Wixom, Roberta Roth, Systems Analysis and Design, 5th edition, Wiley, 2012 • Wendy Boggs & Micheal Boggs (2002), UML with Rational Rose 2003, Sybex • Langer, Arthur M (2008), "Anaysis and Design of Information Systems 3rd Edition", Springer 2008, ISBN 978-1-84628-655-1. • Karl Seguin (2007), "Foundation of Programming: Building Better Software", CodeBetter.com, 2007, http://codebetter.com/karlseguin/2008/06/25/foundation-of-programming-ebook/

User Interface Design

Module name	User Interface Design	
Module level	Undergraduate	
Code	IF221120	
Courses (if applicable)	User Interface Design	
Semester	4	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Agung Mustika Rizki, S.Kom, M.Kom Firza Prima Aditiawan, S.Kom, M.TI Hendra Maulana, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 4th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	case study, collaborative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Advanced Database	
Courses description	User Interface Design is a course that delves into the knowledge of designing interfaces for software. The covered topics include the design, implementation, and evaluation of software interfaces. Some of the key subjects discussed in this course are: interface design concepts, the distinctions between UI and UX, the application of UI and UX, as well as creating user interactions as simple and efficient as possible, focusing on achieving user goals, often referred to as User-Centered Design.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students demonstrate proficiency in elucidating the definitions and terminologies in user interface design. Moreover, they exhibit competence in applying interface design models accurately to fulfill the requirements of each interface prototype interaction. (C2, A2)	PLO5, PLO7, PLO9
	CO2 Students are capable of applying and constructing interface designs, both in theoretical concepts and practical implementations using programming languages correctly. (C3, P4)	PLO5, PLO7, PLO9
	CO3 Students are proficient in evaluating and presenting interface design performance accurately. (C5, P3)	PLO5, PLO7, PLO9
Content	Human Information Processing Systems; Interface Development Models; Fundamentals of Interactive Design; UI/UX Design; Design Thinking for Interface Design; Principles of UI Design and UX Design; Design Sprint and Interaction Design; Communicating UI/UX Design Prototypes to Software Design.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and	One written Midterm assessment (60 minutes) and one final oral exam (30	

Evaluation	minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Bill Scott, Theresa Neil, 2009, Designing Web Interfaces, O'Reilly Media, Inc. • Martin Charlier, Alfred Lui, Claire Rowland, Elizabeth Goodman, Ann Light, 2015 Designing Connected Products, O'Reilly Media, Inc. • The Ultimate Guide to Prototyping, 2015, UXPin inc. • Web UI Design for the Human Eye, 2015, UXPin inc.

Leadership

Module name	Leadership	
Module level	Undergraduate	
Code	UV21013	
Courses (if applicable)	Leadership	
Semester	5	
Lecturer	UPN "Veteran" Jawa Timur Leadership Lecturer Team	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 5th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Discussion group, simulation, case study	
Workload	1. Lectures: 2 sks x 50 = 100 minutes (1 hours 40 minutes) per week. 2. Exercises and Assignments: 2 x 60 = 120 minutes (2 hours) per week. 3. Private study: 2 x 60 = 120 minutes (2 hours) per week	
Credit points	2 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	This course aims to assist students in exploring and demonstrating their leadership potential both in teams and individuals. Students will study various leadership concepts and theories, as well as a variety of approaches to personal and group leadership development.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand theories and concept of leadership.	PLO1, PLO2
	CO2 Students are able to implement leadership qualities that are independent, creative, and innovative, in line with their respective fields of expertise.	PLO1, PLO2
	CO3 Students are able to perform communication, team building, decision-making, and evaluate their activities according to concept of leadership.	PLO1, PLO2
Content	Leadership theories, leadership style, Leader character creation, anti-corruption leadership	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • Kepemimpinan: Teori, Psikologi, Perilaku Organisasi, Aplikasi Dan Penelitian - Wirawan • The Leadership Experience – Draft, R.L 	

Field Work Practices

Module name	Field Work Practices	
Module level	Undergraduate	
Code	UV141114	
Courses (if applicable)	Field Work Practices	
Semester	6	
Lecturer	Muhammad Muharrom Al Haromainy, S.Kom., M.Kom. (PIC) All lecturers of the Undergraduate Program of Informatics, Universitas Pembangunan Nasional "Veteran" Jawa Timur	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion, simulation, project-based learning, problem-based learning, research base	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	1. GPA \geq 2.00 2. Have completed a minimum of 80 credit points. 3. Enroll in the Internship course.	
Courses description	This course is not a face-to-face class but rather a field study to institutions/companies that students select to gather information regarding the latest developments in information and communication technology. This will provide students with insights into the current trends in the information technology industry.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Students are capable of proficiently acquiring up-to-date information on information technology advancements in the current industry from institutions/companies in the field of information technology and demonstrating precision while professionally and responsibly managing software design. (C3, P3, A2)	PLO1, PLO4, PLO6, PLO7, PLO9
Content	Preparing, designing, creating, and testing software in line with the current industry requirements.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	Guidebook for Internship Course for the Bachelor Program in Informatics at	

Community Services

Module name	Community Services	
Module level	Undergraduate	
Code	UV141115	
Courses (if applicable)	Community Services	
Semester	7	
Lecturer	Dr. Zainal Abidin Achmad, S.Sos, M.Si, M.Ed (PIC) All Lecturer appointed by LPPM	
Language	Bahasa Indonesia and English	
Relation to curriculum	Compulsory	
Type of teaching, contact hours	Lecture (Face to face lecture): 2 x 50" x 16 week per Semester	
Teaching Methods	Simulation, case study, cooperative learning, project-based learning, problem-based learning	
Workload	Fieldwork is conducted 6 hours per day for 16 days	
Credit points	2 credit points (sks)	
Requirements according to the examination regulations	-	
Mandatory prerequisites	must take a minimum of 100 credit points (sks)	
Courses description	In this course, students will analyse and execute the steps involved in solving real-life case study challenges	
Learning outcomes and their corresponding PLOs	<p>After completing this module, a student is expected to:</p> <p>CO1 Instilling students' social awareness of community problems as an implementation of the spirit of National Defense.</p> <p>CO2 Participate in activities to solve community problems through Community Engagement Course and improve students abilities to overcome the very complex problems faced by society.</p> <p>CO3 Use suitable technology innovation to assist the government in resolving issues related to the economy, entrepreneurship, environment, health, food security, disaster, stunting, women and children, education, and clean renewable energy.</p>	PLO1, PLO2, PLO3, PLO4, PLO5, PLO6, PLO7, PLO8
Content	Students acquire the ability to utilise their knowledge and produce project documentation in the format of an community services report.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	Students acquire the ability to utilise their knowledge and produce project documentation in the format of an community services report.	
Study and examination requirements and forms of examination	<p>The overall grade in the module is comprised of:</p> <ul style="list-style-type: none"> • presence and activeness: 25% • ethics and politeness: 25% • creativity and feasibility of results: 25% • content and writing of book reports: 25% 	
Reading List	<ul style="list-style-type: none"> • LPPM UPN Veteran Jawa Timur, Petunjuk Teknis KKN Tematik Bela Negara Tahun 2023-2027. 	

Project Management

Module name	Project Management	
Module level	Undergraduate	
Code	IF221124	
Courses (if applicable)	Project Management	
Semester	7	
Lecturer	Retno Mumpuni, S.Kom, M.Sc (PIC) Afina Lina Nurlaili, S.Kom, M.Kom Budi Nugroho, S.Kom, M.Kom Retno Mumpuni, S.Kom, M.Sc	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 7th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, case study, cooperative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	In this course, students are expected to develop comprehensive understanding in implementing stages in information technology project management proficiently.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Students are able to understand and implement the steps of information technology management project thoroughly.	PLO2, PLO6
Content	Project management framework, definition and characteristics of projects, project management knowledge areas, requirements of project management, introduction to Microsoft projects, and project integration management, project scope management, project time management, project cost management, project quality management, human resource management, communication management, information technology project risk management, project procurement management.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.	
Reading List	<ul style="list-style-type: none"> • Ravindranath C Pandian, Applied Software Risk Management A Guide for Software Project Managers, Auerbach Publications Taylor Francis Group, 	

	<p>2007</p> <ul style="list-style-type: none">• Cumberlidge Matt, A Pracical Guide for Business Analysts Develop Business Process Models for Implementation In a Business Process Management System, Brimingham-Mumbai, 2007• Oz Effy, Management Information System Sixth Edition, Pennsylvia State University, Great Valley, 2007.• PMBOK-Guide-and-Standards
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Information Technology Audit

Module name	Information Technology Audit	
Module level	Undergraduate	
Code		
Courses (if applicable)	Information Technology Audit	
Semester	7	
Lecturer	Afina Lina Nurlaili, S.Kom., M.Kom. (PIC) Firza Prima Aditiawan, S.Kom., MTI	
Language	Bahasa Indonesia and English	
Relation to curriculum	Mandatory; 7th semester	
Type of teaching, contact hours	Lectures, < 60 students	
Teaching Methods	Lecture, lab works, project	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Database System	
Courses description	In this course, students learn the concept of system audit including information technology audit, control procedures, risk management, disaster recovery plan for business continuity. The course discusses planning and implementing audit as well as the recommendation to increase the performance of the systems. The course also covers investigation, maturity evaluation and compliance evaluation in comparison with standard operating procedures and the governance	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand the purpose of an information technology audit and identify process and information risks related to confidentiality, integrity and availability	PLO3, PLO4
	CO2 Students are able to design and carry out audit processes that are suitable for enterprise needs	PLO3, PLO4
	CO3 Students are able to design and implement procedures and control measures to manage risk effectively	PLO6, PLO10
	CO4 Students are able to make recommendations for improving system performance by referring to examples of best practices, standards and regulations for information technology governance	PLO6, PLO10
Content	Planning and implementing audit processes. Investigation methods, analysis and maturity evaluation. Compliance evaluation based on the standard operating procedures. Recommendation for increasing risk management and system	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15%	

forms of examination	<ul style="list-style-type: none"> • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Simha R. Magal, Integrated Business Processes with ERP Systems, John Wiley & Sons, Inc., 2012 • Riyanarto Sarno, Audit Sistem Informasi/Teknologi Informasi, ITS Press, 2009.

Entrepreneurship

Module name	Entrepreneurship	
Module level	Undergraduate	
Code	UV141114	
Courses (if applicable)	Entrepreneurship	
Semester	7	
Lecturer	Tri Lathif Mardi Suryanto, S.Kom., M.T. (PIC) UPN "Veteran" Jawa Timur Entrepreneurship Lecturer Team	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 7th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion group, simulation, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Courses description	This course covers the fundamental concepts of entrepreneurship, the process, functions, and models of entrepreneurship, ideas, opportunities, risks in starting a business, as well as its development models, business management, and entrepreneurial strategies. The core competencies include character, creativity, innovation, and competitive strategies in entrepreneurship, business analysis, feasibility studies, business ethics, and business plan development.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	C01 Students are capable of thinking innovatively and creatively.	PLO1
	C02 Students have the ability to choose and effectively employ resources.	PLO1
	C03 Students are capable of identifying needs and practicing lifelong and independent learning.	PLO1
	C04 Students are capable of effectively communicating scientifically regarding ideas, problems, and solutions orally.	PLO1
	C05 Students are capable of designing a business canvas within realistic constraints, including economic, environmental, social, political, ethical, health and safety aspects, production feasibility, and sustainability.	PLO1
	C06 Students are capable of understanding entrepreneurship-related matters or cases.	PLO1
	C07 Students are able to design and assess the economic feasibility of their business.	PLO1
	C08 Students are able to design packaging within realistic constraints and feasibility.	PLO1
C09 Students are able to prepare a business plan within realistic constraints, including economic, environmental, social, political, ethical,	PLO1	

	health and safety aspects, production feasibility, and sustainability	
Content	<p>Presentation of the Syllabus and Learning Outcomes, New Entrepreneurial Needs in Indonesia, Meaning and Objectives of Entrepreneurship, Motivation for Achieving Dreams, Advantages and Disadvantages of Entrepreneurship, Steps to Start a Business; Entrepreneurship Characteristics and Motivation for Entrepreneurship; Identifying Business Opportunities, Selecting a Field of Business, and Developing Business Ideas; Concept of Risk, Types of Business Risks, Forms of Loss Due to Risks, and Risk Management, Business Canvas; The Role of Innovation and Creativity in Product and Service Development, Developing Superior Products and Services, Defining Superior Products and Managing Innovation; Understanding Communication and Its Components, Communication Objectives and Functions, Organizational Communication, Presentation Techniques; Understanding Leadership, Leadership Roles and Styles, Leadership Requirements, Formal and Informal Leaders; Definition of Business Entities, Types of Business Entities, Procedures for Establishing a Business Entity; Definitions and Functions of Marketing, Marketing Strategies, Marketing Mix, Selling Techniques; Business Funding and Resource Acquisition Activities, Evaluating and Controlling a Business, Cash Flow and Break-Even Point; Business Plan Framework, Formal Business Plan Formats, Business Plans for New Businesses and Business Expansion; Creating Business Plans for New Businesses and Business Expansion</p>	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	-	

Pattern Recognition

Module name	Pattern Recognition	
Module level	Undergraduate	
Code	IF221125	
Courses (if applicable)	Pattern Recognition	
Semester	7	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Achmad Junaidi, S.Kom, M.Kom Eka Prakarsa Mandyartha, ST, M.Kom Fetty Tri Anggraeny, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 7th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, case study, collaborative, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	Pattern recognition is a Case Method and Project-Based course that explores the concepts and practices related to methods in the stages of pattern recognition in solving classification and clustering problems. Some of the topics covered in this course include: basic concepts of pattern recognition; stages in the pattern recognition process; statistical and syntactic approaches related to feature extraction and feature selection; introduction to various classification and clustering methods; computation of evaluation methods in pattern recognition; and several case studies from published journals on the application of pattern recognition methods	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the terminologies of pattern recognition and engage in discussions on examples of pattern recognition method applications from various published journals. (C2, A2)	PLO2, PLO4, PLO6, PLO7, PLO10
	CO2 Students are able to analyze, implement, and build each stage of pattern recognition, both in terms of theoretical concepts and practical implementation using programming languages according to the referenced publications that have been studied. (C3, P4)	PLO2, PLO4, PLO6, PLO7, PLO10
	CO3 Students are able to evaluate and perform the classifications and clustering methods in pattern recognition using proper	PLO2, PLO4,

	performance measurement evaluation. (C5, P3)	PLO6, PLO7, PLO10
Content	The subjects covered in this course include: Understanding and Stages of Pattern Recognition; Applications of Pattern Recognition Methods; Sequence of Pattern Recognition Stages; Statistical and Syntactic Methods for Feature Extraction and Selection in Pattern Recognition; Pattern Recognition Classification Methods; Pattern Recognition Clustering Methods; Performance Measurement and Evaluation Methods for Pattern Recognition Algorithms; and Implementation of Pattern Recognition Methods in Programming Languages.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • J. P. Marques de Sa, Pattern Recognition - Concepts, Methods, and Applications, Springer-Porto University Portugal, 2001. • Geoff Dougherty, Pattern Recognition and Classification, Springer New York Heidelberg Dordrecht London, 2013 • J. David Irwin, Supervised and Unsupervised Pattern Recognition - Feature Extraction and Computational, CRC Press LLC USA, 2000 	

Digital Image Processing

Module name	Digital Image Processing	
Module level	Undergraduate	
Code	IF221126	
Courses (if applicable)	Digital Image Processing	
Semester	7	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Achmad Junaidi, S.Kom, M.Kom Wahyu Syaifullah J S, S.kom, M.Kom Hendra Maulana, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 7th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, collaboration, cooperative learning, case-study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	In this course, students learn the concepts and techniques of Image Processing, which include Image Acquisition, Image Histogram, Pixel and Geometry Operation, Binary Image Operation, Colored Image Processing, Image Enhancement, Image Morphology, Image Segmentation, Image Characteristic Extraction, Image Restoration, Image Compression, and case studies illustrating the implementation of image processing to solve real-world problems. The course will be conducted through case studies, group discussions, and project-based learning. Students are expected to undertake projects aimed at providing solutions to everyday problems.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand basic concepts of image processing and math operation in implementing image processing algorithm	PLO2,PLO54, PLO6, PLO7, PLO10
	CO2 Students are able to implement and build every steps of image processing method either theoretically and practically by programming.	PLO2,PLO54, PLO6, PLO7, PLO10
	CO3 Students are able to solve problems about image processing by implementing image processing techniques and methods, either by theory or practice.	PLO2,PLO54, PLO6, PLO7, PLO10
Content	Basics and Concepts of Image Processing; Image Acquisition, Image Histogram, Pixel and Geometry Operations, Binary Image Processing, Colored Image Processing, Image Enhancement, Image Morphology, Image Segmentation, Image Characteristics Extraction, Image Restoration, Image Compression, Image	

	Processing Methods Implementations, and performance evaluations of image processing methods by Programming Language.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Munir, Rinaldi. Pengolahan Citra digital dengan Pendekatan Algoritmik. 2004. • McAndrew, Alasdair. An Introduction to Digital Image Processing with Matlab. 2004. • Willey. Digital Image Processing. 3rd edition. 2001.

Informatics Research

Module name	Informatics Research	
Module level	Undergraduate	
Code	IF221123	
Courses (if applicable)	Informatics Research	
Semester	7	
Lecturer	Eva Yulia Puspaningrum, S.Kom, M.Kom (PIC) Dr. Basuki Rahmat, S.Si, M.T *) Dr. I Gede Susrama, S.T, M.Kom Mohammad Idhom, S.P, S.Kom, M.T	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program; compulsory; 7th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Case study, collaborative learning, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence Software Engineering	
Courses description	In this course, students will be guided to explore and refine ideas, then present them in the form of a scholarly document as research proposals in the field of informatics. This preparation will ensure they encounter no difficulties when composing their thesis proposals.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students possess the capability to conceive, articulate, and compose research proposals in the field of informatics with precision and adherence to standards. (C3, C5)	PLO3, PLO6
Content	Introduction to the Research Process; Systematic Procedures for Research and Proposal Development; Identifying Research Challenges; Defining Research Objectives and Formulating Research Designs in the Field of Informatics; Research Variables; Techniques for Sampling and Data Collection in Research; Formulation of Research Hypotheses; Mathematical Problem Modeling for Research Purposes; Development of Simulations and Software Applications for Research; Numerical, Statistical, and Graphical Analysis of Research Findings; Application of Diverse Citation and Referencing Models in Research; Compilation, Preparation, and Presentation of Research Proposals; Comprehensive Understanding of Each Section in the Research Proposal.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30%	

forms of examination	<ul style="list-style-type: none"> • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Hamdy A. Taha. Operation Research. An Introduction, MacMillan, 1992 • Sri Mulyani. Riset Operasional. LPEM, UI. • Hillier, Frederich S. and Lieberman. Introduction to Operation Research, McGraw-Hill, 1990 • Bazaara. Linear Programming and Network Flows. • Schaum Series Operation Research

Algorithm Design and Analysis

Module name	Algorithm Design and Analysis	
Module level	Undergraduate	
Code	IF221216	
Courses (if applicable)	Algorithm Design and Analysis	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5 th or 6 th semester	
Type of teaching, contact hours	Lectures, < 20 students,	
Teaching Methods	Simulation and case-study	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	In this course students are expected to be able to design precise and efficient algorithms and implement it into a program aimed at providing solutions to real-world problems.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to design precise and efficient algorithms and implement it into a program aimed at providing solutions to real-world problems.	PLO9,PLO10
Content	The material studied by students in this course includes: the understanding of algorithms and their development, important types of algorithms, the framework for algorithm analysis, brute force algorithms, decrease and conquer algorithms, divide and conquer algorithms, transform and conquer algorithms, greedy algorithms, dynamic programming, iterative algorithms, and limitations of algorithm power and ways to overcome them.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • Levitin, Anany, Introduction to the Design and Analysis of Algorithm, 3rd edition, Pearson, 2011. • Goodman, S.E, & Hedetniemi, S.T., Introduction to the Design and Analysis of Algorithm”, McGraw-Hill, 1988. 	

	<ul style="list-style-type: none">• Langsam, Y., Augenstein, M.J., Tenenbaum, A.M., Data Structures Using C and C++, Second Edition, Prentice Hall, 1996.• Cormen, Thomas H et al, Introduction to Algorithms, 3rd edition, The MIT Press, 2009.
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Data Mining

Module name	Data Mining	
Module level	Undergraduate	
Code	IF221217	
Courses (if applicable)	Data Mining	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Eva Yulia Puspaningrum, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	case study, project-based learning, problem-based learning, research base	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	In this course, students will learn about the concepts and models of data mining, perform data preprocessing processes, and conduct the concepts of classification and clustering. Towards the end of the course, students will engage in a case study related to data mining and solve it using various algorithms and available tools.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the fundamental concepts of data mining and elaborate on the concepts of data and data preprocessing using a sample dataset. (C2, C3)	PLO9,PLO10
	CO2 Students are able to apply algorithms for the classification, association, and clustering processes in corresponding to the presented issues. (C2, C3)	PLO9,PLO10
	CO3 Students are able to select and implement the most appropriate data mining techniques for issues that require data mining solutions. (C3)	PLO9,PLO10
	CO4 Students are able to plan and design data mining support applications to address a specific case study. (C3, C4, C5)	PLO9,PLO10
	CO5 Students are able to implement and demonstrate the use of tools suitable for addressing data mining issues. (C4, C5, C6)	PLO9,PLO10
Content	The subjects studied in this course include: Data Mining Concepts, Data Characterization, Data Preprocessing, Exploratory Data Analysis (EDA), Classification, Association, Clustering, Outlier Detection, Cluster Analysis,	

	Information Retrieval, Text Mining, and Web Mining.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: $15\% \times 2 = 30\%$ • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Daniel T. Larose, <i>Discovering Knowledge in Data: An Introduction to Data Mining</i>, John Wiley & Sons, Inc., 2005 • Ian Witten, Mark Hall, and Frank Eibe, <i>Data Mining Practical Machine Learning Tools and Techniques</i> 3rd edition, 2011. • Matthew Russel, <i>Mining The Social Web</i>, 2nd edition, O'Reilly Media, 2013 • Darius Dziuda, <i>Data Mining for Genomics and Proteomics</i>, Wiley-Interscience, 2010

Machine Learning

Module name	Machine Learning	
Module level	Undergraduate	
Code	IF221218	
Courses (if applicable)	Machine Learning	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Agung Mustika Rizki, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning, research base	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	This course is designed to encourage students to understand fundamental ideas, intuition, concepts, algorithms, and techniques to enhance the intelligence of computers by applying specific algorithms, techniques, and methods. In this course, students are expected to innovate by developing a Machine Learning system for particular cases.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the concepts and terminologies in Machine Learning and engage in discussions on examples of pattern recognition method applications, whether from published journals or real-life applications that have been correctly implemented	PLO9 ,PLO10
	CO2 Students are able to apply and build each stage of the Machine Learning method, both in terms of theoretical concepts and practical implementation, using programming languages correctly.	PLO9,PLO10
	CO3 Students can assess and perform the methods used in Machine Learning using appropriate performance measurement evaluation.	PLO9,PLO10
Content	Basic machine learning techniques include supervised, unsupervised, and reinforcement learning. Problem areas and constraints in machine learning surround Classification and Clustering. Common and fundamental algorithms/techniques/methods for developing machine learning-based systems include Bayes Classifier, Naive Bayes, Decision Trees, Artificial Neural Networks, Kohonen Networks, Self-Organizing Maps, K-Means, and K-Nearest Neighbors (K-NN).	

Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Russel, Rudolph, Machine Learning: Step-by-Step Guide to Implement Machine Learning Algorithms with Python, CreateSpace Independent Publishing Platform : Scotts Valley-California, 2018 • Pinheiro and Patetta, Introduction to Statistical and Machine Learning Methods for Data Science, SAS Institute : Cary-North Carolina, 2021. • Sarkar and Bali, Practical Machine Learning with Python: A Problem-Solver's Guide to Building Real-World Intelligent Systems 1st edition, Apress : Bangalore, 2017.

Case Based Reasoning

Module name	Case Based Reasoning	
Module level	Undergraduate	
Code	IF221219	
Courses (if applicable)	Case Based Reasoning	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Made Hanindia Prami S, S.Kom, M.Cs	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	This course places a strong emphasis on maintaining balance between theory and practical implementation in the creation of intelligent systems through a case-based approach.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students possess the ability to comprehend and expound upon the concept of the case-based reasoning approach within an application. (C2, A2)	PLO9,PLO10
	CO2 Students possess the capability to elucidate and fully grasp the constituent components of Case-Based Reasoning (CBR). (C2, A2)	PLO9,PLO10
	CO3 Students possess the ability to comprehend and put into practice multiple algorithms suitable for the construction of CBR applications. (C3, A4, P4)	PLO9,PLO10
	CO4 Students possess the competence to create a CBR-based application. (C3, A4, P4)	PLO9,PLO10
Content	Theoretical Framework and Concepts of Case-Based Reasoning (CBR); Constituent Components of CBR; A Range of Algorithms Applicable to Constructing a CBR System; CBR Implementation Aligned with Case Studies	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	

Reading List	<ul style="list-style-type: none"><li data-bbox="512 232 1445 300">• Richter, M.M., 2013. Case-Based Reasoning : A Textbook. London : Springer<li data-bbox="512 322 1445 389">• Kolodner, J., 1993. Case-Based Reasoning 1st Edition. California : Morgan Kaufmann<li data-bbox="512 412 1445 479">• Manfaat, D., 2013. Case-Based Design Desain Berbasis Kasus. Jakarta : Gramedia Pustaka Utama
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Image Analysis

Module name	Image Analysis	
Module level	Undergraduate	
Code	IF221220	
Courses (if applicable)	Image Analysis	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Achmad Junaidi, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	This course covers the introduction of image object recognition, pattern recognition methods, and the implementation of image analysis in specific domains. The learning process is facilitated through project-based learning, where students collaborate on group projects with specific topics. During the project execution, groups comprehend conceptual aspects, implement methodologies, conduct method testing, and document their findings in the form of a scientific journal.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the fundamental concepts of image analysis in a responsive manner and provide examples of the application of image analysis. (C2, A2, C2)	PLO9,PLO10
	CO2 Students are able to explain image preprocessing and image segmentation processes. (C2, A2)	PLO9,PLO10
	CO3 Students are able to explain image feature extraction, including its types and methods. (C2, A2)	PLO9,PLO10
	CO4 Students are capable of practicing image detection and recognition methods, as well as evaluating their results. (C3, P3, A3)	PLO9,PLO10
Content	Fundamental image concepts, image segmentation, image detection methods, pattern recognition, and other forms of image recognition.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments	
Study and examination requirements and	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% 	

forms of examination	<ul style="list-style-type: none"> • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Richard Woods and Rafael Gonzalez, Digital Image Processing, 3rd edition, Pearson Education, 2014 • Image Processing, Analysis, and Machine Vision 4th Edition, Milan Sonka et al. 2015. • Richard Woods, Rafael Gonzalez, Steven Eddins, Digital Image Processing Using Matlab, 2nd edition, Gatesmark Publishing, 2009 • Munir, Rinaldi. Pengolahan Citra digital dengan Pendekatan Algoritmik. 2004.

Computer Vision

Module name	Computer Vision	
Module level	Undergraduate	
Code	IF221221	
Courses (if applicable)	Computer Vision	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Fetty Tri Anggraeny, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning, research base	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	The course is designed for students to understand object detection, pattern recognition methods, and the implementation of ACVK (Advanced Computer Vision and Knowledge) in specific focus areas. The learning process is conducted using project-based learning, where students work on group projects with specific topics. During the project work, the groups grasp the conceptual, methodological implementation, test the methods, and document their findings in the form of a scientific journal.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the fundamental concepts of computer vision and provide examples of computer vision applications.	PLO9, PLO10
	CO2 Students are able to explain the image segmentation process, the segmentation process, and the evaluation of segmentation.	PLO9, PLO10
	CO3 Students are able to explain image descriptors along with their types and methods.	PLO9, PLO10
Content	Basic concepts of computer vision, image segmentation, descriptors, statistics-based pattern recognition methods, syntax, and neural networks.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% 	

	<ul style="list-style-type: none">• Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none">• Image Processing, Analysis, and Machine Vision 4th Edition, Milan Sonka et al. 2015.• Computer Vision: Algorithms and Applications, Richard Szeliski, Springer, 2011.

Information Retrieval

Module name	Information Retrieval	
Module level	Undergraduate	
Code	IF221222	
Courses (if applicable)	Information Retrieval	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Retno Mumpuni, S.Kom, M.Sc	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion group, simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	This course encompasses the procedures and prerequisites necessary for conducting an analysis of Information Retrieval. It also explores the methodologies that can be implemented during this process of Information Retrieval.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students have the ability to discern areas for testing information systems in accordance with organizational standards. (C2)	PLO9,PLO10
	CO2 Students are able to demonstrate proficiency in selecting an appropriate approach to assess the quality standards of a system. (C2)	PLO9,PLO10
	CO3 Students have the ability to effectively communicate regarding the representation of users engaged in the testing of information systems. (C2, C3)	PLO9,PLO10
	CO4 Students are proficient in identifying stakeholders and delineating their roles in the assessment of system quality standards. (C2, C3)	PLO9,PLO10
Content	Principles of conducting testing for information systems/applications, procedures for organizing software/information system development, utilization of white-box testing and black-box testing methodologies, usability testing techniques, object-oriented testing models (OOA/OOD), tools and resources to support the testing process	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	

Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • D. Suryadi HS dan Bunawan. Pengantar Implementasi Dan Pemeliharaan Sistem Informasi. Penerbit Gunadarma. • Fournier, Greg. 2009. Essential Software Testing: A Use-Case Approach. • Homès, Bernard. 2012. Fundamentals of Software Testing. Hoboken: John Wiley & Sons, Inc. • Kendal & Kendal. 2014. Systems Analysis and Design (9th Ed). Pearson Education. • Pressman, Roger; Maxim, Bruce. 2016. Software Engineering: A Practitioner's Approach, 8th Edition

Optimization Techniques

Module name	Optimization Techniques	
Module level	Undergraduate	
Code	IF221205	
Courses (if applicable)	Optimization Techniques	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Yisti Vita Via, S.ST, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Project-based learning, problem-based learning, and research-based learning.	
Teaching Methods	Lecture, lab works, project	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	This course consists of concepts, practices, and methods of optimization techniques on solving classification and clusterisation. Topics that will be covered in this course are: Optimization Techniques concepts and basics; calculation of evaluation method in Optimization Techniques; and case studies of Optimization Techniques implementations on solving classification and clustering problems.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to illustrate the concept and common terms in Optimization Techniques, able to discuss examples of Optimization Techniques implementations in, either from scientific journals or commonly used everyday applications.	PLO9,PLO10
	CO2 Students are able to implement and build every steps on Optimization Techniques method, either by theory or practice by programming.	PLO9,PLO10
	CO3 Students are able to evaluate and present the performance of classification and clustering methods in Optimization Techniques using performance measurement evaluation methods correctly.	PLO9,PLO10
Content	Concepts of spatial information system, data forms, data storage, data integration, differences between SIS data format, and web-based SIS application.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% 	

	Students must have a final grade of 55.6% or higher to pass.
Reading List	<ul style="list-style-type: none"> • Geographical Information Systems : Principle and Applications. Vol 1. Edited By D.J. Maguire, M.F. Goodchild, and D.W. Rhind. 1991 Burrough P.A, Principle of GIS for Land Resources Assessment, Oxford, 1998 • Green D. and T. Bossomaier, Online GIS and spatial metadata. Taylor & Francis, 2002 GIS cartography: a guide to effective map design / Gretchen N. Peterson. Boca Raton, FL : CRC Press, [2015]

Game Application

Module name	Game Application	
Module level	Undergraduate	
Code	IF221224	
Courses (if applicable)	Game Application	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Pratama Wirya Atmaja, S.Kom., M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	Students will undertake a comprehensive study of games and their derivatives, covering topics including game design, game development, game narratives, game analytics, serious games, intelligent methodologies for games, and gamification.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: CO1 Students exhibit a profound comprehension of game-related knowledge, enabling them to design and develop software for games with originality, apply cutting-edge intelligent algorithms, and address genuine societal needs in areas including entertainment, education, and others (C2, C3, C4, C5)	PLO9,PLO10
Content	The definition of games, recent advancements in the field of gaming, The game development process, game derivatives, gameplay systems, game mechanics, game loops, categorization of games, dynamic aspects of games, player requisites in gaming, the art of game narratives, utilization of Agile methodology, implementation of the SCRUM framework, pre-production phase of game development, vision Document, prototyping in game development, comprehensive Game Design Documentation, technical Design Documentation for games, game analytics and data analysis, the realm of serious games, educational gaming applications, advertising through gaming platforms, procedural content generation techniques, the incorporation of gamification principles	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% 	

	<ul style="list-style-type: none"> • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • S. Rabin, Ed., Introduction to Game Development, edisi 2, Charles River Media, 2010. • E. Adams and J. Dormans, Game Mechanics: Advanced Game Design. New Riders, Berkeley, CA, 2012. • E. Adams, Fundamentals of Game Design, edisi 3, New Riders, 2014. • E. Bethke, Game Development and Production. Wordware Publishing, Inc., 2003. • S. Deterding, "The lens of intrinsic skill atoms: A method for gameful design," Human-Computer Interaction, vol. 30, no. 3–4, pp. 294–335, 2015. • R. Dörner, S. Göbel, W. Effelsberg, and J. Wiemeyer, Eds., Serious Games: Foundations, Concepts and Practice. Springer International Publishing, 2016. • M. Seif El-Nasr, A. Drachen, and A. Canossa, Eds., Game Analytics - Maximizing the Value of Player Data. London: Springer London, 2013. • C. Keith, Agile Game Development with Scrum. Addison-Wesley Professional, 2010. • T. Reiners and L. C. Wood, Eds., Gamification in Education and Business. Cham: Springer International Publishing, 2015. • E. Aarseth, "A narrative theory of games," in Foundations of Digital Games 2012, FDG 2012 - Conference Program, 2012, pp. 129–133. • N. Shaker, J. Togelius, and M. J. Nelson, Procedural Content Generation in Games. Springer International Publishing, 2016. • S. Björk and J. Holopainen, Patterns in Game Design. Charles River Media, 2005. • S. Egenfeldt-Nielsen, J. H. Smith, and S. P. Tosca, Understanding Video Games: The Essential Introduction, 3rd ed. Routledge, 2016. • M. D. Dickey, Aesthetics and Design for Game-based Learning (Digital Games, Simulations, and Learning), 1st ed. Routledge, 2015. • R. Dillon, "The 6-11 framework: A new methodology for game analysis and design," in 3rd Asian Conference on Intelligent Games and Simulation, GAME-ON ASIA 2011 - 3rd Asian Simulation Technology Conference, ASTEC 2011, 2011, pp. 25–29. • P. Sweetser and P. Wyeth, "GameFlow: a model for evaluating player enjoyment in games," Computers in Entertainment, vol. 3, no. 3, 2005. • L. E. Nacke, C. Bateman, and R. L. Mandryk, "BrainHex: A neurobiological gamer typology survey," Entertainment Computing, vol. 5, no. 1, pp. 55–62, Jan. 2014. • B. Horn, S. Cooper, and S. Deterding, "Adapting cognitive task analysis to elicit the skill chain of a game," in CHI PLAY 2017 - Proceedings of the Annual Symposium on Computer-Human Interaction in Play, 2017, pp. 277–289.

Robotics

Module name	Robotics	
Module level	Undergraduate	
Code	IF221225	
Courses (if applicable)	Robotics	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	This course covers topics related to cloud robotics and automation technologies, such as the ROS (Robot Operating System) programming paradigm, cloud computing automation, and commonly used algorithms in robotics. The course also includes a significant assignment to introduce technical comprehension to students.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand the fundamental issues, limitations, strengths, and trends in robotics programming.	PLO9, PLO10
	CO2 Students are able to explain cloud computing technology and the mechanisms of robotic computing.	PLO9, PLO10
	CO3 Students are able to analyze the performance and data of algorithms for cloud robotics.	PLO9, PLO10
Content	Introduction to robotics, ROS (Robot Operating System), robotic computing, robot programming, GORE (Goal-Oriented Robot Execution), SLAM (Simultaneous Localization and Mapping), collective robot learning, crowdsourcing object identification, path planning algorithms, RAAS (Robot as a Service).	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% 	

	Students must have a final grade of 55.6% or higher to pass.
Reading List	<ul style="list-style-type: none"> • Mobile Robots: Mathematics, Models and Methods, Alonzo Kelly, Cambridge University Press, 1st Edition, 2013. • Introduction to Autonomous Mobile Robots, Roland Siegwart, Illah Reza Nourbakhsh, Davide Scaramuzza, The MIT Press; 2nd Edition, 2011. • Programming Robots with ROS: A Practical Introduction to the Robot Operating System, Morgan Quigley, Brian Gerkey and William Smart. O'Reilly Media, 1st Edition, 2015. • Robot Operating System (ROS), Open Source Robotics Foundations, www.ros.org. • A Survey of Research on Cloud Robotics and Automation. Ben Kehoe, Sachin Patil, Pieter Abbeel, Ken Goldberg. IEEE Transactions on Automation Science and Engineering (T-ASE): Special Issue on Cloud Robotics and Automation. Vol. 12, no. 2. • Learning Robotics using Python, Lentin Joseph, Packt Publishing, 1st Edition, 2015. • A Gentle Introduction to ROS, Jason M.O'Kane, CreateSpace Independent Publisher; 1st Edition, 2013.

requirements and forms of examination	<ul style="list-style-type: none"> • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Ted Van Sickle, Programming Microcontrollers in C Second Edition, ISBN: 1-878707-57-4, LLH Technology Publishing 2001. • Julien Bayle, C Programming for Arduino, ISBN 978-1-84951-758-4, Packt Publishing, 2013. • Adeel Javed, Building Arduino Projects for the Internet of Things, ISBN-13 (pbk): 978-1-4842-1939-3, DOI 10.1007/978-1-4842-1940-9, Apress 2016.

Heuristic Techniques

Module name	Heuristic Techniques	
Module level	Undergraduate	
Code	IF221205	
Courses (if applicable)	Heuristic Techniques	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Yisti Vita Via, S.ST, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Project-based learning, problem-based learning, and research-based learning.	
Teaching Methods	Lecture, lab works, project	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Artificial Intelligence	
Courses description	This course consists of concepts, practices, and methods of heuristic techniques on solving classification and clusterisation. Topics that will be covered in this course are: Heuristic Techniques concepts and basics; calculation of evaluation method in Heuristic Techniques; and case studies of Heuristic Techniques implementations on solving classification and clustering problems.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to illustrate the concept and common terms in Heuristic Techniques, able to discuss examples of Heuristic Techniques implementations in, either from scientific journals or commonly used everyday applications.	PLO9,PLO10
	CO2 Students are able to implement and build every steps on Heuristic Techniques method, either by theory or practice by programming.	PLO9,PLO10
	CO3 Students are able to evaluate and present the performance of classification and clustering methods in Heuristic Techniques using performance measurement evaluation methods correctly.	PLO9,PLO10
Content	Concepts of spatial information system, data forms, data storage, data integration, differences between SIS data format, and web-based SIS application.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% 	

	Students must have a final grade of 55.6% or higher to pass.
Reading List	<ul style="list-style-type: none"> • Geographical Information Systems : Principle and Applications. Vol 1. Edited By D.J. Maguire, M.F. Goodchild, and D.W. Rhind. 1991 Burrough P.A, Principle of GIS for Land Resources Assessment, Oxford, 1998 • Green D. and T. Bossomaier, Online GIS and spatial metadata. Taylor & Francis, 2002 GIS cartography: a guide to effective map design / Gretchen N. Peterson. Boca Raton, FL : CRC Press, [2015]

Mobile Application

Module name	Mobile Application	
Module level	Undergraduate	
Code	IF221201	
Courses (if applicable)	Mobile Application	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	Within this course, students will gain proficiency in the development of mobile applications, encompassing integrated development environments, infrastructure, design, as well as the development and testing of mobile applications connected to databases, with the objective of addressing real-world challenges.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students possess the ability to expound upon the definitions and terminology associated with mobile application development. Furthermore, they demonstrate competence in engaging in discussions concerning exemplars of correct and effective mobile application development, referencing published journal sources, authoritative literature, and market-available mobile applications. (C2, A2)	PLO9,PLO10
	CO2 Students are proficient in crafting the User Interface (UI) and User Experience (UX) of mobile applications, adhering to established principles as per published journal references, authoritative literature, and current articles featuring expert opinions. (C3, P3)	PLO9,PLO10
	CO3 Students demonstrate proficiency in applying and advancing through each stage of mobile application development, encompassing both theoretical concepts and practical implementation. This includes the utilization of programming languages, frameworks, database design, as well as the implementation of sound principles in UI and UX design. (C6, P4)	PLO9,PLO10
Content	Introduction to mobile application programming; Designing User Interface (UI) and User Experience (UX) for mobile applications; Android Activity; UI Fragments; Menu and Dialog design; Listview, Gridview, and Recyclerview Utilization; SQLite database management; Integration of Google APIs within applications; Procedures	

	for the publication of applications on the Google Play Store; individual project assignments
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Grant Allen, Android for Absolute Beginners: Getting Started with Mobile Apps Development Using the Android Java SDK, 2021 • John Horton, Android Programming for Beginners: Build In-depth, Full-featured Android Apps Starting from Zero Programming Experience, 3rd Edition, 2021

Data Warehouse

Module name	Data Warehouse	
Module level	Undergraduate	
Code	IF221202	
Courses (if applicable)	Data Warehouse	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	<p>Data Warehouse Manipulation is a course that delves into the principles and practical applications of methods used in the manipulation of data in Warehouse format. This course addresses problem-solving in the context of Web Data Warehouse manipulation and the incorporation of Data Warehouse concepts into third-party applications. Topics encompassed in this course include fundamental concepts of data manipulation within a Warehouse format, stages in the data manipulation process within a Warehouse, statistical and syntactic approaches related to Data Warehouse Configuration and Data Warehouse Extraction, introduction to various methods of Web Data Warehouse and Desktop Data Warehouse manipulation, calculation methods for the evaluation of data manipulation within a Warehouse, as well as several case studies illustrating the application of data manipulation methods within Warehouse contexts to resolve issues related to Web Data Warehouse and Desktop Data Warehouse manipulation.</p>	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are adept at providing comprehensive explanations of the definitions and terminologies associated with data manipulation in Warehouse format. Additionally, they are proficient in engaging in discussions concerning real-world applications of data manipulation methods in Warehouse format, supported by references from published journal literature and correctly implemented practical applications. (C2, A2)	PLO9,PLO10
	CO2 Students exhibit a high level of proficiency in applying and constructing every stage of the data manipulation method in Warehouse format, both theoretically and practically, while employing programming languages accurately. (C3, P4)	PLO9,PLO10

	CO3 Students demonstrate the ability to evaluate and present the performance of Data Warehouse manipulation methods accurately, in both desktop and web contexts, utilizing proper performance measurement evaluation techniques. (C5, P3)	PLO9,PLO10
Content	The Definition and Stages of Data Manipulation in Warehouse Format; Application of Data Manipulation Methods in Warehouse Format; Sequence of Data Manipulation Stages in Warehouse Format; Statistical and Syntactic Approaches to Data Warehouse Configuration and Data Warehouse Extraction in Data Manipulation in Warehouse Format; Methods for Manipulating Web Data in Data Manipulation in Warehouse Format; Methods for Manipulating Desktop Data in Data Manipulation in Warehouse Format; Performance Algorithm Measurement and Evaluation Techniques in Data Manipulation in Warehouse Format; Implementation of Methods in Data Manipulation in Warehouse Format using Programming Languages.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • Paulraj Ponniah, “Data Warehousing Fundamentals”, John Wiley & Sons, Inc – 2001 • Ralph Kimbal, “The Data Warehouse Toolkit”, Willey – 2002 • W. H. Inmon, “Building the Data Warehouse Third edition”, John Wiley & Sons, Inc – 2002 	

Enterprise Resource Planning Application

Module name	Enterprise Resource Planning Application	
Module level	Undergraduate	
Code	IF221203	
Courses (if applicable)	Enterprise Resource Planning Application	
Semester	5/6	
Lecturer	Fetty Tri Anggraeny, S.Kom, M.Kom (PIC) Dr. I Gede Susrama, S.T, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective ; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	The ERP Applications course is an academic curriculum that comprehensively explores the knowledge related to the concept of integrating corporate resources within a unified system. The integration of enterprise resource management aims to achieve a high degree of efficiency and streamline the decision-making process. This course encompasses subjects such as the evolution of the definition and scope of Enterprise Resource Planning (ERP), the technological aspects of ERP, ERP modules, ERP implementation, maintenance, and ERP software.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are proficient in elucidating the definitions and terminologies within ERP applications. They possess a thorough understanding of Business Functions and Business Processes within ERP Applications and can articulate their development accurately. (C2, A2)	PLO9,PLO10
	CO2 Students exhibit a precise comprehension of the theoretical and practical concepts of modules in ERP applications. (C3, P4)	PLO9,PLO10
	CO3 Students are proficient in designing and executing business processes within ERP Applications. (C5, P3)	PLO9,PLO10
Content	Definition of ERP Applications and the explanation of associated terminologies; Fundamental concepts of ERP Applications; Modules within ERP Applications; Functional areas of operation; Business processes; ERP software; Sales and Distribution, Production, and Supply Chain Management (SCM), Accounting, and Human Resources Processes (HR) within ERP Applications; Concepts of Process Modeling, Process Improvement, and their application within ERP Applications.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and	One written Midterm assessment (60 minutes) and one final oral exam (30	

Evaluation	minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Monk, Ellen and Wagner, Bret., 2007, "Concepts in enterprise resource planning, 3th Edition ", South-Western College Publishing. • O'Leary, D.E., 2000, "Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commerce and Risk", Cambridge University Press • Dhewanto, Wawan dan Falahah., 2007, "Enterprise Resource Planning : Menyelaraskan Teknologi Informasi dengan Strategi Bisnis", Penerbit Informatika, Bandung

Application Programming Interface Programming

Module name	Application Programming Interface Programming	
Module level	Undergraduate	
Code	IF221204	
Courses (if applicable)	Application Programming Interface Programming	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	API Programming involves working with data through APIs. This course explores the concepts and practices associated with manipulating data using APIs to address challenges related to web API handling and integrating APIs into third-party applications. Topics discussed in this course include: the fundamental concepts of data manipulation using APIs, the stages within the data manipulation process through APIs, statistical and syntactic approaches related to Rest APIs and API Extraction, an introduction to various methods for manipulating web APIs and desktop APIs, assessment methods within data manipulation through APIs, and several case studies demonstrating the application of data manipulation methods through APIs in addressing web API and desktop API manipulation issues.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the concepts and terminologies related to data manipulation through APIs and are capable of discussing the application of methods for data manipulation through APIs, both from published journals and applications that have been properly integrated. (C2, A2)	PLO9,PLO10
	CO2 Students are able to apply and build each stage of data manipulation methods through APIs, within both theoretical understanding and practical execution. (C3, P4)	PLO9,PLO10
	CO3 Students are able to evaluate and perform the methods for manipulating Web APIs and Desktop APIs in data manipulation through APIs, using performance measurement evaluation methods correctly. (C5, P3)	PLO9,PLO10

Content	The subjects studied in this course include: understanding and Stages of Data Manipulation through APIs; Applications of Data Manipulation Methods through APIs; Workflow of Data Manipulation through APIs; Statistical and Syntactical Methods for Rest API and API Data Extraction in data manipulation through APIs; Web API Manipulation Methods in data manipulation through APIs; Desktop API Manipulation Methods in data manipulation through APIs; Algorithm Performance Measurement Evaluation Methods in data manipulation through APIs; and Implementation of Methods in data manipulation through APIs using Programming Languages.
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Parlika, Rizky, & Atmaja, Pratama Wirya 2018, 'Rizubot Version 1.0 algorithm: How to read the price movements of Crypto Currency Using the API to find a good purchase price', pp. 1045-1049, ISSN 2589-4943, Atlantis Press, https://doi.org/10.2991/icst-18.2018.211 • Parlika, R, & Atmaja, PW 2020, 'Realtime monitoring of Bitcoin prices on several Cryptocurrency markets using Web API, Telegram Bot, MySQL Database, and PHP-Cronjob', 2020 6th Information Technology ..., ieeexplore.ieee.org, https://ieeexplore.ieee.org/abstract/document/9321109/ • Parlika, R, & Pratama, A 2021, 'Use of the Web API as a basis for obtaining the latest data on bitcoin prices at 30 exchange places', IOP Conference Series: Materials Science ..., iopscience.iop.org, https://iopscience.iop.org/article/10.1088/1757-899X/1125/1/012035/meta

Spatial Information Systems

Module name	Spatial Information System	
Module level	Undergraduate	
Code	IF221205	
Courses (if applicable)	Spatial Information System	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Dr. Rr. Ani Dijah Rahajoe, S.T, M.Cs	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 20 students,	
Teaching Methods	Simulation, case-study, project-based learning, and problem-based learning.	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	In this course students learns about the concepts of Spatial Informationn System, which commonly referred to as Geographical Information System that relates to spatial data to form maps along with its features that aims to build a map model.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand Spatial Information System Technology.	PLO9,PLO10
	CO2 Students are able to understand data forms, data integrations, and SIS format differences.	PLO9,PLO10
	CO3 Students are able to understand SIS application, map and its features, Web-based SIS concepts and able to create an example of it.	PLO9,PLO10
	CO4 Students are able to understand and give examples, discuss and demonstrate the data input of SIS/GIS Application for case study.	PLO9,PLO10
Content	Concepts of spatial information system, data forms, data storage, data integration, differences between SIS data format, and web-based SIS application.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	

Reading List	<ul style="list-style-type: none">• Geographical Information Systems : Principle and Applications. Vol 1. Edited By D.J. Maguire, M.F. Goodchild, and D.W. Rhind. 1991 Burrough P.A, Principle of GIS for Land Resources Assessment, Oxford, 1998• Green D. and T. Bossomaier, Online GIS and spatial metadata. Taylor & Francis, 2002 GIS cartography: a guide to effective map design / Gretchen N. Peterson. Boca Raton, FL : CRC Press, [2015]
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Requirement Analysis

Module name	Requirements Analysis	
Module level	Undergraduate	
Code	IF221206	
Courses (if applicable)	Requirements Analysis	
Semester	5/6	
Lecturer	Budi Nugroho, S.Kom, M.Kom (PIC) Retno Mumpuni, S.Kom, M.Sc	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th/6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	discussion group, simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	This course encompasses the procedures and prerequisites necessary for conducting an analysis of requirements for information systems or computer applications. It also explores the methodologies that can be implemented during this process of requirements analysis for information systems or computer applications.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students have the ability to discern areas for testing information systems in accordance with organizational standards. (C2)	PLO9,PLO10
	CO2 Students are able to demonstrate proficiency in selecting an appropriate approach to assess the quality standards of a system. (C2)	PLO9,PLO10
	CO3 Students have the ability to effectively communicate regarding the representation of users engaged in the testing of information systems. (C2, C3)	PLO9,PLO10
	CO4 Students are proficient in identifying stakeholders and delineating their roles in the assessment of system quality standards. (C2, C3)	PLO9,PLO10
Content	Principles of conducting testing for information systems/applications, procedures for organizing software/information system development, utilization of white-box testing and black-box testing methodologies, usability testing techniques, object-oriented testing models (OOA/OOD), tools and resources to support the testing process	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and	One written Midterm assessment (60 minutes) and one final oral exam (30	

Evaluation	minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • D. Suryadi HS dan Bunawan. Pengantar Implementasi Dan Pemeliharaan Sistem Informasi. Penerbit Gunadarma. • Fournier, Greg. 2009. Essential Software Testing: A Use-Case Approach. • Homès, Bernard. 2012. Fundamentals of Software Testing. Hoboken: John Wiley & Sons, Inc. • Kendal & Kendal. 2014. Systems Analysis and Design (9th Ed). Pearson Education. • Pressman, Roger; Maxim, Bruce. 2016. Software Engineering: A Practitioner's Approach, 8th Edition

Testing and Implementation

Module name	Testing and Implementation	
Module level	Undergraduate	
Code	IF221207	
Courses (if applicable)	Testing and Implementation	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Sugiarto, S.Kom., M.Kom.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5 th or 6 th semester	
Type of teaching, contact hours	Lectures, < 20 students,	
Teaching Methods	Discussion, case-study, simulation, project-based learning, problem-based learning.	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	Experimentation and implementation is a course that studies the steps needed to or prepared to conduct trials of software/computer applications, methods that can be applied in the implementation of these trials to software/computer applications, creating a report from the testing model whose scenarios have been created in the process of testing software/computer applications, and creating and implementing a report in the IEEE format for each selected case study.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand concepts of analytical, numerical, linear, and nonlinear methods..	PLO9,PLO10
	CO2 Students are able to understand and apply solutions for linear and nonlinear equations using a programming language.	PLO9,PLO10
	CO3 Students are able to understand and implement differentiation and integration concepts using a programming language.	PLO9,PLO10
Content	The material studied by students in this course includes: software/computer application testing, software/application development, testing using white-box testing methods, testing using black-box testing methods, usability testing methods, object-oriented testing models (OOA/OOD), support tools for testing, presentation of the progress of trial and implementation projects from each team/group according to the case study, testing planning and completion estimation, testing process control, implementation of testing templates used in the field, and the creation of planning and execution reports for each project group.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and	One written Midterm assessment (60 minutes) and one final oral exam (30	

Evaluation	minutes), two short computer-based quizzes, takehome written assignments
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • D. Suryadi HS dan Bunawan. Pengantar Implementasi Dan Pemeliharaan Sistem Informasi. Penerbit Gunadarma • Fournier, Greg. 2009. Essential Software Testing: A Use-Case Approach • Homès, Bernard. 2012. Fundamentals of Software Testing. Hoboken: John Wiley & Sons, Inc. • Kendal & Kendal. 2014. Systems Analysis and Design (9th Ed). Pearson Education. • Pressman, Roger; Maxim, Bruce. 2016. Software Engineering: A Practitioner's Approach, 8th Edition

Framework Programming

Module name	Framework Programming	
Module level	Undergraduate	
Code	IF221208	
Courses (if applicable)	Framework Programming	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Fawwaz Ali Akbar, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	In this course, students will study the concepts of web design using available frameworks and apply object-oriented web programming in web databases. In addition, this course covers security factors, image and graphics handling, as well as the implementation of AJAX and JQuery within the framework. Students will also learn several frontend frameworks to support web development. At the end of this course, students are required to create a final project in the form of a web application using a framework. This course is a project-based.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to design and implement a framework in creating a web-based and database-driven system.	PLO9, PLO10
Content	Concepts of Object-Oriented Web Programming, object-oriented web programming in web databases (dynamic web), configuration of Web Framework within the MVC (Model-View-Controller) concept, fundamental CRUD (Create, Read, Update, Delete) functions in the framework, web application security, library and helper concepts in the framework, AJAX and JQuery concepts and their application in Web Framework, and templates of Web Framework.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% 	

	Students must have a final grade of 55.6% or higher to pass.
Reading List	<ul style="list-style-type: none"> • Azis Farid M, Object Oriented Programming PHP, 2005. • Andi Gutmans, Stig Saether Bakken, DerickRethans, PHP 5 Power Programming, Prentice Hall PTR, Maryland-US, 2004. • Ullman Larry, PHP Advanced and Object-Oriented Programming: Visual QuickPro Guide, 2013 • Wiwit Siswoutomo, PHP Undercover : Mengungkap Rahasia Pemrograman PHP, Elexmedia Komputindo, Jakarta, 2004 • Awan Pribadi Basuki, Membangun Web Berbasis PHP dengan Framework CodeIgniter, Lokomedia, Yogyakarta, 2010 • David Upton, CodeIgniter for Rapid PHP Application Development: Improve your PHP coding productivity with the free compact open-source MVC CodeIgniter framework, Packt Publishing, 2007. • CodeIgniter User Guide Version 1.7.2 • http://littlebrain.org/2008/05/27/codeigniter-and-ajax-using-jquery-tutorial/ • http://www.smarty.net

Information Technology Infrastructure Analysis

Module name	Information Technology Infrastructure Analysis	
Module level	Undergraduate	
Code	IF221209	
Courses (if applicable)	Information Technology Infrastructure Analysis	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Firza Prima Aditiawan, S.Kom, M.TI	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	This course introduces the principles and concepts of information Infrastructure Analysis that involve various aspects, both those acquired in previous semesters and the latest ones, especially standardized information technology Infrastructure Analysis.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain terminologies in Information Infrastructure Analysis. (C2, C3)	PLO9,PLO10
	CO2 Students are able to understand the concept of Information Technology design in KAMI index. (C2, C4)	PLO9,PLO10
	CO3 Students are able to design and implement Infrastructure Analysis for Information Technology. (C3, C4)	PLO9,PLO10
Content	The content covered in this course involves Information Technology Security Management, which encompasses Information Security Governance, Information Security Risk Management, Information Security Framework, Information Asset Management, Information Technology and Information Security, and the Role of Information Technology in maintaining the level of Information Technology service. This course aims to support the information technology security management capabilities of an organization or company with a business strategy.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments	
Study and examination	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30%	

requirements and forms of examination	<ul style="list-style-type: none"> • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Indeks Keamanan Informasi (kominfo.go.id) (bssn.go.id) • Michael E. Whitman, Herbert J. Mattord, Management of Information Security, Course Technology, 3rd edition, 2010. • Certified Information Security Manager Review Manual 2012/2013/2014 • Darril Gibson, Managing Risk in Information Systems, Jones & Bartlett Learning, 2011. • Thomas R. Peltier, Justin Peltier, Complete Guide to Certified Information Security Manager Certification, Auerbach Publications, 2007.

Network Programming

Module name	Network Programming	
Module level	Undergraduate	
Code	IF221210	
Courses (if applicable)	Network Programming	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Andreas Nugroho S, S.Kom, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	Simulation, Case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	In this course, students will learn about the fundamentals of internet networking, preparation for network programming, an introduction to sockets, Java multithreading, connection-oriented and connectionless system protocols, programming using HTTP, FTP, SMTP, and POP3 protocols, network programming with IPv6, programming based on TLS/SSL, and programming based on proxy protocols.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to understand the fundamental of internet networking	PLO9,PLO10
	CO2 Students are able to understand network-based Java APIs, become familiar with sockets, and understand Java multithreading.	PLO9,PLO10
	CO3 Students are able to understand system protocols, both connection-oriented and connectionless.	PLO9,PLO10
	CO4 Students are able to explain network programming based on the HTTP and FTP protocols.	PLO9,PLO10
	CO5 Students are able to understand network programming based on the SMTP mail protocol.	PLO9,PLO10
	CO6 Students are able to understand network programming based on the POP3 protocol	PLO9,PLO10

	CO7 Students are able to understand network programming based on IPv6.	PLO9,PLO10
	CO8 Students are able to understand network programming based on TLS/SSL.	PLO9,PLO10
	CO9 Students are able to understand network programming based on proxy protocols.	PLO9,PLO10
Content	The subjects studied in this course include: the definition and concept of network analysis, including system approaches; the concept and process of determining requirements for building a network; how to analyze traffic flow that can be used for performance requirements for various network traffic flows; network architecture processes (an introduction to network architecture, internal and external development relationships within and between core functions such as addressing and routing, security, network management, and performance) within the network; detailing each of these core functions, developing components and reference architectures that depict their internal and external relationships; the design process, (applying it to make the design decisions, including how to evaluate and select vendors and service providers, and diagrams design)	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 56 or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • Elliotte Rusty Harold. Java Network Programming, Fourth Edition O'Reilly Media. 2014 	

Network Design and Management

Module name	Network Design and Management	
Module level	Undergraduate	
Code	IF221211	
Courses (if applicable)	Network Design and Management	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Achmad Junaidi, S.Kom, M.Kom Henni Endah Wahanani, S.T, M.Kom	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	simulation, case study, project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	A case-based method course that covers the fundamental concepts of network analysis, architecture and design processes, service description for networks, and the identification and/or derivation of network requirements from systems. The discussed concepts are derived into various user, application, and device requirements, and the development of both requirements, namely application specifications and maps. It involves determining variables for measurement (service metrics) and how to conduct measurements, introducing modeling and simulation, and exploring other techniques to describe user and application behavior. It encompasses the development of performance requirements for capacity, delay, and RMA, including the establishment of performance thresholds and limits, flow specifications, where performance requirements are consolidated for flows or flow groups (peer-peer, client-server, distributed networks). It also involves determining data rate estimates occurring in computer networks, addressing and routing architecture, network architecture models, security architecture, optimization of computer network architecture, addressing mechanisms, routing mechanisms, routing analysis, network management definitions and characteristics, network management mechanisms, network traffic control management, security development and privacy plan, security and privacy administration, rules and procedures, network design concept, network product design, and network simulation.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to specifically analyze the process of developing the required prerequisites for constructing networks, understanding traffic flow, and conducting risk analysis.	PLO9, PLO10
	CO2 Students are able to delineate the method for creating preferred	PLO9,

	technologies and topologies for network construction, comprehend the interrelations among various functions within the network, and apply this information to develop architecture.	PLO10
	CO3 Students can explain the network architecture employed as input for the design process, where informations on location, equipment, and vendor selection are utilized to specify network design	PLO9, PLO10
Content	Definition and concept of network analysis, requirements for network construction; how to analyze traffic flows that can be used to determine performance requirements for various network traffic flows; network architecture process (introduction to network architecture, the development of internal and external relationships within and between core functions (addressing and routing, security, network management, and performance) in the network; detailing each of these core functions, developing components and reference architectures that depict their internal and external relationships; the design process (applying it to make design decisions, including how to evaluate and select vendors and service providers, and design diagrams).	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	<p>The final grade in the module is composed of:</p> <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>	
Reading List	<ul style="list-style-type: none"> • McCabe, James . D, Network Analysis, Architecture, And Design, 3nd Edition, Morgan Kaufmann Publisher, Europe, 2007 • Gebali, Fayez : “Analysis of Computer and Communication Networks“ , Springer, 2008 	

Information Technology Architecture

Module name	Information Technology Architecture	
Module level	Undergraduate	
Code	IF221212	
Courses (if applicable)	Information Technology Architecture	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Firza Prima Aditiawan, S.Kom, M.TI	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	This course introduces the principles and concepts of information technology architecture that involve various aspects, both those acquired in previous semesters and the latest ones, especially standardized information technology architecture.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain terminologies in Information Architecture. (C2, C3)	PLO9,PLO10
	CO2 Students are able to understand the concept of Information Technology design in KAMI index. (C2, C4)	PLO9,PLO10
	CO3 Students are able to design and implement architecture for Information Technology. (C3, C4)	PLO9,PLO10
Content	The content covered in this course involves Information Technology Security Management, which encompasses Information Security Governance, Information Security Risk Management, Information Security Framework, Information Asset Management, Information Technology and Information Security, and the Role of Information Technology in maintaining the level of Information Technology service. This course aims to support the information technology security management capabilities of an organization or company with a business strategy.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments	
Study and examination	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30%	

requirements and forms of examination	<ul style="list-style-type: none"> • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Indeks Keamanan Informasi (kominfo.go.id) (bssn.go.id) • Michael E. Whitman, Herbert J. Mattord, Management of Information Security, Course Technology, 3rd edition, 2010. • Certified Information Security Manager Review Manual 2012/2013/2014 • Darril Gibson, Managing Risk in Information Systems, Jones & Bartlett Learning, 2011. • Thomas R. Peltier, Justin Peltier, Complete Guide to Certified Information Security Manager Certification, Auerbach Publications, 2007.

Information Technology Strategy and Policy

Module name	Information Technology Strategy and Policy	
Module level	Undergraduate	
Code	IF221213	
Courses (if applicable)	Information Technology Strategy and Policy	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5 th or 6 th semester	
Type of teaching, contact hours	Lectures, < 20 students,	
Teaching Methods	Simulation, case-study, project-based learning, problem-based learning.	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	This course illustrate the process of developing effective strategic IT plan using tools and techniques for formulating IT policy that supports the organization's business policy.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to use tools and techniques to formulate IT policies that support the organization's business strategy and can organize and manage IT strategies.	PLO9,PLO10
	CO2 Students are able to implement managing the information technology governance of an organization	PLO9,PLO10
Content	The material studied by students in this course includes: the role of IT from a strategic perspective, concepts of business strategy and their implications for IT strategy, effective IT strategy development, analysis of IT strategy, organization and availability of IT resources, IT investment management, strategies for IT and knowledge management, and management of IT infrastructure provisioning.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% Students must have a final grade of 55.6% or higher to pass.	
Reading List	<ul style="list-style-type: none"> • Ward, John. Strategic Planning for Information System, John-Wiley 2002. • Tozer, Edwin. Strategic IS/IT Planning, Butterworth-heinemann 1996. Penduk • International Journals and articles about "IT Strategy and Policy". 	

Information Technology Governance

Module name	Information Technology Governance	
Module level	Undergraduate	
Code	IF221205	
Courses (if applicable)	Information Technology Governance	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC)	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5 th or 6 th semester	
Type of teaching, contact hours	Lectures, < 20 students,	
Teaching Methods	Simulation, case-study, project-based learning, and problem-based learning.	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	This course covers a fundamental understanding of the concept of information technology governance and introduces methodologies and standardization in information technology governance. Students are required to conduct a review of information technology governance.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain the theory and the scope of information technology governance.	PLO9,PLO10
	CO2 Students are able to implement managing the information technology governance of an organization	PLO9,PLO10
Content	The material studied by students in this course includes: the scope of information technology governance, the Plan and Organize (PO) domain and the Acquire and Implement (AI) domain within the COBIT framework, the Deliver and Support (DS) domain and the Monitor and Evaluate (ME) domain within the COBIT framework, the Service Strategy process and the Service Design process within the ITIL framework, the Service Transition process and the Service Operation process within the ITIL framework, and Continual Process Improvement within the ITIL framework.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, takehome written assignments	
Study and examination requirements and forms of examination	The final grade in the module is composed of: <ul style="list-style-type: none"> • Two short computer-based quizzes: 15% x 2 = 30% • Take-home written assignments : 15% • Written Midterm assessment: 25% 	

	<ul style="list-style-type: none"> • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Cobit 5, A Business Framework for the Governance and Management of Enterprise IT, ISACA and IT Governance Institute, 2009-2012 • An Introductory Overview of ITIL V3, The IT service management forum. The UK chapter of the itSMF, 2007

Information Technology Security Management

Module name	Information Technology Security Management	
Module level	Undergraduate	
Code	IF221215	
Courses (if applicable)	Information Technology Security Management	
Semester	5/6	
Lecturer	Yisti Vita Via, S.ST, M.Kom (PIC) Firza Prima Aditiawan, S.Kom, M.TI	
Language	Bahasa Indonesia and English	
Relation to curriculum	Elective; 5th or 6th semester	
Type of teaching, contact hours	Lectures, < 60 students,	
Teaching Methods	project-based learning, problem-based learning	
Workload	1. Lectures: 3 sks x 50 = 150 minutes (2 hours 30 minutes) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Software Engineering	
Courses description	This course introduces the principles and concepts of information technology security management that involve various aspects, both those acquired in previous semesters and the latest ones, especially standardized information technology security.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to:	
	CO1 Students are able to explain terminologies in Information Security and Information Security Management. (C2, C3)	PLO9,PLO10
	CO2 Students are able to understand the concept of Information Technology design in KAMI index. (C2, C4)	PLO9,PLO10
	CO3 Students are able to design and implement security for Information Technology. (C3, C4)	PLO9,PLO10
Content	The content covered in this course involves Information Technology Security Management, which encompasses Information Security Governance, Information Security Risk Management, Information Security Framework, Information Asset Management, Information Technology and Information Security, and the Role of Information Technology in maintaining the level of Information Technology service. This course aims to support the information technology security management capabilities of an organization or company with a business strategy.	
Media employed	LCD, whiteboard, websites, books (as references), online meeting, etc.	
Assessments and Evaluation	One written Midterm assessment (60 minutes) and one final oral exam (30 minutes), two short computer-based quizzes, take home written assignments	
Study and examination	The final grade in the module is composed of: • Two short computer-based quizzes: 15% x 2 = 30%	

requirements and forms of examination	<ul style="list-style-type: none"> • Take-home written assignments : 15% • Written Midterm assessment: 25% • Final oral exam: 30% <p>Students must have a final grade of 55.6% or higher to pass.</p>
Reading List	<ul style="list-style-type: none"> • Indeks Keamanan Informasi (kominfo.go.id) (bssn.go.id) • Michael E. Whitman, Herbert J. Mattord, Management of Information Security, Course Technology, 3rd edition, 2010. • Certified Information Security Manager Review Manual 2012/2013/2014 • Darril Gibson, Managing Risk in Information Systems, Jones & Bartlett Learning, 2011. • Thomas R. Peltier, Justin Peltier, Complete Guide to Certified Information Security Manager Certification, Auerbach Publications, 2007.